

Appendix J

Ecological Field Studies for Each Evaluation Unit

This appendix to the final progress report (report) for the Hanford Site-Wide Risk Review Project contains the field evaluations for ecological resources. The evaluation of risk to ecological resources in the current, during active cleanup, and near-term post-cleanup periods depends on the resource level in each evaluation unit (EU) and its buffer zone. While there have been some recent ecological inventories on the Hanford Site, many of the EUs have not been examined for resource level in many years. Thus, it was necessary to conduct on-the-ground evaluations of the current resource level on each EU with its associated buffer area (defined as one-times the largest diameter of the EU). To accomplish this, Consortium for Risk Evaluation with Stakeholder Participation (CRESP), in collaboration with Pacific Northwest National Laboratory (PNNL), developed a field protocol for personnel to assess current resource levels. Evaluations were made of each EU and its buffer area by trained professional PNNL ecologists, including the percent of the EU and buffer area that was composed of each resource level type (see Chapter 7 of the methodology document). The field reports completed by PNNL are included in this appendix. Note, the field evaluations for the EUs in this report were conducted in the winter, which is not optimal because most of vegetation is not actively growing. Further, time constraints and access issues prevented evaluation of some parts of some EUs and buffer areas.

The field evaluations were used in conjunction with the risk rating table (from Chapter 7 of the methodology document) and the disposition table (Appendix B) to rate the risk to ecological resources currently, during active cleanup, and in the near-term post-cleanup period. All rating evaluation results may be found in Chapter 3 of this report. A key indicator of risk used by the authors to evaluate the ecological resources is the summary of the percentage of each biological resource level within each evaluation unit (Table J.1) and within the adjacent landscape buffer area (Table J.2).

There were five levels of ecological resources (DOE/RL-96-32), described briefly below (see Chapter 7 of the methodology document for a full description).

Levels of Ecological Resources (DOE/RL-96-32 2013)

Level 5 = Irreplaceable habitat or federal threatened and endangered species (including proposed species, and species that are new to science or unique to Washington State)

Level 4 = Essential habitat for important species

Level 3 = Important habitat

Level 2 = Habitat with high potential for restoration (ecologically, not legally)

Level 1 = Industrial or developed

Level 0 = Non-native plants and animals

Three caveats should be noted: (1) many of these resources have not been evaluated for a decade or more (and so may have changed), (2) no invasive species inventory has been completed, and (3) while much of the site was evaluated for resource level, not all sites were evaluated—thus evaluations are valid where given, but if a site is blank on the resource map, it may not indicate lack of a value, but rather that the site was not surveyed.

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Evaluation Unit: 618-11 Burial Ground
 ID: RC-LS-1
 Group: Legacy Source
 Operable Unit Cross-Walk: 300-FF-2
 Related EU: CP-GW-1
 Sites & Facilities: 618-11 Burial Ground
 Key Data Sources Docs: WCH-542, Rev 0
 WCH-183, Rev 1
 WCH-459, Rev 1
 DOE/RL-96-32 2013
 PNNL ECAP Database¹
 Field Survey Date: 7/16/2014
 Data Sheet prepared by: JLD 10/5/2014

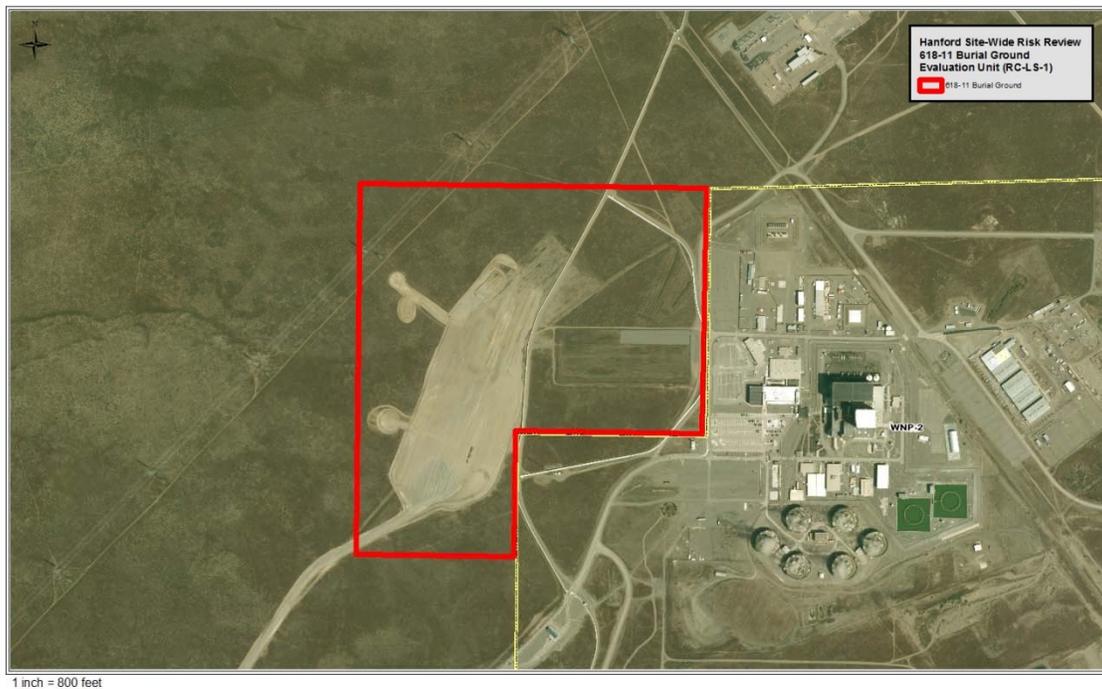
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Figure J.1. Site Map with Evaluation Unit Boundaries

RC-LS-1: 618-11 Burial Grounds

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the

¹ The Ecological Compliance and Assessment Project (ECAP) database is an evolving set of data that is maintained by Pacific Northwest National Laboratory (PNNL) and updated as new ecological assessments are completed.

current Endangered and Threatened Species (Federal and State) distribution data; priority habitats as defined by Washington Department of Fish and Wildlife; available current aerial imagery, locations of Hanford Unit waste sites and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data tables.

The following steps were taken to assess the EU associated with the 618-11 burial ground:

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. A visual survey was conducted within the EU boundary by experienced shrub-steppe ecologists. PNNL biologists also reviewed the observations and biological survey data available in the Ecological Compliance and Assessment Project (ECAP) database from the past 5 years for the EU to determine the status and resource level of the habitats within the EU and supplement the evaluation with previous wildlife or plant species observations.
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2012 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.
6. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

Vegetation on the area of the 618-11 Burial Ground within the EU was visually estimated to be composed of approximately 30% to 40% crested wheatgrass (*Agropyron cristatum*), an introduced perennial bunchgrass planted for erosion control, and approximately 10% to 20% Russian thistle (*Salsola tragus*).

Vegetation was measured in habitat patches to the north in a stand dominated by big sagebrush (*Artemisia tridentata*) and gray rabbitbrush (*Ericameria nauseosa*), in grasslands to the west, and south of the burial ground, as well as within the bladed laydown area visible in Figure J.1 to the far west of the burial ground. A summary of these data is provided in Table J.1 and data sheets for the site are included at the end of this summary.

No information was found documenting previous wildlife surveys of the 618-11 Burial Ground. Wildlife species (or their sign) observed during the 16 July 2014 survey include horned lark (*Eremophila alpestris*), loggerhead shrike (*Lanius ludovicianus*), western meadowlark (*Sturnella neglecta*), common raven (*Corvus corax*), unknown hawk (*Buteo* spp.), northern pocket gopher (*Thomomys talpoides*), coyote (*Canis latrans*), and American badger (*Taxidea taxus*).

Table J.1. Percent Canopy Cover and Surface Cover Measured at 618-11 Burial Ground

Vegetation/Surface Cover	618-11 South	618-11 West	618-11 North	Borrow/Laydown Area
BARE	3.0	30.5	19.3	22.8
CRUST	2.5	4.5	17.6	5.5
LITTER	40.0	29.3	32.4	28.5
Introduced Forb	20.0	14.8	3.7	6.3
Introduced Grass	17.8	15.0	16.1	27.5
Native Forb	2.8	3.8	1.1	-
Native Grass	14.0	2.3	9.7	11.5
Climax Shrubs	-	-	9.6	-
Successional Shrubs	<1	< 1	.3	-

Landscape Evaluation and Resource Classification:

The spatial area of each level of biological resources was evaluated at two scales: 1) within the 618-11 Burial Grounds EU, and 2) within a circular area radiating 1164 m from the geometric center of the site (equivalent to 1052 acres)(Figure J.2).

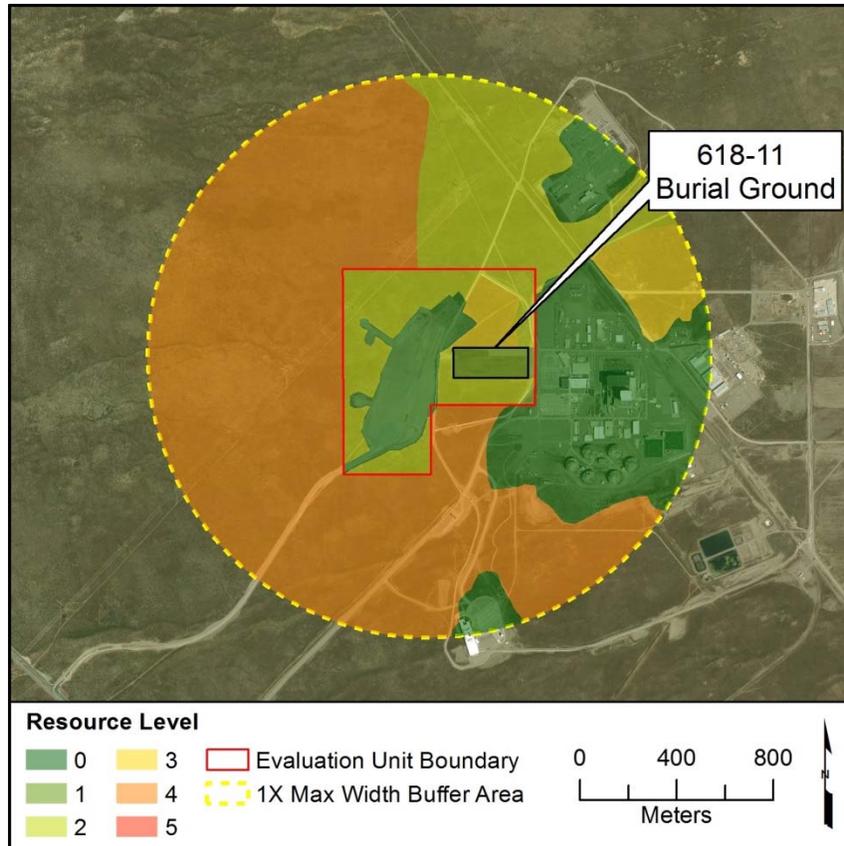


Figure J.2. Map of Biological Resource Level Classifications at the 618-11 Burial Grounds Evaluation Site (red boundary) and Landscape Buffer Area (yellow dashed line boundary)

The EU was originally characterized as containing habitats classified as levels 0, 2, and 4 (DOE/RL-96-32 2013). However, those areas of the EU that were originally classified as level 4 habitat were reclassified in this assessment as level 0 (bladed lay down area to west), and level 2 and 3 habitats based on field observations and data collected during the 16-July 2014 field visit. Resource levels within the landscape buffer area outside the EU were not re-classified for this assessment.

Table J.2 summarizes the areal extent of existing biological resources and potential changes or impacts due to clean-up activities within the landscape buffer area. All resources within the EU are assumed to be lost during cleanup and classified as 0 level habitat for evaluation of post-cleanup conditions.

Table J.2. Area and Proportion of Each Biological Resource Level Within the 618-11 Burial Ground Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
0	41.4	197.9	239.4	22.7%	31.8%	9.1%
1	11.5	0.0	11.5	1.1%	0.0%	-1.1%
2	70.1	130.6	200.7	19.1%	12.4%	-6.7%
3	13.8	33.3	47.1	4.5%	3.2%	-1.3%
4	0.0	553.6	553.6	52.6%	52.6%	0.0%
5	0.0	0.0	0.0	0.0%	0.0%	0.0%
<i>Total</i>	136.8	915.4	1052.2	100.0%	100.0%	

1 Resource levels for the evaluation unit were reviewed in the field and via imagery during July 2014 and revised to reflect current habitats conditions.

2 Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.

Assumptions and Uncertainty:

Due to project time constraints, the field surveys and reconnaissance of this EU were conducted in mid-July. By the time of the survey, the cool-season annual and perennial herbaceous plants that dominate shrub-steppe habitat had completed seasonal growth and senesced making identification and inventory difficult and most likely incomplete. Although no records for plant species of concern have been noted, the absence of species cannot be confirmed by surveys during this time of year.

By mid-July, most migratory birds have completed their nesting cycles, and surveys may not reflect their occupancy and use of habitat within the evaluation unit earlier in the season. Their absence cannot be confirmed by surveys in July after the nesting season is over. Further surveys during the nesting season would be required to fully assess the ecological impacts to nesting migratory birds.

Summary of Ecological Review:

- More than half of the EU consists of level 2 (mixed native and non-native grassland) resources. Approximately 13 acres of the EU contain a mixed sagebrush and rabbitbrush stand that qualifies as level 3 habitat, although it is degraded by invasion with non-native grasses and forbs. This area is also adjacent to another operable unit.
- The EU is adjacent and contiguous to a large industrial site— because this industrial area already affects habitat connectivity, cleanup activities inside the EU are not expected to impact habitat connectivity through loss of habitat or fragmentation.
- No species of concern were observed within or in the vicinity of the EU during the 16-July-2014 surveys.
- Approximately 56 % of the total landscape area evaluated (Figure J.2) is classified as level 3 or higher biological resources, which are not expected to be significantly impacted by cleanup actions within the EU.

References

- DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 1.
- U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington.
http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902
- U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act.
<http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>
- Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. Available at:
<http://wdfw.wa.gov/conservation/phs/list/>
- Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington.
<http://wdfw.wa.gov/conservation/endangered/>
- Washington Noxious Weed Control Board. 2014. Noxious Weed List. Available on line at
<http://www.nwcb.wa.gov/>
- Washington State Department of Natural Resources. 2014. Washington Natural Heritage Program Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

Definitions and Acronyms:

Adjacent Landscape Buffer – a circular area adjacent to and outside the EU boundary with the center of the circle at the centroid of the EU, and with a radius that is 1 times the maximum dimension (width or length—whichever is greatest). This circular buffer area is used to evaluate indirect effects and assess the remediation in relation to the landscape features and resources adjacent to the EU. This circular area is generally at least 3 times the area of the EU.

Biological Resource Levels (from DOE-RL-96-32-01)

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats.
- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks.
- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub-steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.
- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.
- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

MBTA – Migratory Bird Treaty Act; referring to species listed and protected under the federal Act.

PNNL ECAP (Ecological Compliance and Assessment Project) Database – PNNL performed ecological reviews for individual projects and annually surveyed selected areas and buildings on the Hanford Site for DOE-RL under the DOE's Public Safety and Resource Protection Program until 2011. The data collected during those surveys is archived in the ECAP database, and is used to supplement ecological evaluations as available.

Priority Habitats – Priority habitats are habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type (e.g., shrub-steppe) or dominant plant species (e.g., juniper savannah), a described successional stage (e.g., old-growth forest), or a specific habitat feature (e.g., cliffs).

Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

Field Data Sheets for the 618-11 Burial Ground

Percent Canopy Cover Visually Estimated in 0.5 m2 quadrats (Q1-Q4)										
Site	Survey Area	Species	Origin & Class	Q1	Q2	Q3	Q4	sum	Mean Canopy Cover	Freq.
618-11	Around Laydown Area	BRTE	IG	18	42	40	10	110	27.5	1
618-11	Around Laydown Area	POSA	NG	14	10	4	18	46	11.5	1
618-11	Around Laydown Area	SAKA	IF	5	4	2	10	21	5.25	1
618-11	Around Laydown Area	TRDU	IF		4			4	1	0.25
618-11	Around Laydown Area	Litter	LITTER	10	30	42	32	114	28.5	1
618-11	Around Laydown Area	Crust	CRUST	4	0	0	18	22	5.5	0.5
618-11	Around Laydown Area	Bare	BARE	59	10	10	12	91	22.75	1
Quantification										
Visual Estimate from Outside Fence for Entire Area										
Site	Survey Area	Species	Origin & Class	Percent Canopy Cover						
618-11	Burial Ground	AGCR	IG	35						
618-11	Burial Ground	SAKA	IF	10						

Percent Canopy Cover Visually Estimated in 0.5 m2 quadrats (Q1-Q4)										
Site	Survey Area	Species	Origin & Class	Q1	Q2	Q3	Q4	sum	Mean canopy cover	Freq.
618-11	South of BG Fence	AGCR	IF					0	0	0
618-11	South of BG Fence	AMAC	NF					0	0	0
618-11	South of BG Fence	OEPA	NF					0	0	0
618-11	South of BG Fence	FEOC	NG					0	0	0
618-11	South of BG Fence	BRTE	IG		18	15	38	71	17.75	0.75
618-11	South of BG Fence	POSA	NG	12	6			18	4.5	0.5
618-11	South of BG Fence	BARE	BARE	7	4	1		12	3	0.75
618-11	South of BG Fence	SAKA	IF		32	40	8	80	20	0.75
618-11	South of BG Fence	MACA	NF					0	0	0
618-11	South of BG Fence	LITTER	LITTER	29	36	42	53	160	40	1
618-11	South of BG Fence	CRUST	CRUST	10				10	2.5	0.25
618-11	South of BG Fence	RUVE	NF	4	4	2	1	11	2.75	1
618-11	South of BG Fence	AMTE	NF					0	0	0
618-11	South of BG Fence	STCO	NG	38				38	9.5	0.25

Percent Canopy Cover Visually Estimated in 0.5 m2 quadrats (Q1-Q4)										
Site	Survey Area	Species	Origin & Class	Q1	Q2	Q3	Q4	sum	Mean Canopy Cover	Freq.
618-11	West of Burial Ground	AGCR	IF	14				14	3.5	0.25
618-11	West of Burial Ground	AMAC	NF	4				4	1	0.25
618-11	West of Burial Ground	OEPA	NF	2				2	0.5	0.25
618-11	West of Burial Ground	FEOC	NG	1				1	0.25	0.25
618-11	West of Burial Ground	BRTE	IG	4	10	32	14	60	15	1
618-11	West of Burial Ground	POSA	NG	1	3		4	8	2	0.75
618-11	West of Burial Ground	BARE	BARE	74	30	4	14	122	30.5	1
618-11	West of Burial Ground	SAKA	IF		10	16	19	45	11.25	0.75
618-11	West of Burial Ground	MACA	NF		3		1	4	1	0.5
618-11	West of Burial Ground	LITTER	LITTER		32	40	45	117	29.25	0.75
618-11	West of Burial Ground	CRUST	CRUST		12	4	2	18	4.5	0.75
618-11	West of Burial Ground	RUVE	NF			4		4	1	0.25
618-11	West of Burial Ground	AMTE	NF				1	1	0.25	0.25

Percent Canopy Cover Visually Estimated in 0.5 m2 quadrats (Q1-Q7)													
Site	PatchLoc	Species	Origin & Class	Q1	Q2	Q3	Q4	Q5	Q6	Q7	sum	Mean canopy cover	Freq.
618-11	N of Burial Ground	PLPA	NF	7							7	1.0	0.25
618-11	N of Burial Ground	BRTE	IG	6	30	20	20	35		2	113	16.1	1.5
618-11	N of Burial Ground	SAKA	IF	1	16			6	1	2	26	3.7	1.25
618-11	N of Burial Ground	POSA	NG	8		6	14	1	3	14	46	6.6	1.5
618-11	N of Burial Ground	Litter	LITTER	30	40	30	56	58	9	4	227	32.4	1.75
618-11	N of Burial Ground	Crust	CRUST	48	14	22	8		5	26	123	17.6	1.5
618-11	N of Burial Ground	STCO	NG			22					22	3.1	0.25
618-11	N of Burial Ground	Bare	BARE				2		82	51	135	19.3	0.75
618-11	N of Burial Ground	ERUI	NF							1	1	0.1	0.25

Line Intercept Measurement of Shrub Canopy Cover						
Site	Survey Area	Species	Transect distance (total)	Start	Stop	Dif
618-11	North Patch, West End of Burial Ground	Artr	100	2	3.55	1.55
618-11	North Patch, West End of Burial Ground	Artr	100	6.6	8	1.4
618-11	North Patch, West End of Burial Ground	Artr	100	16.15	16.7	0.55
618-11	North Patch, West End of Burial Ground	Artr	100	25.2	26.75	1.55
618-11	North Patch, West End of Burial Ground	Artr	100	71.8	74.3	2.5
618-11	North Patch, West End of Burial Ground	Artr	100	78.05	79.55	1.5
618-11	North Patch, West End of Burial Ground	Artr	100	88.3	88.85	0.55
618-11	North Patch, West End of Burial Ground	Chna	100	91.7	92	0.3
						9.9

Evaluation Unit: K Area Waste Sites
 ID: RC-LS-2
 Group: Legacy Source
 Operable Unit Cross-Walk: 100-KR-1
 100-KR-2
 Related EU: RC-DD-2
 Sites & Facilities: Legacy waste sites within the fence at 100-K, where remediation is post-2015
 Key Data Sources Docs: DOE/RL-96-32 2013
 PNNL ECAP Database²
 Field Survey Date: 10/16/2014
 Data Sheet Prepared By: JLD, KBL, SAM, KDH; 10/23/2013

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Figure J.3. Site Map with Evaluation Unit Boundaries

RC-LS-2: K Area Waste Sites

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the current Endangered and Threatened Species (Federal and State) distribution data; priority

² The Ecological Compliance and Assessment Project (ECAP) database is an evolving set of data that is maintained by Pacific Northwest National Laboratory (PNNL) and updated as new ecological assessments are completed.

habitats as defined by Washington Department of Fish and Wildlife; available current aerial imagery, locations of Hanford Unit waste sites and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data tables.

The following steps were taken to assess the EU associated with the K Area Waste Sites:

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. A visual survey was conducted within the EU boundary by experienced shrub-steppe ecologists. Because the unit consists of primarily of unvegetated industrial and graveled surfaces and buildings, no field measurements of vegetation were taken, but canopy cover and surface condition were estimated visually in one level 2 resource area. PNNL biologists also reviewed the observations and biological survey data available in the Ecological Compliance and Assessment Project (ECAP) database from the past 5 years for the EU to determine the status and resource level of the habitats within the EU and supplement the evaluation with previous wildlife or plant species observations.
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2012 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.
6. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

Field evaluation of the 100-K Area Waste Sites EU revealed that most of the EU consists of built infrastructure, roads, parking lots, buildings, with small fragments of habitat to the north of the two reactors. Much of the surrounding area has been revegetated after cleanup of waste areas and trenches outside the 100-K fence lines. Installation of numerous pump and treat wells, well pads, buildings and transfer pipes has occurred both within and outside the EU.

No observations of wildlife were made during the October 16, 2014 survey of the EU. However, a PNNL ECAP review of the 100-K Area and buildings done in 2010 is included at the end of this summary. Numerous birds were noted in association with the buildings and structures that existed within the EU at that point in time. Since then, clean up and decommissioning activities may have removed much of the infrastructure that previously was used as nesting and perching habitat.

Table J.3. Percent Canopy Cover and Surface Cover Visually Estimated in Level 2 Resource Area within the K Area Waste Sites Evaluation Unit

Vegetation/Surface Cover	Slope to the North of Reactors (%)
Introduced Forb	2
Introduced Grass	5
Native Forb	<1
Native Grass	30
Successional Shrubs	15

Landscape Evaluation and Resource Classification:

Approximately 89% of the area within EU is classified as level 0 or level 1 biological resources (Table J.4, Figure J.4). A small hillslope north of the reactors is classified as level 2 resources (Figure J.5). The level 4 resources within the EU reflect a restricted use buffer area for the bald eagle (*Haliaeetus leucocephalus*) roosting site to the northwest of the 100-K Area along the river and do not consist of any habitat resources.

The amount and proximity of biological resources to the 100-K Waste Sites EU was examined within the adjacent landscape buffer area radiating 1,396 m from the geometric center of the EU (equivalent to 1,286 acres). Note that within the landscape buffer area, obvious areas where vegetation was cleared or removed were reclassified as level 0 resources. Numerous areas within the adjacent landscape buffer had been revegetated with varying degrees of success; these areas were not reclassified, but retain the original biological resource level assigned in DOE/RL-96-32 2013. The adjacent landscape buffer area extends across the Columbia River shoreline and into the riverine habitat. Level 4 resource patches along the river shoreline and in the river reflect the riparian habitat along the shoreline and a small patch of level 5 habitat in

the river reflects a known spawning location for Fall Chinook salmon (*Oncorhynchus tshawytscha*).

Table J.4. Area and Proportion of Each Biological Resource Level Within the Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
0	195.7	15.0	210.7	13.9%	15.9%	2.0%
1	5.4	0.0	5.4	0.4%	0.0%	-0.4%
2	5.9	269.3	275.2	18.2%	17.8%	-0.4%
3	0.2	158.0	158.2	10.5%	10.5%	0.0%
4	17.9	842.8	860.7	56.9%	55.8%	-1.2%
5	0.0	1.1	1.1	0.1%	0.1%	0.0%
Total	225.1	1286.2	1511.4	100.0%	100.0%	

1 Resource levels for the evaluation unit were reviewed in the field and via imagery during October 2014 and revised to reflect current habitats conditions.

2 Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.

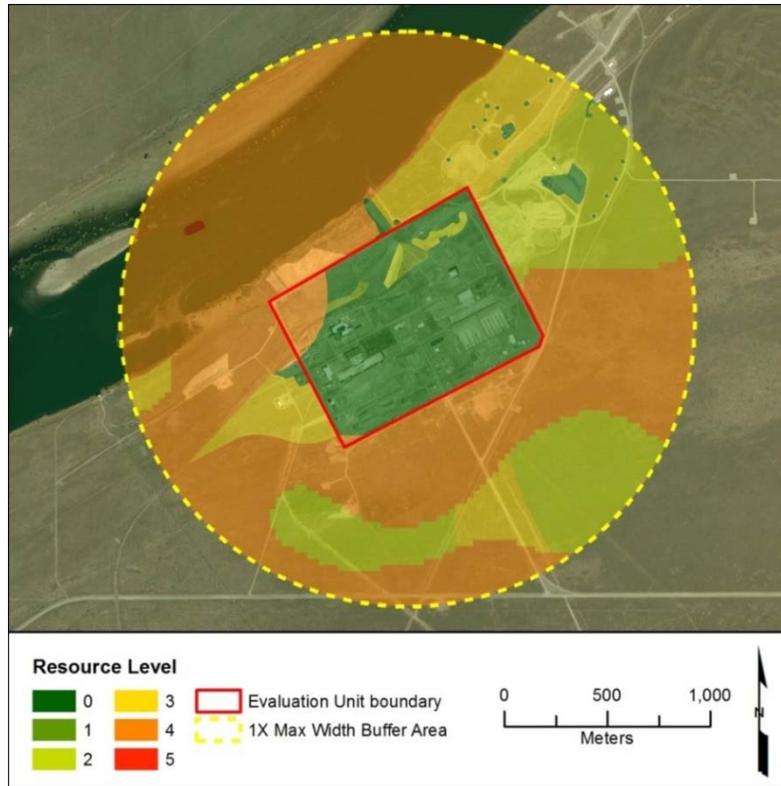


Figure J.4. Biological Resource Level Classifications Based on October 2014 Surveys for the K Area Waste Sites Evaluation Unit (red solid line) and the Adjacent Landscape Buffer (yellow dashed line)



Figure J.5. Condition of Landscape on the Slope North of the 100-K Area Reactors in October 2014

Assumptions and Uncertainty:

Due to project time constraints, the field surveys and reconnaissance of this EU were conducted in October. By the time of the survey, the cool-season annual and perennial herbaceous plants that dominate shrub-steppe habitat had completed seasonal growth and senesced making identification and inventory difficult and most likely incomplete. Although no records for plant species of concern have been noted, the absence of species cannot be confirmed by surveys during this time of year.

By October, migratory birds have completed their nesting cycles, and most have migrated out of the region. Surveys conducted in late fall will not reflect their occupancy and use of habitat within the EU earlier in the season. Their absence cannot be confirmed by surveys October after the nesting season is over. Further surveys during the nesting season would be required to fully assess the ecological impacts to nesting migratory birds.

Summary of Ecological Review:

- Most of the K Waste Sites EU (nearly 90% of the area) has been disturbed or consists of buildings, roadways, parking areas, and infrastructure that are classified as level 0 or level 1 habitat.
- Level 4 resources within the EU reflect the bald eagle roost site buffer area (~400 m diameter) that extends into the EU. Noise and construction activities associated with clean-up activities within 400 m of the roost site could potentially influence eagle use of the roost, during the seasonal use period when eagles are present along the river.
- Because most of the EU is disturbed, and remaining habitat within the unit is not contiguous with the adjacent landscape, the loss of habitat resources within the K Waste Sites evaluation unit would not be expected to negatively impact habitat connectivity at the landscape level.

References

- DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 0.
- U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act. <http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>
- U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington. http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902
- Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. <http://wdfw.wa.gov/conservation/phs/list/>
- Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington. <http://wdfw.wa.gov/conservation/endangered/>
- Washington Noxious Weed Control Board. 2014. Noxious Weed List. <http://www.nwcb.wa.gov/>
- Washington State Department of Natural Resources. 2014. Washington Natural Heritage Program Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

Definitions and Acronyms:

Adjacent Landscape Buffer – a circular area adjacent to and outside the EU boundary with the center of the circle at the centroid of the EU, and with a radius that is 1 times the maximum dimension (width or length—whichever is greatest). This circular buffer area is used to evaluate indirect effects and assess the remediation in relation to the landscape features and resources adjacent to the EU. This circular area is generally at least 3 times the area of the EU.

Biological Resource Levels (from DOE-RL-96-32-01) –

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats.
- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks.
- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub-steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.
- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.
- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

MBTA – Migratory Bird Treaty Act; referring to species listed and protected under the federal Act.

PNNL ECAP (Ecological Compliance and Assessment Project) Database – PNNL performed ecological reviews for individual projects and annually surveyed selected areas and buildings on the Hanford Site for DOE-RL under the DOE's Public Safety and Resource Protection Program until 2011. The data collected during those surveys is archived in the ECAP database, and is used to supplement ecological evaluations as available.

Priority Habitats – Priority habitats are habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation

type (e.g., shrub-steppe) or dominant plant species (e.g., juniper savannah), a described successional stage (e.g., old-growth forest), or a specific habitat feature (e.g., cliffs).

Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

PNNL ECAP Review of the 100-K Buildings in 2010

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michael.sackschewsky@pnl.gov

May 18, 2010

Mr. Brett Barnes
CH2M Hill Plateau Remediation
P.O. Box 1600, MSIN X4-01
Richland, WA 99352

Dear Mr. Barnes:

BLANKET BIOLOGICAL REVIEW OF 100-K AREA MAINTENANCE AND OPERATION
ACTIVITIES; 100-K AREA; ECR #2010-100-073

Project Description:

This blanket biological review covers all routine maintenance and operations activities for buildings and facilities within the fenced boundary of the 100-K Area. Also included is coverage for continued use of existing lay-down yards, debris/soil piles, and queues adjacent to the KW and KE Sedimentation Basins and overburden storage and queue areas in the north-central and northeast regions of the site (Figure 1). This review does not apply to the demolition/removal or construction/installation of buildings, except that ongoing demolition of 1706KE, 1706KEL, 1706KER, 183.1KW, and 183.7KW is allowed under this letter. This review does not apply to any work outside of the 100-K fence. This letter may be used as a reference for NEPA CX checklists and for support for excavation permits within the area of coverage.

Survey Objectives:

To determine the occurrence in the project area of plant and animal species protected under the Endangered Species Act (ESA), candidates for such protection, and species listed as threatened, endangered, candidate, sensitive, or monitor by the state of Washington, and species protected under the Migratory Bird Treaty Act (MBTA).

To evaluate and quantify the potential impacts of disturbance on priority habitats and protected plant and animal species identified in the survey.

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Survey Methods:

Pedestrian and ocular reconnaissance of the 100-K area was conducted by K. Hand and M. Chamness on May 7, 2010.

Priority habitats and species of concern are documented in Washington Department of Fish and Wildlife (2009a, 2009b), and Washington State Department of Natural Resources (2009). Lists of animal and plant species considered Endangered, Threatened, Proposed, or Candidate by the U.S. Fish and Wildlife Service are maintained at 50 CFR 17.11 and 50 CFR 17.12; the list of birds protected under the MBTA is maintained at 50 CFR 10.13.

Survey Results:

Most of the area within the 100-K boundary fence is highly disturbed with substrate consisting primarily of compacted gravel. Vegetation consists primarily of widely scattered weedy species, with most of the area having essentially no vegetation. An exception is 116-KW-3 (an approximately 2.6 hectare area in the northwest corner of the site) which has been remediated and is characterized by Sandberg's bluegrass (*Poa secunda*), and bluebunch wheatgrass (*Pseudoroegneria spicata*).

The following migratory bird activity was observed. Nest sites active at the time of the survey are underlined.

- **105KE** -Two common ravens (*Corvus corax*) searching within the exposed north side.
 -One inactive common raven nest on a catwalk on the west side.
-One active Say's phoebe (*Sayornis saya*) nest inside a propped-open door at the southeast corner.
- **105KW** -One active house finch (*Carpodacus mexicanus*) nest behind the light above Door 607 on the north side.
 -A pair of house finches perched on the west side.
 -One inactive western kingbird (*Tyrannus verticalis*) nest on a pipe bracket on the northeast corner.
- **115KE** -One Say's phoebe perched on the roof on the northeast corner.
- **142K** -Two inactive house finch nests; one on a pipe bracket on the west side and one behind an alarm box on the east side.
- **151KE (Substation)** -Two house finches perched within the structure.

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- **151KW (Substation)** -One house finch perched within the structure.
- **1720K**
 - One American robin (*Turdus migratorius*) flushed from a dead tree at the southeast corner.
 - One western kingbird perched on the fence on the south side.
 - One killdeer (*Charadrius vociferous*) flying past the south side.
- **151K (Substation)** -A pair of house finches perched within the structure.
- **181KE**
 - One California quail (*Callipepla californica*) perched on the fence on the east side.
 - Ten inactive cliff swallow (*Hirundo pyrrhonota*) nests under building overhangs.
- **181KW**
 - One American robin perched on a nearby fence.
 - Two black-billed magpies (*Pica pica*) hunting among beams on the south side.
 - Several inactive cliff swallow nests under building overhangs.
 - One California quail near the building.
- **183KE** -Two inactive house finch nests under a wooden eave at the northwest corner.
- **183KE (Storage Conexes)**
 - One active house finch nest in a southeast conex corner.
 - Two Say's phoebes perched on a fence on the south side.
 - One western kingbird perched on a fence on the south side.
- **183.1KE** -One black-billed magpie perched adjacent to the tanks on the south side.
- **183.2KE & 183.3KE**
 - Over 30 active cliff swallow nests underneath walkways and beams throughout the structure.
 - Several barn swallows (*Hirundo rustica*) and probable nests underneath walkways and beams on the south side.
 - One common raven flying over the structure.
- **190KW** -Two black-billed magpies near the building.
- **MO-237** -One inactive house finch nest in a porch eave at the southwest corner.

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- **MO-293** -One white-crowned sparrow (*Zonotrichia leucophrys*) on the ground near the building.
- An active bee hive was observed on vent pipe/catwalk on the west side of 105KW.
- No migratory birds or nests were observed at the time of the survey on the following buildings or structures:

111KE (Bottle Dock), 115KW, 116KE, 116KW, 117KE, 117KW, 118KE, 118KW, 119KW, 142KA, 1506K1, 166KE, 166KE (Blue Shed), 166KW, 167K, 1705KE, 1713KW, 1714KW, 1717K, 1724K, 1724KA, 183.5KE, 183.6KE, 185K, 1908K, 1908KE, 190KE, MO-054, MO-079, MO-087, MO-236, MO-323, MO-442, MO-500, MO-506, MO-507, MO-806, MO-872, MO-880, MO-917, MO-955, MO-1101, MO-1102, MO-1103, MO-1104, MO-1105, MO-1106, MO-1107, MO-1108, MO-1109, MO-1110, MO-1111, MO-1112, MO-1115, MO-1301, MO-1302, MO-1303, and MO-1501
- Numerous European starling (*Sturnus vulgaris*), house sparrow (*Passer domesticus*) and rock pigeon (*Columba livia*) birds or nests were observed throughout the 100-K Area. These species are not protected under the MBTA.

Considerations and Recommendations:

No plant or animal species protected under the ESA, candidates for such protection, or species listed by the Washington state government as threatened or endangered were observed within the 100-K perimeter fence.

Several species of migratory birds were observed within the 100-K Area (as listed in the Survey Results section). These species are afforded protection under the MBTA, which makes it illegal to take, capture, or kill, as applicable, any migratory bird, or any part, nest or egg of such bird. In locations containing active nests work activities should be postponed until after the young have fledged. Specifically, it is recommended that the door at the southeast corner of 105KE be left propped open and undisturbed until the Say's phoebe nest has fledged. Please contact M. R. Sackschewsky at 371-7187 for assistance in determining nest status as necessary.

Although many buildings and structures had no nests or had inactive nests at the time of the survey, the breeding season of local migratory birds extends through mid-July and the status of nesting activity can change quickly. Gravel substrates common throughout the 100-K Area may provide potential nesting habitat for ground-nesting migratory birds (e.g., killdeer) and buildings may provide potential nesting habitat for numerous structure-nesting birds (e.g. American robin, barn swallow, black-billed magpie, cliff swallow, common raven, house finch, Say's phoebe, western kingbird).

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Project staff should be advised to check for bird activity on ground surfaces and structures prior to initiating work tasks. If any active nests or birds exhibiting defensive behaviors (flying at workers, refusal to leave area, strident vocalizations) are encountered during work, please contact M. R. Sackschewsky for further consultation.

It is recommended that all entrances (e.g. doorways, window, holes, cracks) to buildings be maintained in a closed or sealed condition (except the 105KE southeast door) to prevent birds from entering and establishing nests in building interiors.

For non-routine activities such as excavation, building construction, and building demolition (except those buildings already exempted as listed in the Project Description section) or for activities within the re-vegetated 116-KW-3 area, please request support from the PNNL Ecological Monitoring and Compliance staff to initiate project-specific biological reviews.

Assuming compliance with the above recommendations, no adverse impacts to species or habitats are expected to occur from routine operation and maintenance activities within the 100-K Area.

This Ecological Compliance Review is valid until April 15, 2011.

Sincerely,



Michael R. Sackschewsky
Compliance Assessment Manager
Ecological Monitoring and Compliance Project

LB:mrs
kdh

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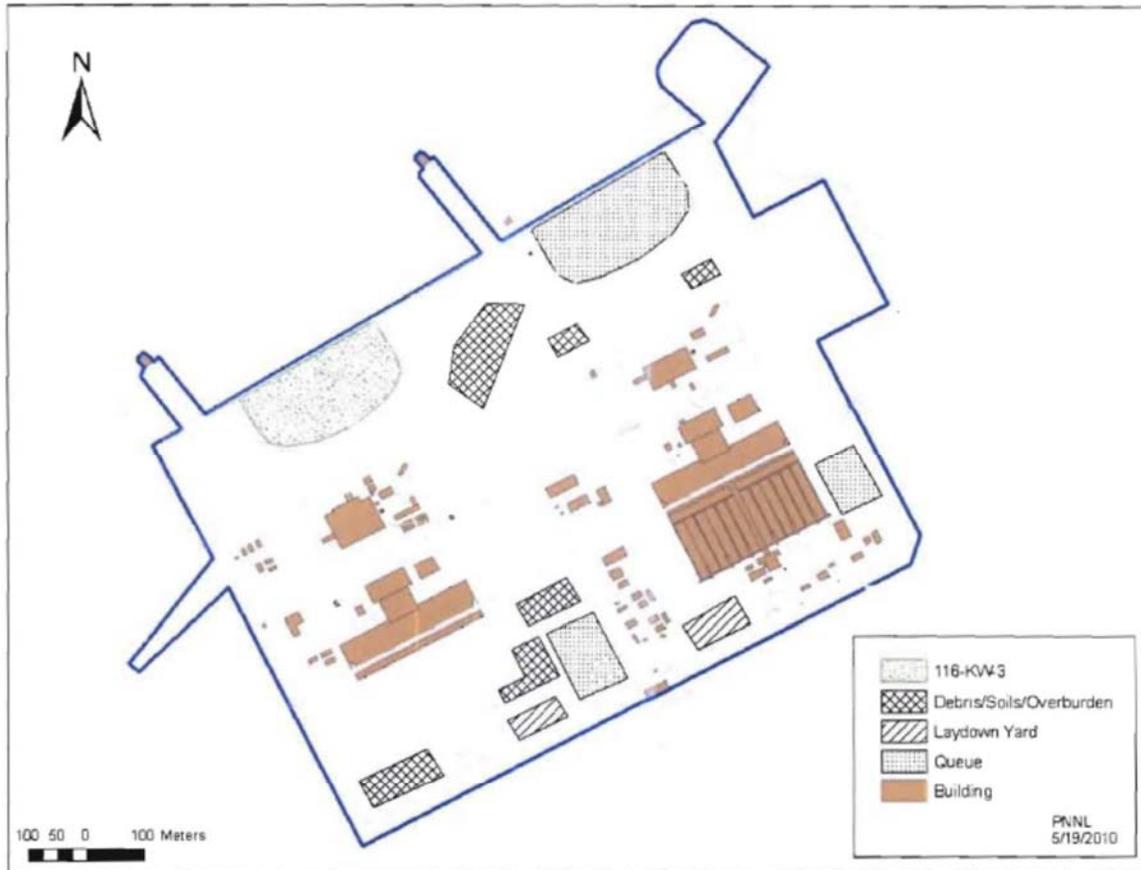


Figure 1. 100-K Area

REFERENCES

Washington Department of Fish and Wildlife. 2009a. Species of Concern in Washington State. <http://wdfw.wa.gov/wlm/diversty/soc/soc.htm>

Washington Department of Fish and Wildlife. 2009b. Priority Habitats and Species List. WDFW web site. <http://wdfw.wa.gov/hab/phspage.htm>

Washington Department of Natural Resources. 2009. Washington Natural Heritage Information System Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/plants.html>

Evaluation Unit: 618-10 Burial Ground
 ID: RC-LS-4
 Group: Legacy Source
 Operable Unit Cross-Walk: 300-FF-2
 Related EU: NA
 Sites & Facilities: 618-10 Burial Ground
 Key Data Sources Docs: DOE-RL-96-32-01; Mission Support Alliance maps³
 Field Survey Date: 06/01/2015
 Datasheet prepared by: MAC, KDH, SAM 11/06/2015
 Datasheet reviewed by:



Figure J.6. RC-LS-4 (618-10) Site Location Map

RC-LS-4: 618-10 Burial Ground

Survey and Analysis Methods

³ MSA (Mission Support Alliance) maintains biological resource information for the Hanford Site for the Department of Energy.

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the current Endangered and Threatened Species (Federal and State) distribution data; priority habitats as defined by Washington Department of Fish and Wildlife; available current aerial imagery, locations of Hanford Site waste units and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data records. The following steps were taken to assess the EU associated with 618-10 Burial Ground:

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. A pedestrian survey was conducted within the EU boundary by experienced shrub-steppe ecologists.
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2013 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.
6. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Surveys

The 618-10 Burial Ground EU is currently being remediated and contains modular buildings, parking lots and laydown yards with primarily bare and graveled surfaces. Sand dunes stabilized

by cheatgrass (*Bromus tectorum*) and native grasses including Sandberg's bluegrass and needle-and-thread grass (*Poa secunda* and *Hesperostipa comata*) lie beyond the burial ground (Table J.5). Various native forbs occur throughout the EU, but are relatively sparse. Two large wildfires, one in 1984 and the next in 2000, removed most of the shrub cover.

Table J.5. Percent Canopy Cover and Surface Cover Estimated at the 618-10 Burial Ground Evaluation Unit

Vegetation/Surface Cover	Survey Area 2-1 (%)
Bare Ground	-
Introduced forb	-
Introduced grass	40
Native forb	-
Native grass	25
Successional shrub	-
Climax shrub	-
Note: a dash (-) indicates no percent cover data were collected	

Isolated occurrences of coyote tobacco (*Nicotiana attenuata*), a state sensitive species, were noted in the somewhat disturbed open sand areas within the EU. Over 100 specimens were noted during the June survey. No estimate of vegetation cover was made for these level 3 occurrences. Two loggerhead shrikes were observed in a large bitterbrush (*Purshia tridentata*), but no nest was found.

Landscape Evaluation and Resource Classification:

Approximately 5% of the EU is classified as resource level 0 and none classified as level 1. Nearly 54% of the EU is classified as resource level 2 (Table J.6) containing native grasses and forbs with sparse, scattered bitterbrush and gray rabbitbrush (*Ericameria nauseosa*). The remaining 41% of the EU is classified as resource level 3 based on overlapping buffers around previous locations of coyote tobacco, a state sensitive species. Individual specimens of coyote tobacco identified during the June surveys fell within these patches of level 3 biological resources.

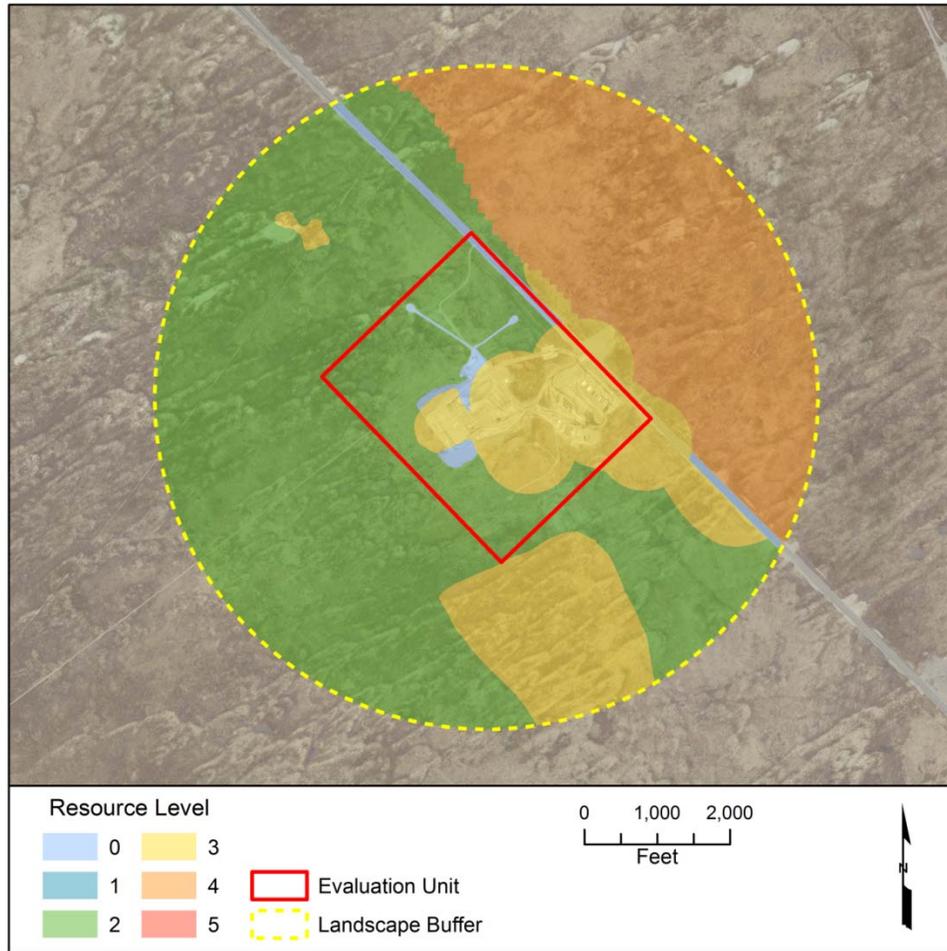


Figure J.7. Biological Resource Level Classifications Based on the June 1, 2015 Surveys at the 618-10 Burial Ground Evaluation Unit (red solid line) and Adjacent Landscape Buffer Area (yellow dashed line).

Table J.6. Area and Proportion of Each Biological Resource Level Within the 618-10 Burial Ground Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources.

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
0	12.9	13.4	26.3	1.76%	16.39%	14.64%
1	0	0	0	0.00%	0.00%	0.00%
2	124.4	688.0	812.3	54.26%	45.96%	-8.30%
3	94.8	175.8	270.6	18.08%	11.74%	-6.33%
4	0	387.8	387.8	25.91%	25.91%	0.00%
5	0	0	0	0.00%	0.00%	0.00%
Total	232.0	1265.0	1497.0	100.00%	100.00%	

¹ Resource levels for both the evaluation unit and adjacent landscape boundary were reviewed in the field and via imagery during May-August 2015 and revised to reflect current habitats conditions.

² Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.

The amount and proximity of biological resources surrounding the 618-10 EU were examined within the adjacent landscape buffer area, which extends 4556 ft (1389 m) from the geometric center of the EU (Figure J.7). The landscape beyond the EU to the north, west and south is very similar to that within the EU. Fifty-seven percent of the combined EU and adjacent buffer area is classified as resource level 2 or level 0 (Table J.6). There are no level 1 resources identified within the combined area.

Assumptions and Uncertainty:

Although all observations for species of concern and current conditions of biological resources were noted during surveys and evaluations conducted in 2015, the presence or absence of species cannot be assumed or predicted for future years. Field reconnaissance and surveys of evaluation units at the time of remediation will need to be conducted to verify resources and evaluate ecological conditions at that time.

Summary of Ecological Review:

- More than 59% of the EU is classified as resource level 2 or below.
- Within the EU, almost all of the level 3 resources are based on occurrences of a state sensitive species, coyote tobacco. The loss of all habitat within the EU could be a significant impact to this species on the Hanford Site. It is not known what the impact would be at a larger landscape scale.

- 2 loggerhead shrikes, a state candidate species were noted using the habitat in the EU

References:

DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 0.

U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act. <http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>

U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington. http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902

Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. <http://wdfw.wa.gov/conservation/phs/list/>

Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington. <http://wdfw.wa.gov/conservation/endangered/>

Washington Noxious Weed Control Board. 2014. Noxious Weed List. <http://www.nwcb.wa.gov/>

Washington State Department of Natural Resources. 2014. Washington Natural Heritage Program Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

Definitions and Acronyms:

Adjacent Landscape Buffer – a circular area adjacent to and outside the EU boundary with the center of the circle at the centroid of the EU, and with a radius that is 1 times the maximum dimension (width or length—whichever is greatest). This circular buffer area is used to evaluate indirect effects and assess the remediation in relation to the landscape features and resources adjacent to the EU. This circular area is generally at least 3 times the area of the EU.

Biological Resource Levels (from DOE-RL-96-32-01) –

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats.
- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks.
- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.

- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.
- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.
- Level 0 resources consist of non-native plants and animals (unless otherwise listed at a higher level), non-vegetated areas, and industrial areas.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

MBTA – Migratory Bird Treaty Act; referring to species listed and protected under the federal Act.

PNNL ECAP (Ecological Compliance and Assessment Project) Database – PNNL performed ecological reviews for individual projects and annually surveyed selected areas and buildings on the Hanford Site for DOE-RL under the DOE's Public Safety and Resource Protection Program until 2011. The data collected during those surveys is archived in the ECAP database, and is used to supplement ecological evaluations as available.

Priority Habitats – Priority habitats are habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type (e.g., shrub-steppe) or dominant plant species (e.g., juniper savannah), a described successional stage (e.g., old-growth forest), or a specific habitat feature (e.g., cliffs).

Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

Field Data Records

Bird, Mammal and Herpetofauna Species			
June 1 2015, 618-10 EU			
Patch ID	Name	Common name	Comment
2-1	<i>Corvus corax</i>	common raven	2 being chased by Weki
2-1	<i>Tyrannus verticalis</i>	western kingbird	chasing 2 Cora
2-1	<i>Eremophila alpestris</i>	horned lark	singing
2-1	<i>Numenius americanus</i>	long-billed curlew	call from S
2-1	<i>Sturnella neglecta</i>	western meadowlark	singing
2-1	<i>Lanius ludovicianus</i>	loggerhead shrike	2 in mature Putr, 2 around conex
2-1	<i>Canis latrans</i>	coyote	tracks, dig
2-1		unidentified small mammal	holes and tracks
2-1	<i>Thomomys talpoides</i>	northern pocket gopher	mounds
2-1	<i>Sylvilagus nutalli</i>	mountain cottontail	scat, tracks
2-1	<i>Uta stansburiana</i>	side-blotched lizard	

Plant Species Identified During Visual Surveys			
June 1 2015, 618-10 EU			
Patch ID	Name	Common name	Abundance
2-1	<i>Achnatherum hymenoides</i>	indian ricegrass	
2-1	<i>Agropyron cristatum</i>	crested wheatgrass	
2-1	<i>Ambrosia acanthicarpa</i>	bur ragweed	
2-1	<i>Amsinckia species</i>		
2-1	<i>Artemisia tridentata</i>	big sagebrush	
2-1	<i>Astragalus carvicinus</i>	buckwheat milkvetch	
2-1	<i>Balsamorhiza careyana</i>	Carey's balsamroot	
2-1	<i>Bromus tectorum</i>	cheatgrass	40
2-1	<i>Chondrilla juncea</i>	Rush skeletonweed	
2-1	<i>Cryptantha circumscissa</i>	matted cryptantha	
2-1	<i>Dalea ornata</i>	Blue mountain prairie clover	
2-1	<i>Ericameria nauseosa</i>	gray rabbitbrush	+
2-1	<i>Erigeron pumilis</i>	shaggy fleabane	
2-1	<i>Eriogonum niveum</i>	snow buckwheat	
2-1	<i>Eriogonum vimineum</i>	broom buckwheat	
2-1	<i>Filago arvensis</i>	field fluffweed	
2-1	<i>Gayophytum diffusum</i>	spreading gayophytum	
2-1	<i>Hesperostipa comata</i>	needle-and-thread grass	15
2-1	<i>Machaeranthera canescens</i>	hoary aster	
2-1	<i>Mentzelia albicaulis</i>	whitestem stickleaf	
2-1	<i>Nama densum</i>	purplemat	
2-1	<i>Nicotiana attenuata</i>	coyote tobacco	
2-1	<i>Oenothera pallida</i>	pale evening primrose	
2-1	<i>Phacelia linearis</i>	threadleaf scorpionweed	
2-1	<i>Phlox longifolia</i>	longleaf phlox	
2-1	<i>Poa bulbosa</i>	bulbous bluegrass	
2-1	<i>Poa secunda</i>	Sandberg's bluegrass	10
2-1	<i>Psoralea lanceolata</i>	dune scurfpea	
2-1	<i>Pteryxia terebinthina var. terebinthina</i>	turpentine springparsley	
2-1	<i>Purshia tridentata</i>	bitterbrush	
2-1	<i>Rumex venosus</i>	winged dock	
2-1	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	
2-1	<i>Sitanion hystrix</i>	bottlebrush grass	
2-1	<i>Sporobolus cryptandrus</i>	sand dropseed	
2-1	<i>Tragopogon dubius</i>	Yellow salsify	

Evaluation Unit: BC Cribs and Trenches
 ID: CP-LS-1
 Group: Legacy Source
 Operable Unit Cross-Walk: 200-BC-1
 Related EU: CP-LS-17
 CP-GW-1
 Sites & Facilities: Cribs, trenches and tanks located to the south of the 200-E area
 Key Data Sources Docs: DOE/RL-96-32 2013
 PNNL ECAP Database⁴
 Field Survey Date: 7/16/2014
 Data Sheet prepared by: KBL 10/6/2014

DRAFT

Figure J.8. Site Map with Evaluation Unit Boundaries

CP-LS-1: BC Cribs and Trenches

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the

⁴ The Ecological Compliance and Assessment Project (ECAP) database is an evolving set of data that is maintained by Pacific Northwest National Laboratory (PNNL) and updated as new ecological assessments are completed.

current Endangered and Threatened Species (Federal and State) distribution data; priority habitats as defined by Washington Department of Fish and Wildlife; available current aerial imagery, locations of Hanford Site waste sites and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the evaluation units including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data tables.

The following steps were taken to assess the evaluation unit associated with the BC-Cribs and Trenches:

1. The evaluation unit boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. A visual survey was conducted within the evaluation unit boundary by experienced shrub-steppe ecologists. Because the unit consists of disturbed and revegetated areas and graveled surfaces, no field measurements of vegetation were taken. PNNL biologists also reviewed the observations and biological survey data available in the (Ecological Compliance and Assessment Project) ECAP database from the past 5 years for the evaluation unit to determine the status and resource level of the habitats within the evaluation unit and supplement the evaluation with previous wildlife or plant species observations.
3. A second boundary (polygon) outside the evaluation unit was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the evaluation unit and encompasses a circular area with a radius 1 times the maximum width of the evaluation unit and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the evaluation unit was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2012 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the evaluation unit and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the evaluation unit were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the evaluation unit is assumed to be lost to remediation and cleanup activities and resources in the evaluation unit are considered level 0.

6. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the evaluation unit.

Field Survey:

Reconnaissance of the BC Cribs and Trenches evaluation unit indicated that most of the EU currently consists of non-vegetated areas, heavily disturbed or revegetated areas, and compacted gravel areas (i.e., level 0 resources; Table J.8). A portion of this area that was previously classified as level 3 and 4 (approximately 153 acres) was reclassified as level 0 for this assessment to reflect current vegetation conditions (Figure J.9 and Figure J.10). Habitat around the level 0 resources in the disturbed area of the evaluation unit consists of level 3 and 4 resources along the boundary of the evaluation unit. These patches are contiguous with the adjacent landscape, but no pedestrian surveys or field data collection were attempted in these areas because this waste site and evaluation unit lie within a radiological control area. A project review letter summarizing data collected within the evaluation unit boundary in 2008 and 2009 is included at the end of this summary to provide information on habitat quality in the remaining level 3 and level 4 resources.

Figure J.10 shows the condition of the area where revegetation was attempted and failed, resulting in scattered cover of Russian thistle (*Salsola tragus*) and scurf pea (*Psoralea lanceolata*) across the southern portion of the EU.

Table J.7. Percent Canopy Cover and Surface Cover Measured at BC Cribs and Trenches

No field measurements of vegetation were taken; visual and pedestrian survey of the evaluation unit consists mainly of graveled pads, disturbed and bare soils (cover > 80%) and scattered Russian thistle and scurf pea growing in failed revegetation areas.
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Landscape Evaluation and Resource Classification:

The amount of each category of biological resources at the BC Cribs and Trenches EU was examined within a circular area radiating 1830 m from the geometric center of the unit (equivalent to 2598 acres). Approximately 71 percent of the total combined area (evaluation unit and associated adjacent landscape) is classified as level 3 or higher biological resources in the existing resource level map. However, the majority of the level 3 and level 4 resources lie to outside of the evaluation unit boundary (Figure J.9).

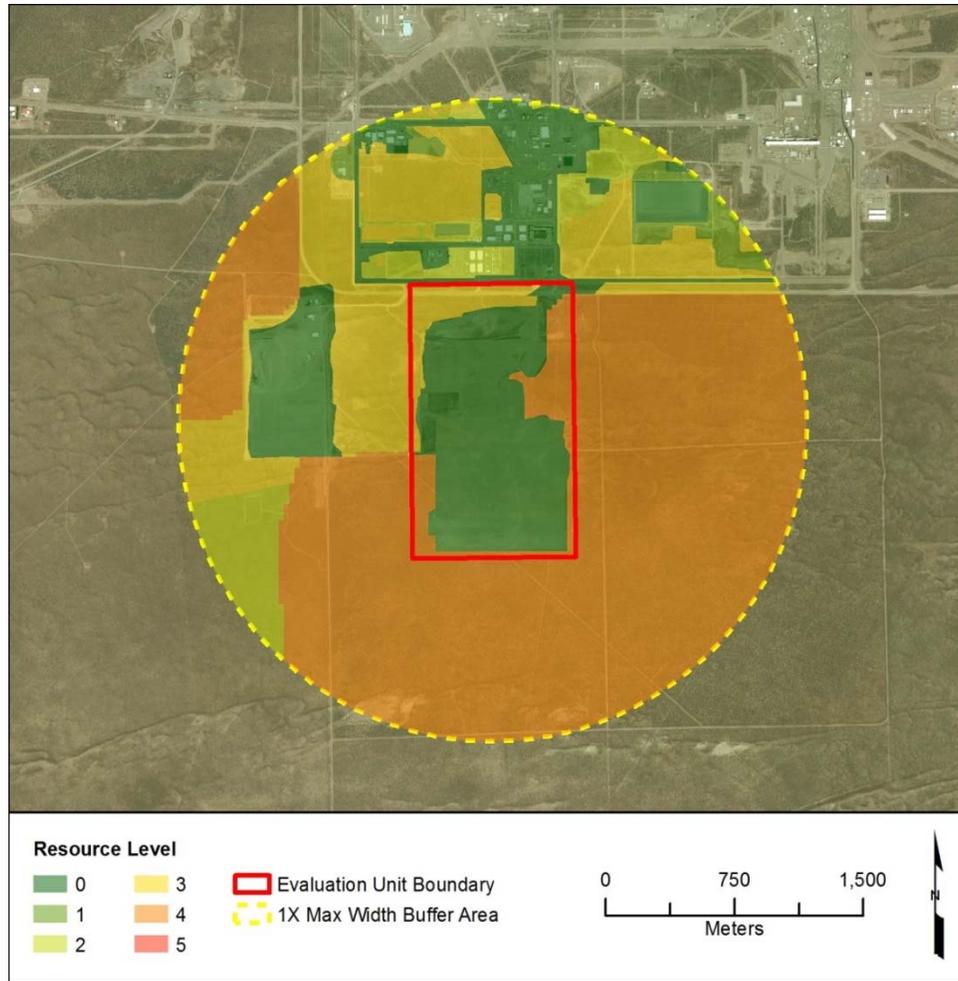


Figure J.9. Map of Biological Resource Level Classifications for the BC Cribs and Trenches Evaluation Unit Based on July 2014 Pedestrian and Vehicle Survey (red boundary) and Reconnaissance of the Adjacent Landscape Buffer (yellow dashed line)

Table J.8. Area and Proportion of Each Biological Resource Level Within the Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
0	255.9	294.7	550.6	21.2%	25.5%	4.3%
1	0.0	52.1	52.1	2.0%	2.0%	0.0%
2	0.0	163.2	163.2	6.3%	6.3%	0.0%
3	41.5	429.0	470.5	18.1%	16.5%	-1.6%
4	69.6	1292.5	1362.1	52.4%	49.7%	-2.7%
5	0.0	0.0	0.0	0.0%	0.0%	0.0%
Total	367.0	2231.5	2598.5	100.0%	100.0%	-

¹ Resource levels for both the evaluation unit and adjacent landscape boundary were reviewed in the field and via imagery during July 2014 and revised to reflect current habitats conditions.

² Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.



Figure J.10. Photograph of Disturbed/Revegetated Area within the BC Cribs and Trenches Evaluation Unit

Summary of Ecological Review:

- Most of the EU currently consists of non-vegetated areas, compacted gravel areas, and heavily disturbed or revegetated areas.

- Level 3 or higher biological resources exist near the perimeter of the BC Cribs and Trenches EU (Figure J.10); a previous review and habitat characterization (see information for zone A in attached letter) was conducted in 2008 and 2009 indicating that the habitat within the evaluation unit is level 3 or higher.
- Excavation and blading within the evaluation unit would remove approximately 111 additional acres of level 3 or higher resources at the BC Cribs and Trenches EU (Table J.8). This represents a 4.3 percent reduction in the amount of level 3 or higher resources within a 1.8 km radius of the unit;
- Because these areas are contiguous with surrounding habitat near the perimeter of the evaluation unit (i.e., they are not considered distinct habitat patches), their removal would not be expected to significantly affect habitat connectivity.

Assumptions and Uncertainty:

Due to project time constraints, the field surveys and reconnaissance of this evaluation unit were conducted in mid-July. By the time of the survey, the cool-season annual and perennial herbaceous plants that dominate shrub-steppe habitat had completed seasonal growth and senesced making identification and inventory difficult and most likely incomplete. Although no records for plant species of concern have been noted, the absence of species cannot be confirmed by surveys during this time of year.

By mid-July, most migratory birds have completed their nesting cycles, and surveys may not reflect their occupancy and use of habitat within the evaluation unit earlier in the season. Their absence cannot be confirmed by surveys in July after the nesting season is over. Further surveys during the nesting season would be required to fully assess the ecological impacts to nesting migratory birds.

References

- DOE/RL-96-32. 2013. Hanford Unit Biological Resources Management Plan, Revision 1.
- PNNL. 2009. 300 Area Buildings Survey for 2009, Ecological Compliance and Assessment Project Database. Data collected by PNNL for DOE/RL under the Public Safety and Resource Protection Program.
- U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington.
http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902
- U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act.
<http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>
- Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. Available at:
<http://wdfw.wa.gov/conservation/phs/list/>
- Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington.
<http://wdfw.wa.gov/conservation/endangered/>

Washington Noxious Weed Control Board. 2014. Noxious Weed List. Available on line at <http://www.nwcb.wa.gov/>

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Definitions and Acronyms:

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Biological Resource Levels (from DOE-RL-96-32-01) –

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PNNL ECAP Project Review Letter Describing Original Habitat within the BC-Cribs and Trenches EU:



Tel: (509) 371-7187
Fax: (509) 371-7160
MSIN: K6-85
Michael.sackschewsky@pnl.gov

July 14, 2009

Mr. Randy Hermann
CH2M Hill Plateau Remediation Company
P.O. Box 1600
Richland, WA 99352

Dear Mr. Hermann:

ECOLOGICAL REVIEW OF THE BC CONTROLLED AREA, 600 AREA, ECR #2008-600-006A, rev. 1

Project Background and Description:

Construction and remediation activities at the BC Controlled Area (BCCA) UPR-200-E-83 Waste Unit are scheduled to commence in August 2009 (Figure 1). This 12-mi² area has been split into three zones, A, B, and C, based on the levels and extent of contamination. Zone A consists of an area roughly 140 ac that is characterized by higher levels of radiological contamination. Remediation activities in Zone A will include large-scale grubbing of the top 6 to 12 inches of soil. Ecological reviews for Zone A will be covered under this ECR #2008-600-006A rev. 1.

Zone B contains spots of detectable contamination covering an area of about 6 mi². Because of the large area involved, work will commence in a phased approach (Figure 2). Review letters will be submitted based upon project schedule which indicates first the remediation and construction of the queue area followed by Phase 1 remediation of Zone B. Ecological reviews for Zone B will be covered under ECR #2008-600-006B.

Zone C remediation activities are not scheduled to begin in the near term but will be addressed under ECR #2008-600-006C at a later date.

This letter reevaluates Zone A (originally surveyed in 2008).

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Survey Objectives:

Determine the occurrence in the project area of plant and animal species protected under the Endangered Species Act (ESA), candidates for such protection, and species listed as threatened, endangered, candidate, sensitive, or monitor by the state of Washington, and species protected under the Migratory Bird Treaty Act (MBTA).

Evaluate and quantify the potential impacts of disturbance on priority habitats and protected plant and animal species identified in the survey.

Survey Methods:

Pedestrian and visual reconnaissance of Zone A was performed by Robin Durham, on April 7 and 8, 2008, and again on June 9, 2009. Percent cover of dominant vegetation was visually estimated.

Priority habitats and species of concern are documented in: Washington Department of Fish and Wildlife (2008a, 2008b), and Washington State Department of Natural Resources (2008). Lists of animal and plant species considered Endangered, Threatened, Proposed, or Candidate by the U.S. Fish and Wildlife Service are maintained at 50 CFR 17.11 and 50 CFR 17.12; the list of birds protected under the MBTA is maintained at 50 CFR 10.13.

Survey Results:

Zone A (2009 Review):

Shrub cover within Zone A varied from 10 to 30 percent, with most of the cover provided by mature sagebrush (*Artemisia tridentata*). Spiny hopsage (*Grayia spinosa*) was present to a lesser degree, co-dominating the shrub layer on some portions of the zone. Antelope bitterbrush (*Purshia tridentata*) was found localized on stabilized dunes along the northern section of the zone. The understory was dominated by Sandberg's bluegrass (*Poa sandbergii*), cheatgrass (*Bromus tectorum*), and native forbs such as Carey's balsamroot (*Balsamorhiza careyana*), long-leaved phlox (*Phlox longifolia*), yarrow (*Achillea millefolium*), daisy fleabane (*Erigeron* spp.) and turpentine spring parsley (*Cymopterus terebinthinus*). Sage sparrows (*Amphispiza belli*), loggerhead shrikes (*Lanius ludovicianus*) and black-tailed jackrabbits (*Lepus californicus*) were observed in abundance across the site. Coyote (*Canis latrans*) sign were noted.

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Considerations and Recommendations:

A number of loggerhead shrikes were observed in Zone A during surveys conducted in both years. This migratory bird is a state candidate and federal species of concern. Some individuals have been known to remain year round in eastern Washington but in general, loggerhead shrikes arrive in early March, and nest from late March through July. Fledging occurs in May, and by September most have departed for their migration south (DOE 2001, WDFW 2008b).

Two additional state species of concern, the sage sparrow and black-tailed jackrabbit, were observed in abundance across Zone A.

- 1) The sage sparrow is a migratory bird that arrives in mid February (DOE 2001), nests from March through June (Vander Haegen 2004) and migrates by mid August (DOE 2001).
- 2) Black-tailed jackrabbits breed from late February to mid-July (Flinders and Chapman 2003). Black-tailed jackrabbits are known to be relatively fast moving animals. Because these animals are highly mobile, it is anticipated that they will be able to move out of the way of earth-moving equipment. However, recently birthed young will likely be impacted.

It is unlawful, according to the MBTA, to take, capture or kill, as applicable, any migratory bird, or any part, nest or egg of such. To assure compliance with the MBTA, excavation activities in Zone A should be limited to the period between July 15 and March 1. This restriction will also reduce the impact of habitat removal during the breeding season of other state species of concern.

If nesting birds (if not a nest, a pair of birds of the same species or a single bird that will not leave the area when disturbed) are encountered, or bird defensive behaviors (flying at workers, refusal to leave area, strident vocalizations) are observed during project activities, please contact Mike Sackschewsky at 371-7187.

Lastly, Zone A contains a high-quality old-growth sagebrush-steppe community. This is considered a priority habitat by the state (WDFW 2008b) and regarded as a Level III resource at Hanford. Revegetation of Zone A with native grasses and sagebrush will help reduce the impacts of habitat fragmentation through the encouragement of successional development. In addition to revegetating the site of disturbance, some sort of compensatory mitigation will be required as stipulated under the Hanford Site

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Biological Resources Management Plan (DOE 2001), and Hanford Site Biological Resources Mitigation Strategy (DOE 2003).

It will be necessary to draft a Mitigation Action Plan (MAP) to outline the methods you will use to mitigate for this Level III resource loss. We are available to assist you, if desired, with the development of this MAP, and to assist you in reaching your mitigation action goals.

This Ecological Compliance Review is valid until April 15, 2010.

Sincerely,



Michael R. Sackschewsky
Compliance Assessment Manager
Ecological Monitoring and Compliance Project

LB:mrs

Evaluation Unit: Plutonium Contaminated Waste Sites
 ID: CP-LS-2
 Group: Legacy Source
 Operable Unit Cross-Walk: 200-PW-1, 3, 6
 200-CW-5
 Related EU: CP-DD-5
 CP-GW-2
 Sites & Facilities: Plutonium (Pu) contaminated cribs and trenches associated with
 PFP in central part of 200-W area
 Key Data Sources Docs: DOE/RL-96-32 2013
 PNNL ECAP Database⁵
 Field Survey Date: 10/10/2014
 Data Sheet Prepared By: JLD, MAC, KBL, KDH, SAM; 10/08/2014

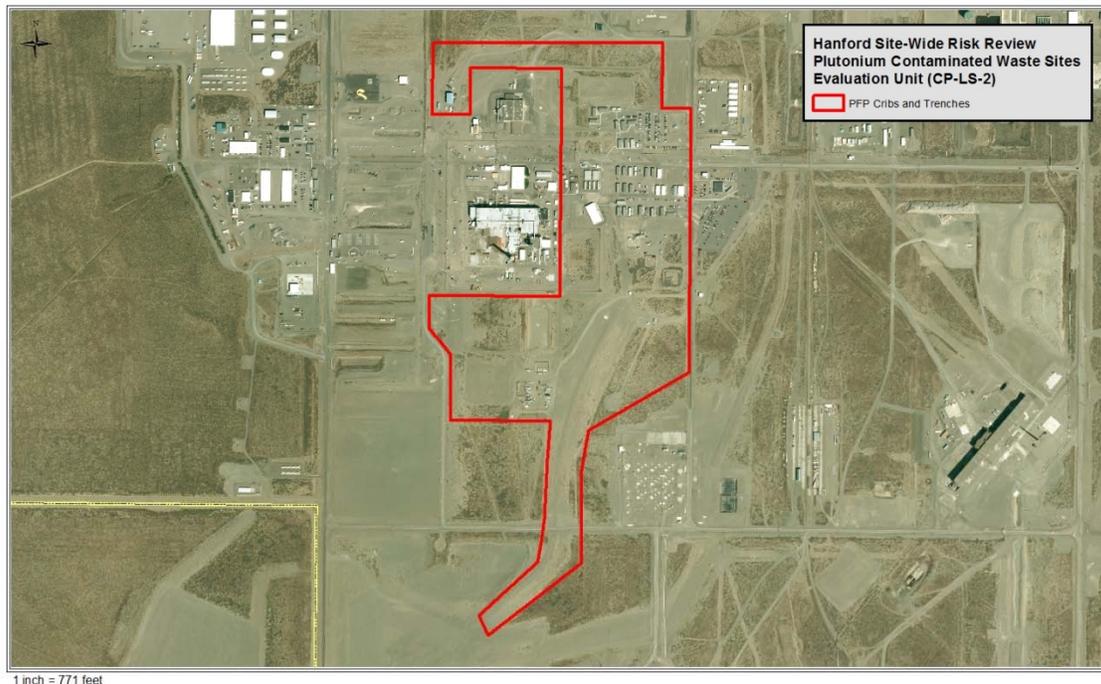
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Figure J.11. Site Map with Evaluation Unit Boundaries

CP-LS-2: Plutonium Contaminated Waste Sites

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the

⁵ The Ecological Compliance and Assessment Project (ECAP) database is an evolving set of data that is maintained by Pacific Northwest National Laboratory (PNNL) and updated as new ecological assessments are completed.

current Endangered and Threatened Species (Federal and State) distribution data; priority habitats as defined by Washington Department of Fish and Wildlife; available current aerial imagery, locations of Hanford Site waste sites and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data tables.

The following steps were taken to assess the EU associated with the Plutonium Contaminated Waste Sites:

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. A visual and pedestrian survey was conducted within the EU boundary by experienced shrub-steppe ecologists. Vegetation was measured in the field in level 3 habitat resources. PNNL biologists also reviewed the observations and biological survey data available in the Ecological Compliance and Assessment Project (ECAP) database from the past 5 years for the EU to determine the status and resource level of the habitats within the EU and supplement the evaluation with previous wildlife or plant species observations.
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2012 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.
6. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

PNNL biologists conducted pedestrian and vehicle surveys throughout the EU. Canopy cover of species was estimated visually in level 2 resource areas, and measured along a transect in a level 3 resource area. Much of the EU has been previously disturbed by ongoing operations and the installation and operation of various pump-and-treat wells and remaining habitat occurs in strips and patches surrounded by roads and infrastructure. Vegetation measurements confirmed the status of resources within the EU. Two individual species occurrences of Piper's daisy (*Erigeron piperianus*) were previously noted in the EU, but were not relocated during October 2014 survey of the unit.

Some wildlife sign was observed during the October survey including small mammal tracks and burrows, coyote tracks (*Canis latrans*), unidentified lizards, rabbit tracks, and harvester ant hills. These observations match wildlife observations and sign noted previously by the PNNL ECAP surveys. PNNL ECAP surveys conducted in 2009 and 2010 recorded mountain cottontail (*Sylvilagus nutalli*), northern pocket gopher (*Thomomys talpoides*), side-blotched lizard (*Uta stansburiana*), western kingbird (*Tyrannus verticalis*), lark sparrow (*Chondestes grammacus*), rock dove (*Columba livia*), American robin (*Turdus migratorius*), American kestrel (*Falco sparverius*), and mourning dove (*Zenaida macroura*) within the multiple habitat patches in this EU (see attached records at end of this summary).

Table J.9. Percent Canopy Cover and Surface Cover Measured at the Plutonium Contaminated Waste Sites Evaluation Unit

Vegetation/Surface Cover	Survey Area 2-10 (%)	Survey Area 2-12 (%)	Survey Area 3-07 (%)
Bare Ground	-	30	44.4
Litter	-	25	36.0
Introduced Forb	5	25	16.3
Introduced Grass	-	-	8.7
Native Grass	11	1	45.5
Climax Shrubs	-	-	7.0
Successional Shrubs	25	20	4.7

Landscape Evaluation and Resource Classification:

More than 60% of the acreage in the Plutonium Contaminated Waste Sites EU is classified as level 0 or level 1 habitat and does not provide significant habitat resources (Table J.10, Figure J.12). The EU contains approximately 4.2 acres (less than 5%) of level 3 biological resources. The amount and proximity of the biological resources to the EU was examined within the adjacent landscape buffer area radiating 1,365 m from the geometric center of the EU (equivalent to

1,357 acres). More than half of the combined total area (EU and adjacent landscape buffer area) is classified as level 0 or 1 habitat, with level 2 habitat resources comprising 38.5% and level 3 and above resources comprising only 3.4% of the area at the landscape level. Some of the habitat patches within this EU are contiguous with habitat in the surrounding adjacent landscape buffer area, but the patches in the adjacent landscape buffer are not contiguous with habitat outside the 200-West industrial area and generally represent isolated habitat fragments.

Table J.10. Area and Proportion of Each Biological Resource Level Within the Plutonium Contaminated Waste Sites Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
0	41.9	630.5	672.4	46.5%	49.7%	3.2%
1	14.3	152.8	167.1	11.6%	10.6%	-1.0%
2	27.6	529.3	556.9	38.5%	36.6%	-1.9%
3	4.2	44.7	48.9	3.4%	3.1%	-0.3%
4	0.0	0.0	0.0	0.0%	0.0%	0.0%
5	0.0	0.0	0.0	0.0%	0.0%	0.0%
Total	88.0	1357.3	1445.3	100.0%	100.0%	

1 Resource levels for both the evaluation unit and adjacent landscape boundary were reviewed in the field and via imagery during October 2014 and revised to reflect current habitats conditions.

2 Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.

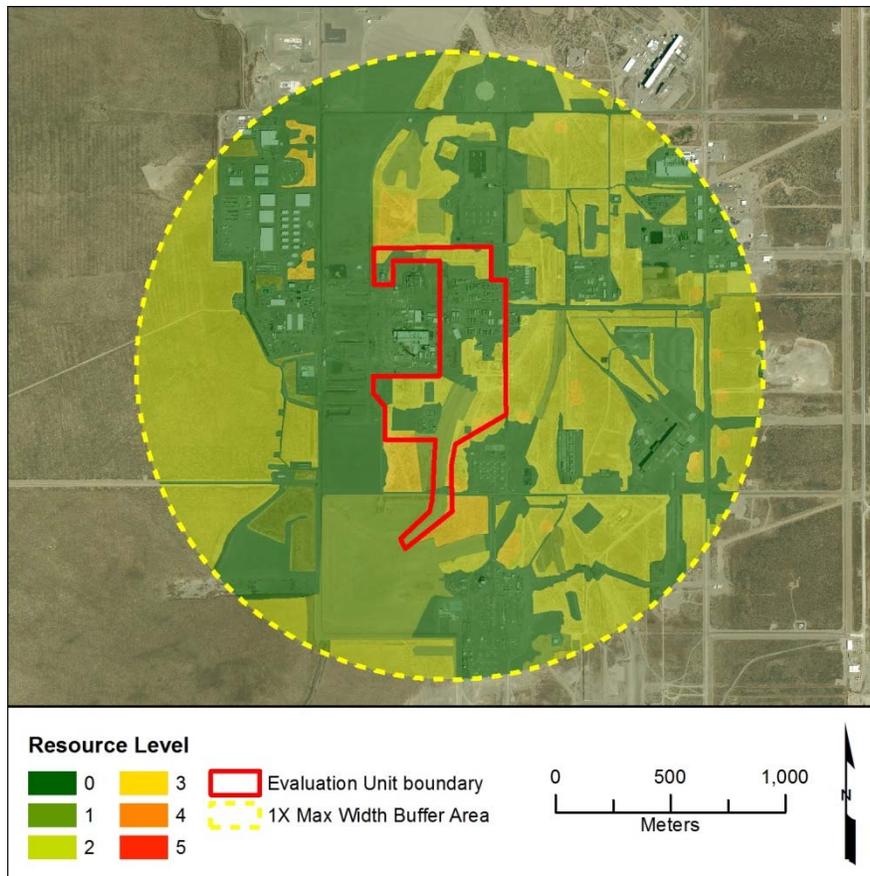


Figure J.12. Biological Resource Level Classifications Based on October 2014 Surveys for the Plutonium Contaminated Waste Sites Evaluation Unit (red solid line) and Adjacent Landscape Buffer (yellow dashed line)

Assumptions and Uncertainty:

Due to project time constraints, the field surveys and reconnaissance of this EU were conducted in October. By the time of the survey, the cool-season annual and perennial herbaceous plants that dominate shrub-steppe habitat had completed seasonal growth and senesced making identification and inventory difficult and most likely incomplete. Although no records for plant species of concern have been noted, the absence of species cannot be confirmed by surveys during this time of year.

By October, migratory birds have completed their nesting cycles, and most have migrated out of the region. Surveys conducted in late fall will not reflect their occupancy and use of habitat within the EU earlier in the season. Their absence cannot be confirmed by surveys October after the nesting season is over. Further surveys during the nesting season would be required to fully assess the ecological impacts to nesting migratory birds.

Summary of Ecological Review:

- More than 60% of the acreage in the Plutonium Contaminated Waste Sites EU is classified as level 0 or level 1 habitat and does not provide significant habitat resources

- Approximately 4 acres of level 3 habitat exist within the Plutonium Contaminated Waste Sites EU; total loss of this habitat would result in a change of 0.3% at the landscape level.
- The remaining level 2 and level 3 habitat within the EU are fragmented and isolated from habitat surrounding the 200-West Area.
- Individual species occurrences of Piper's daisy represent approximately 1 acre of level 3 resources within the EU. Loss of individual plants of this species is not likely to affect population viability for the Washington State sensitive species.
- Because remaining habitat within the EU and adjacent landscape buffer area is isolated from contiguous habitat outside the 200-West Area, any loss of habitat within the Plutonium Contaminated Waste Sites EU would not be expected to impact habitat connectivity at the landscape level.

References

- DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 0.
- U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act. <http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>
- U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington. http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902
- Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. <http://wdfw.wa.gov/conservation/phs/list/>
- Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington. <http://wdfw.wa.gov/conservation/endangered/>
- Washington Noxious Weed Control Board. 2014. Noxious Weed List. <http://www.nwcb.wa.gov/>
- Washington State Department of Natural Resources. 2014. Washington Natural Heritage Program Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

Definitions and Acronyms:

Adjacent Landscape Buffer – a circular area adjacent to and outside the EU boundary with the center of the circle at the centroid of the EU, and with a radius that is 1 times the maximum dimension (width or length—whichever is greatest). This circular buffer area is used to evaluate indirect effects and assess the remediation in relation to the landscape features and resources adjacent to the EU. This circular area is generally at least 3 times the area of the EU.

Biological Resource Levels (from DOE-RL-96-32-01) –

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats.

- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks.
- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub-steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.
- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.
- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

MBTA – Migratory Bird Treaty Act; referring to species listed and protected under the federal Act.

PNNL ECAP (Ecological Compliance and Assessment Project) Database – PNNL performed ecological reviews for individual projects and annually surveyed selected areas and buildings on the Hanford Site for DOE-RL under the DOE’s Public Safety and Resource Protection Program until 2011. The data collected during those surveys is archived in the ECAP database, and is used to supplement ecological evaluations as available.

Priority Habitats – Priority habitats are habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type (e.g., shrub-steppe) or dominant plant species (e.g., juniper savannah), a described successional stage (e.g., old-growth forest), or a specific habitat feature (e.g., cliffs).

Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

Previous PNNL ECAP Survey Data

ECAP Database Query Results for W-026

Observer: *Chamness, Mickie* Date: *7/7/2010*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
Russian thistle	Salsola kali	25	Mostly sprayed wasteland
gray rabbitbrush	Chrysothamnus nauseosus	15	Can access big N part again
No vegetation present	No vegetation		40% Loose sand
cheatgrass	Bromus tectorum	1	
indian ricegrass	Oryzopsis hymenoides	1	
stiff wirelettuce	Stephanomeria paniculata		
needle-and-thread grass	Stipa comata		
Yellow salisfy	Tragopogon dubius		

Mammal

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
unknown/unidentified small mammal	small mammal		Common tracks, poop
coyote	Canis latrans	Present	Tracks
mountain cottontail	Sylvilagus nutalli	Present	Tracks

Herpt

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
Unidentified/Unlisted herpt	Unidentified/Unlisted herpt	Present	Snake track
side-blotched lizard	Uta stansburiana	Present	

Bird

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
killdeer	Charadrius vociferus	1	Flew over
western kingbird	Tyrannus verticalis	1	Flew over

Observer: *Simmons, Mary Ann* Date: *7/7/2010*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
gray rabbitbrush	Chrysothamnus nauseosus		
Russian thistle	Salsola kali		

Mammal

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
unknown/unidentified small mammal	small mammal	Present	tracks
mountain cottontail	Sylvilagus nutalli	Present	Fellets

Herpt

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
side-blotched lizard	Uta stansburiana	Present	

ECAP Database Query Results for W-026a

Observer: *Simmons, Mary Ann* Date *7/7/2010*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
No vegetation present	No vegetation	90	gravel
Russian thistle	Salsola kali		
needle-and-thread grass	Stipa comata		

Mammal

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
unknown/unidentified small mammal	small mammal	Present	Tracks; possible rabbit and snake

Bird

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
rock dove	Columba livia	3	Roosting

ECAP Database Query Results for W-026b

Observer: *Simmons, Mary Ann* Date *7/7/2010*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
No vegetation present	No vegetation	90	gravel
gray rabbitbrush	<i>Chrysothamnus nauseosus</i>		
Russian thistle	<i>Salsola kali</i>		

ECAP Database Query Results for W-028

Observer: *Chamness, Mickie* Date *7/7/2010*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
big sagobrush	Artemisia tridentata	30	W edge overgrazed? more dead shrub
prairie fumegrass	Koeleria cristata		Use % frm last yr
Sandberg's bluegrass	Poa sandbergii		Brts
Russian thistle	Salsola kali	15	Because its dom on W
crested wheatgrass	Agropyron cristatum		
bur ragweed	Ambrosia acanthicarpa		
Cary's balsamroot	Balsamorhiza carwynna		
gray rabbitbrush	Chrysothamnus nanosectus		
green rabbitbrush	Chrysothamnus viscidiflorus		
bastard toadflax	Comandra umbellata		
turpentine springsparsley	Cymopteris tubethimms		
western tansymustard	Descurainia pinnata		
flixweed	Descurainia sophia		
prickly lettuce	Lactuca scariola		
hoary aster	Machaeranthera canescens		
indian ricegrass	Oryzopsis hymenoides		
indian ricegrass	Oryzopsis hymenoides		
longleaf phlox	Phlox longifolia		
Jim Hill's tumbledmustard	Sisymbrium altissimum		
bottlebrush grass	Sitanion hystrix		
needle-and-thread grass	Stipa comata		

Mammal

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
unknown/unidentified small mammal	small mammal	Abundant	tracks
mountain cottontail	Sylvilagus nuttalli	Present	

Herpt

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
Unidentified/Unlisted herpt	Unidentified/Unlisted herpt	Common	Lizard tracks

Bird

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
No birds observed	No birds		

Observer: *Simmons, Mary Ann* Date *7/7/2010*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
Sandberg's bluegrass	Poa sandbergii	5	
needle-and-thread grass	Stipa comata	5	

ECAP Database Query Results for W-034

Observer: *Chamness, Mickie* Date *7/7/2010*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
Russian thistle	Salsola kali	5	
gray rabbitbrush	Chrysothamnus nauseosus	30	
Sandberg's bluegrass	Poa sandbergii	20	
cheatgrass	Bromus tectorum	10	
indian ricegrass	Oryzopsis hymenoides	1	
needle-and-thread grass	Stipa comata	1	
yarrow	Achillea millefolium		
crested wheatgrass	Agropyron cristatum		
big sagebrush	Artemisia tridentata		
stalked-pod milkvetch	Astragalus sclerocarpus		
green rabbitbrush	Chrysothamnus viscidiflorus		
Fendler's cryptantha	Cryptantha fendleri		
turpentine springparsley	Cymopteris terobithimus		
prairie Junegrass	Koeleria cristata		
hoary aster	Machaeranthera canescens		
pale evening primrose	Oenothera pallida		
threadleaf scorpionweed	Phacelia linearis		

Mammal

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
coyote	Canis latrans	Present	Tracks
northern pocket gopher	Thomomys talpoides	Present	Mud
unknown/unidentified small mammal	small mammal	Common	Holes, tracks

Herpt

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
Unidentified/Unlisted herpt	Unidentified/Unlisted herpt	Present	Lizard trks

Bird

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
lark sparrow	Chondestes grammacus	2	On China
western kingbird	Tyrannus verticalis	2	Acrobatics

Observer: *Simmons, Mary Ann* Date *7/7/2010*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
cheatgrass	Bromus tectorum	25	
gray rabbitbrush	Chrysothamnus nauseosus	25	
indian ricegrass	Oryzopsis hymenoides	10	
needle-and-thread grass	Stipa comata	10	

ECAP Database Query Results for W-034b

 Observer: *Chamness, Mickie* Date *7/7/2010*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
big sagebrush	<i>Artemisia tridentata</i>	1	
cheatgrass	<i>Bromus tectorum</i>	40	
crested wheatgrass	<i>Agropyron cristatum</i>	20	
bur ragweed	<i>Ambrosia acanthicarpa</i>		
gray rabbitbrush	<i>Chrysothamnus nauseosus</i>		
matted cryptantha	<i>Cryptantha circumscissa</i>		
prickly lettuce	<i>Lactuca scariola</i>		
hoary aster	<i>Machaeranthera canescens</i>		
indian ricegrass	<i>Oryzopsis hymenoides</i>		
Sandberg's bluegrass	<i>Poa sandbergii</i>		
Russian thistle	<i>Salsola kali</i>		
needle-and-thread grass	<i>Stipa comata</i>		

Mammal

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
coyote	<i>Canis latrans</i>	Present	Tracks
mountain cottontail	<i>Sylvilagus nuttalli</i>	Present	Tracks
unknown/identified small mammal	small mammal	Common	Holes, tracks

Bird

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
western meadowlark	<i>Sturnella neglecta</i>	1	Sing E pwarpole
mourning dove	<i>Zenaida macroura</i>	2	Flushed
cliff swallow	<i>Hirundo pyrrhonota</i>	1	Feeding

 Observer: *Simmons, Mary Ann* Date *7/7/2010*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
crested wheatgrass	<i>Agropyron cristatum</i>	15	
yarrow	<i>Achillea millefolium</i>		
cheatgrass	<i>Bromus tectorum</i>		
gray rabbitbrush	<i>Chrysothamnus nauseosus</i>		
green rabbitbrush	<i>Chrysothamnus viscidiflorus</i>		
slender sixweeks	<i>Festuca octoflora</i>		
prickly lettuce	<i>Lactuca scariola</i>		
hoary aster	<i>Machaeranthera canescens</i>		
indian ricegrass	<i>Oryzopsis hymenoides</i>		
Sandberg's bluegrass	<i>Poa sandbergii</i>		
Russian thistle	<i>Salsola kali</i>		

ECAP Database Query Results for W-034N

Observer: *Chamness, Mickie* Date *7/7/2010*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
No vegetation present	No vegetation		50%
Russian thistle	Salsola kali	30	
gray rabbitbrush	Chrysothamnus nauseosus	20	
big sagebrush	Artemisia tridentata		
cheatgrass	Bromus tectorum		
green rabbitbrush	Chrysothamnus viscidiflorus		
indian ricegrass	Oryzopsis hymenoides		
stiff wirelettuce	Stephanomeria paniculata		

Mammal

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
mountain cottontail	Sylvilagus nuttalli	Present	Tracks, seen all veg
coyote	Canis latrans	Present	Tracks
unknown/unidentified small mammal	small mammal	Common	Tracks

Bird

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
cliff swallow	Hirundo pyrrhonota	1	flew over. Losh nest not used

Observer: *Simmons, Mary Ann* Date *7/7/2010*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
puncture vine	Tribulus terrestris		tickweed
gray rabbitbrush	Chrysothamnus nauseosus	25	
Russian thistle	Salsola kali	20	
bur ragweed	Ambrosia acanthicarpa		
big sagebrush	Artemisia tridentata		
cheatgrass	Bromus tectorum		
indian ricegrass	Oryzopsis hymenoides		
Yellow salsify	Tragopogon dubius		

Mammal

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
unknown/unidentified small mammal	small mammal	Present	Tracks
coyote	Canis latrans	Present	Scat
mountain cottontail	Sylvilagus nuttalli	Common	pellets

Herpt

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
side-blotched lizard	Uta stansburiana	Present	

ECAP Database Query Results for W-102

Observer: *Chamness, Mickie* Date *6/8/2010*

Bird

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
western kingbird	Tyrannus verticalis	2	Acrobatics

Observer: *Freeman-Cadoret, Natalie* Date *6/21/2010*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
cheatgrass	Bromus tectorum	15	
Sandberg's bluegrass	Poa sandbergii	15	
crested wheatgrass	Agropyron cristatum	10	
needle-and-thread grass	Stipa comata	+	
big sagebrush	Artemisia tridentata		
slender sixweeks	Festuca octoflora		
indian ricegrass	Oryzopsis hymenoides		
Russian thistle	Salsola kali		

Mammal

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
unknown/unidentified small mammal	small mammal		Present

Bird

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
American kestrel	Falco sparverius	1	

ECAP Database Query Results for W-505

Observer: *Chamness, Mickie* Date: *4/29/2009*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
No vegetation present	No vegetation		

Bird

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
American robin	<i>Turdus migratorius</i>	1	On gmd behind razor wire

Bird

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
western meadowlark	<i>Sturnella neglecta</i>	1	On powerline to E

Evaluation Unit: PFP		Observers: JLD, MAC
Patch ID: 2-10		Date: 10/10/2014
Wildlife Observations Recorded During Pedestrian or Vehicle Surveys		
Species	Observation	
UTST	Lizard	
Small mammal	Burrow	
Coyote	Tracks	
Harvester ants		
Notes		

Evaluation Unit: PFP		Observers: JLD, MAC
Patch ID: 2-12		Date: 10/10/2014
Wildlife Observations Recorded During Pedestrian or Vehicle Surveys		
Species	Observation	
Small mammal	Tracks	
Lizards		
Jack rabbit/Cotton tail	Tracks	
Harvester ants		
Notes		

Evaluation Unit: PFP		Observers: MAC
Patch ID: 3-07		Date: 10/10/2014
Wildlife Observations Recorded During Pedestrian or Vehicle Surveys		
Species	Observation	
Mouse	Tracks	
CALA	Tracks	
Lizard		
Harvester ants		
Notes		

Evaluation Unit: U Plant Cribs and Ditches
ID: CP-LS-3
Group: Legacy Source
Operable Unit Cross-Walk: 200-DV-1, 200-WA-1
Related EU: CP-LS-7, CP-DD-3, CP-GW-2
Sites & Facilities: Liquid waste discharges in the central part of 200-W Area associated with U Plant operations.
Key Data Sources Docs: DOE-RL-96-32-01; Mission Support Alliance maps⁶
Field Survey Date: 5/28/2015
Datasheet prepared by: MAC, SAM, KDH 10/5/2015
Datasheet reviewed by: JLD, 10/23/2015



Figure J.13. CP-LS-3 (U Plant Cribs and Ditches) Site Location Map

⁶MSA (Mission Support Alliance) maintains biological resource information for the Hanford Site for the Department of Energy

CP-LS-3: U Plant Cribs and Ditches

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the current Endangered and Threatened Species (Federal and State) distribution data; priority habitats as defined by Washington Department of Fish and Wildlife; available current aerial imagery, locations of Hanford Site waste units and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data records.

The following steps were taken to assess the EU associated with the U Plant cribs and ditches:

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. Transect measurements and visual surveys were conducted within the EU boundary by experienced shrub-steppe ecologists.
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2013 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.
6. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

The U Plant Cribs and Ditches EU consists of a patchwork of successional habitat and heavily disturbed areas associated with buildings, parking lots, waste sites and roads. Graveled waste sites and dirt or gravel roads are sprayed with herbicides to prevent vegetation growth. PNNL biologists conducted pedestrian and vehicle surveys throughout the EU. Vegetation canopy cover was measured on transects in the level 3 habitat in the southwest corner of the EU. Canopy cover in level 2 habitats was estimated visually. Based on field observations, all patches of level 2 resources within the EU were considered part of one habitat area broken into smaller pieces by roads and pipelines. Table J.11 provides average canopy cover for the level 2 patches within the EU, which are dominated by gray rabbitbrush (*Ericameria nauseosus*) with native and introduced forbs and grasses in the understory. Field data records documenting survey of the EU for each patch are included at the end of this section.

Mature big sagebrush (*Artemisia tridentata*) provides approximately 5.5% canopy cover of climax shrubs in the level 3 area in the southwest corner of the EU, with a degraded understory dominated by bare ground and the introduced grass, cheatgrass (*Bromus tectorum*) (Table J.11). Other areas of level 3 biological resources are related to previously noted occurrences of Piper's daisy (*Eriogeron piperianus*), a species considered sensitive in the state of Washington. No Piper's daisy plants were found during the 2015 survey. A state-monitored species, Swainson's hawk (*Buteo swainsoni*), was observed soaring over the area. Other animal species or their sign include coyote (*Canis latrans*), unidentified lizards, Say's phoebe (*Sayornis saya*), western meadowlarks (*Sturnella neglecta*), lark sparrow (*Chondestes grammacus*) and mountain cottontail (*Sylvilagus nutalli*).

Table J.11. Percent Canopy Cover and Surface Cover Estimated at the U Plant Cribs and Ditches Evaluation Unit

Vegetation/Surface Cover	Survey Area 2 (% cover)	Survey Area 3-1 (% cover)
Bare Ground	-	42.1
Introduced Forb	10	3.8
Introduced Grass	10	24.2
Native Forb	-	<1
Native Grass	10	1.3
Successional Shrubs	30	<1
Climax Shrubs	-	5.4

Landscape Evaluation and Resource Classification:

The U Plant Cribs and Ditches EU consists of a patchwork of level 2 successional habitat interspersed with level 0 and level 1 habitat resources associated with buildings, parking lots, waste sites and roads. The 129.3 acres of level 0 resources within this EU overlaps with 12.3 acres of level 0 habitat contained within the U Plant EU (Table J.12).

Table J.12. Area and Proportion of Each Biological Resource Level Within the U Plant Cribs and Ditches Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources.

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
0	129.3	1004.2	1133.6	37.58%	43.75%	6.17%
1	15.8	263.2	279	9.25%	8.73%	-0.52%
2	157.4	544.4	701.8	23.27%	18.05%	-5.22%
3	12.9	610.6	623.5	20.67%	20.24%	-0.43%
4	0	272.8	272.8	9.04%	9.04%	0.00%
5	0	5.8	5.8	0.19%	0.19%	0.00%
Total	315.5	2701	3016.5	100.00%	100.00%	

1 Resource levels for both the evaluation unit and adjacent landscape boundary were reviewed in the field and via imagery during May-August 2015 and revised to reflect current habitats conditions.

2 Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.

The amount and proximity of biological resources surrounding the U Plant Cribs and Ditches EU were examined within the adjacent landscape buffer area, which extends 3212 feet (979 m) from the geometric center of the EU (Figure J.14). Approximately 95% of the EU habitat is classified as level 2 or lower (level 0 and level 1 habitats comprise almost 50% of the EU). Approximately 70% of the combined area of the EU and adjacent landscape buffer (3016 acres) (Table J.12) consists of level 0, 1, and 2 resources. The EU is contiguous with several small patches of level 3 habitat to the east, but is surrounded by level 0 and 1 habitats interspersed with small patches of level 2 habitat (Figure J.14).

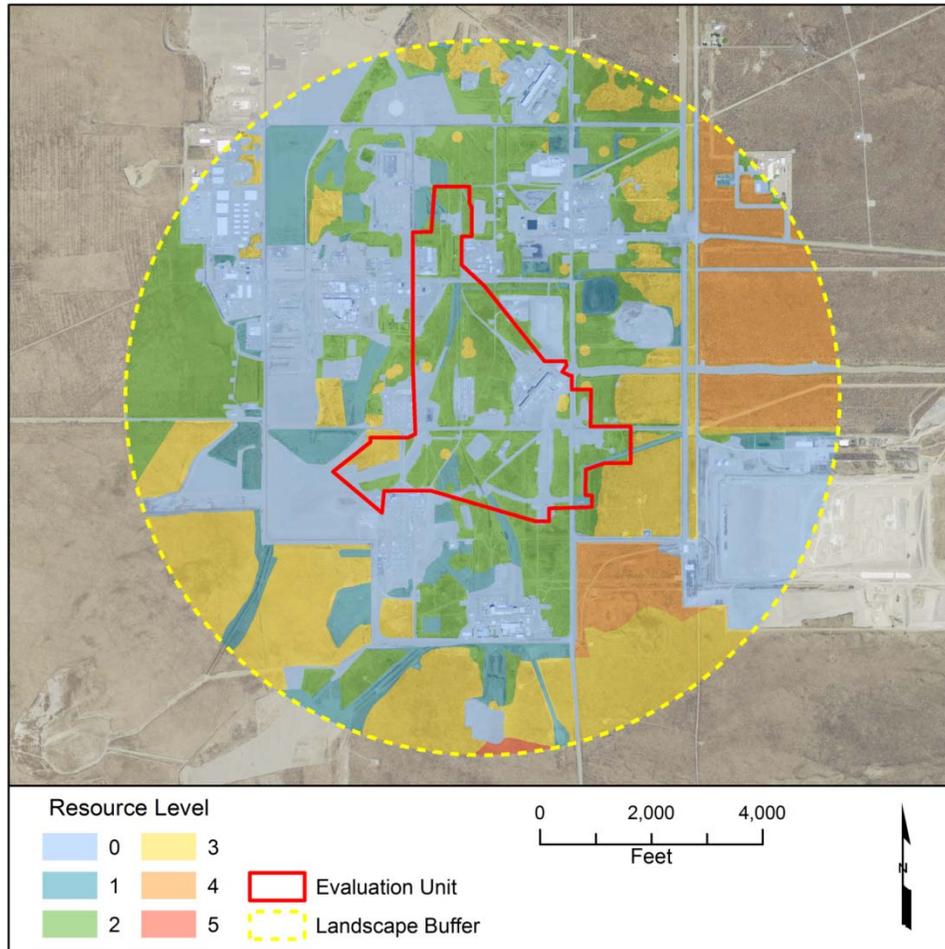


Figure J.14. Biological Resource Level Classifications Based on the May 28, 2015 Survey at the U Plant Cribs and Ditches Evaluation Unit (red solid line) and Adjacent Landscape Buffer Area (yellow dashed line).

Assumptions and Uncertainty:

Although all observations for species of concern and current conditions of biological resources were noted during surveys and evaluations conducted in 2015, the presence or absence of species cannot be assumed or predicted for future years. Field reconnaissance and surveys of evaluation units at the time of remediation will need to be conducted to verify resources and evaluation ecological conditions at that time.

Summary of Ecological Review:

- 46% of the EU consists of level 0 and 1 habitat; level 2 habitat is fragmented by roads, waste sites and pipelines which are kept free of vegetation.
- The largest area of resource level 3 habitat (~13 acres) is in the southwest corner of the EU, and is bounded by level 0 resource habitats on all sides.
- Level 2 habitats within the U Plant Cribs and Ditches EU are fragmented as is much of the landscape within the 200-West Area. Loss of remaining level 2 or level 3 habitat

associated with remediation actions in this EU would not be expected to significantly alter habitat connectivity outside the 200-West Area.

- Individual occurrences of Piper’s daisy, a state sensitive species, have been previously documented in the EU, although none were observed during the 2015 survey. Loss of individual plants of this species is not likely to affect population viability for the Washington State sensitive species.

References:

DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 0.

U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act. <http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>

U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington. http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902

Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. <http://wdfw.wa.gov/conservation/phs/list/>

Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington. <http://wdfw.wa.gov/conservation/endangered/>

Washington Noxious Weed Control Board. 2014. Noxious Weed List. <http://www.nwcb.wa.gov/>

Washington State Department of Natural Resources. 2014. Washington Natural Heritage Program Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

Definitions and Acronyms:

Adjacent Landscape Buffer – a circular area adjacent to and outside the EU boundary with the center of the circle at the centroid of the EU, and with a radius that is 1 times the maximum dimension (width or length—whichever is greatest). This circular buffer area is used to evaluate indirect effects and assess the remediation in relation to the landscape features and resources adjacent to the EU. This circular area is generally at least 3 times the area of the EU.

Biological Resource Levels (from DOE-RL-96-32-01) –

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats.
- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks.

- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub-steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.
- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.
- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.
- Level 0 resources consist of non-native plants and animals (unless otherwise listed at a higher level), non-vegetated areas, and industrial areas.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

MBTA – Migratory Bird Treaty Act; referring to species listed and protected under the federal Act.

PNNL ECAP (Ecological Compliance and Assessment Project) Database – PNNL performed ecological reviews for individual projects and annually surveyed selected areas and buildings on the Hanford Site for DOE-RL under the DOE’s Public Safety and Resource Protection Program until 2011. The data collected during those surveys is archived in the ECAP database, and is used to supplement ecological evaluations as available.

Priority Habitats – Priority habitats are habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type (e.g., shrub-steppe) or dominant plant species (e.g., juniper savannah), a described successional stage (e.g., old-growth forest), or a specific habitat feature (e.g., cliffs).

Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

Field Data Records

Plant Species Identified During Visual Surveys May 28 2015, U Plant Cribs and Ditches EU			
Patch ID	Name	Common name	Abundance
2-1	<i>Achnatherum hymenoides</i>	indian ricegrass	
2-1	<i>Bromus tectorum</i>	cheatgrass	20
2-1	<i>Ericameria nauseosa</i>	gray rabbitbrush	10
2-1	<i>Poa secunda</i>	Sandberg's bluegrass	
2-1	<i>Pteryxia terebinthina var. terebinthina</i>	turpentine springparsley	
2-1	<i>Salsola tragus</i>	Russian thistle	
2-2	<i>Achnatherum hymenoides</i>	indian ricegrass	
2-2	<i>Bromus tectorum</i>	cheatgrass	20
2-2	<i>Ericameria nauseosa</i>	gray rabbitbrush	10
2-2	<i>Poa secunda</i>	Sandberg's bluegrass	
2-2	<i>Pteryxia terebinthina var. terebinthina</i>	turpentine springparsley	
2-2	<i>Salsola tragus</i>	Russian thistle	
2-3	<i>Agropyron cristatum</i>	crested wheatgrass	
2-3	<i>Bromus tectorum</i>	cheatgrass	20
2-3	<i>Ericameria nauseosa</i>	gray rabbitbrush	10
2-3	<i>Machaeranthera canescens</i>	hoary aster	
2-3	<i>Poa bulbosa</i>	bulbous bluegrass	5
2-3	<i>Poa secunda</i>	Sandberg's bluegrass	
2-3	<i>Salsola tragus</i>	Russian thistle	
2-3	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	
2-4	<i>Achillea millefolium</i>	yarrow	
2-4	<i>Achnatherum hymenoides</i>	indian ricegrass	
2-4	<i>Agropyron cristatum</i>	crested wheatgrass	
2-4	<i>Ambrosia acanthicarpa</i>	bur ragweed	
2-4	<i>Bromus tectorum</i>	cheatgrass	10
2-4	<i>Ericameria nauseosa</i>	gray rabbitbrush	10
2-4	<i>Machaeranthera canescens</i>	hoary aster	
2-4	<i>Poa bulbosa</i>	bulbous bluegrass	0
2-4	<i>Poa secunda</i>	Sandberg's bluegrass	
2-4	<i>Salsola tragus</i>	Russian thistle	
2-4	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	
2-4	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	
2-5	<i>Achillea millefolium</i>	yarrow	
2-5	<i>Bromus tectorum</i>	cheatgrass	20
2-5	<i>Ericameria nauseosa</i>	gray rabbitbrush	20
2-5	<i>Poa secunda</i>	Sandberg's bluegrass	1
2-5	<i>Salsola tragus</i>	Russian thistle	
2-5	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	
2-6	<i>Bromus tectorum</i>	cheatgrass	10
2-6	<i>Ericameria nauseosa</i>	gray rabbitbrush	10
2-6	<i>Poa secunda</i>	Sandberg's bluegrass	
2-6	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	
2-6	<i>Sporobolus cryptandrus</i>	sand dropseed	
2-7	<i>Achillea millefolium</i>	yarrow	

Plant Species Continued			
May 28 2015, U Plant Cribs and Ditches EU			
Patch ID	Name	Common name	Abundance
2-7	<i>Achnatherum hymenoides</i>	indian ricegrass	
2-7	<i>Agropyron cristatum</i>	crested wheatgrass	
2-7	<i>Artemisia tridentata</i>	big sagebrush	
2-7	<i>Bromus tectorum</i>	cheatgrass	10
2-7	<i>Calochortus macrocarpus</i>	sagebrush mariposa lily	
2-7	<i>Ericameria nauseosa</i>	gray rabbitbrush	20
2-7	<i>Hesperostipa comata</i>	needle-and-thread grass	
2-7	<i>Machaeranthera canescens</i>	hoary aster	
2-7	<i>Poa secunda</i>	Sandberg's bluegrass	10
2-7	<i>Pteryxia terebinthina var. terebinthina</i>	turpentine springparsley	
2-7	<i>Salsola tragus</i>	Russian thistle	10
2-7	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	
2-7	<i>Stephanomeria paniculata</i>	stiff wirelettuce	
2-8	<i>Achillea millefolium</i>	yarrow	
2-8	<i>Achnatherum hymenoides</i>	indian ricegrass	
2-8	<i>Agropyron cristatum</i>	crested wheatgrass	
2-8	<i>Ambrosia acanthicarpa</i>	bur ragweed	
2-8	<i>Artemisia tridentata</i>	big sagebrush	
2-8	<i>Bromus tectorum</i>	cheatgrass	10
2-8	<i>Calochortus macrocarpus</i>	sagebrush mariposa lily	
2-8	<i>Ericameria nauseosa</i>	gray rabbitbrush	10
2-8	<i>Hesperostipa comata</i>	needle-and-thread grass	
2-8	<i>Machaeranthera canescens</i>	hoary aster	
2-8	<i>Poa secunda</i>	Sandberg's bluegrass	
2-8	<i>Salsola tragus</i>	Russian thistle	
2-8	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	
2-8	<i>Sporobolus cryptandrus</i>	sand dropseed	
2-8	<i>Stephanomeria paniculata</i>	stiff wirelettuce	
2-8	<i>Tragopogon dubius</i>	Yellow salsify	
2-9	<i>Achillea millefolium</i>	yarrow	
2-9	<i>Ambrosia acanthicarpa</i>	bur ragweed	
2-9	<i>Bromus tectorum</i>	cheatgrass	20
2-9	<i>Ericameria nauseosa</i>	gray rabbitbrush	10
2-9	<i>Hesperostipa comata</i>	needle-and-thread grass	
2-9	<i>Poa secunda</i>	Sandberg's bluegrass	
2-10	<i>Artemisia tridentata</i>	big sagebrush	
2-10	<i>Bromus tectorum</i>	cheatgrass	
2-10	<i>Ericameria nauseosa</i>	gray rabbitbrush	20
2-10	<i>Hesperostipa comata</i>	needle-and-thread grass	
2-10	<i>Mentzelia albicaulis</i>	whitestem stickleaf	
2-10	<i>Poa secunda</i>	Sandberg's bluegrass	
2-10	<i>Salsola tragus</i>	Russian thistle	5
2-10	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	

Bird, Mammal and Herpetofauna Species Continued May 28 2015, U Plant Cribs and Ditches EU			
Patch ID	Name	Common name	Comment
2-2	<i>Sturnella neglecta</i>	western meadowlark	
2-5	<i>Chondestes grammacus</i>	lark sparrow	1 singing
2-6	<i>Buteo swainsoni</i>	Swainson's hawk	soaring overhead
2-7	<i>Sayornis saya</i>	Say's phoebe	foraging nearby
2-8	<i>Sturnella neglecta</i>	western meadowlark	singing
2-9	<i>Sturnella neglecta</i>	western meadowlark	perched on post
3-1		unidentified lizard	tracks
3-1	<i>Canis latrans</i>	coyote	tracks
3-1	<i>Sturnella neglecta</i>	western meadowlark	singing
3-1	<i>Sylvilagus nutalli</i>	mountain cottontail	tracks

Percent Canopy Cover of Herbaceous Species Measured in 0.5 m2 quadrats May 28 2015, U Plant Cribs and Ditches EU, Patch 3-1																	
Patch ID	Species	Origin & Class	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Sum	Mean Canopy Cover	Frequency
3-1	Bare	Bare	6	2	5	65	8	30	65	70	34	90	80	50	505	42.08	1.00
3-1	Litter	Litter	7	85	60	32	45	45	26	28	30	18	20	35	431	35.92	1.00
3-1	Saka	IF	6	2	2		1	18	1	4	3	2	1	4	44	3.67	0.92
3-1	Brte	IG	1	12	55	5	65	35	28	21	40	2	1	25	290	24.17	1.00
3-1	Artr	NS		65											65	5.42	0.08
3-1	Coum	NF		3											3	0.25	0.08
3-1	Crust	Crust						2		2					4	0.33	0.17
3-1	Pose	NG				4									4	0.33	0.08
3-1	Stco	NG				3		1	5					1	10	0.83	0.33
3-1	Vumi/Vuoc	NG								2		1			3	0.25	0.17
3-1	Houm	IF								1					1	0.08	0.08
3-1	Orhy	NG										1			1	0.08	0.08
3-1	Chvi	NS											4		4	0.33	0.08

Shrub Canopy Measured by Line-Intercept Methods on 50m Transect May 28 2015, U Plant Cribs and Ditches EU, Patch 3-1						
Patch ID	Species Code	Species Name	Start	Stop	Difference	Height (cm)
3-1	Artr	<i>Artemisia tridentata</i>	3.11	3.15	0.04	110
3-1	Artr	<i>Artemisia tridentata</i>	18.73	19.62	0.89	105
3-1	Artr	<i>Artemisia tridentata</i>	23.47	23.77	0.30	78
3-1	Artr	<i>Artemisia tridentata</i>	36.08	36.72	0.64	81
3-1	Chvi	<i>Chrysothamnus viscidiflorus</i>	48.5	48.85	0.35	40
3-1	Chvi	<i>Chrysothamnus viscidiflorus</i>	49.25	49.76	0.51	58

Evaluation Unit: REDOX Cribs and Ditches
 ID: CP-LS-4
 Group: Legacy Source
 Operable Unit Cross-Walk: 200-DV-1, 200-WA-1
 Related EU: CP-DD-4, CP-GW-2
 Sites & Facilities: Liquid waste discharges in the southern part of 200-W Area associated with REDOX (S Plant) operations.
 Key Data Sources Docs: DOE-RL-96-32-01; Mission Support Alliance maps⁷
 Field Survey Date: 05/27/2015
 Datasheet prepared by: MAC, KDH, SAM 11/09/2015
 Datasheet reviewed by:

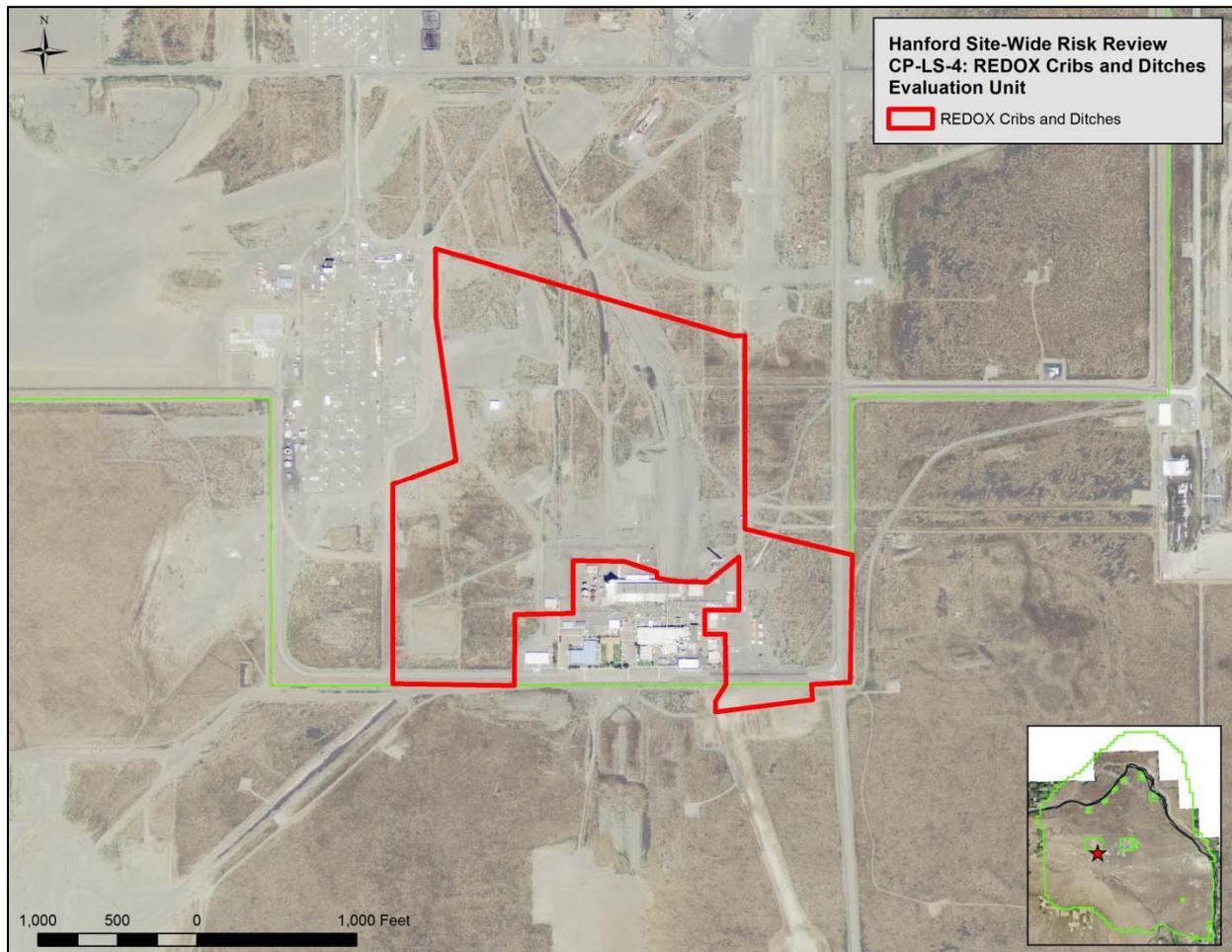


Figure J.15. CP-LS-4 (REDOX Cribs and Ditches) Site Location Map

CP-LS-4: REDOX Cribs and Ditches

⁷MSA (Mission Support Alliance) maintains biological resource information for the Hanford Site for the Department of Energy.

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the current Endangered and Threatened Species (Federal and State) distribution data; priority habitats as defined by Washington Department of Fish and Wildlife; available current aerial imagery, locations of Hanford Site waste units and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data records.

The following steps were taken to assess the EU associated with REDOX Cribs and Ditches:

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. A visual survey was conducted within the EU boundary by experienced shrub-steppe ecologists.
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2013 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.
6. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

The REDOX Cribs and Ditches EU consists of patches of habitat disturbed years ago between the REDOX industrial area to the south and the S-SX tank farms to the northwest (Figure J.16). A little over half of the EU contains successional vegetation with 10% cover by gray rabbitbrush (*Ericameria nauseosa*) and the understory dominated by 20% each of the native Sandberg's bluegrass (*Poa secunda*) and introduced cheatgrass (*Bromus tectorum*) along with variable amounts of native and introduced forbs (Table J.13). These patches of successional vegetation are cut by more disturbed areas adjacent to small roads or the old railroad and are predominantly Russian thistle (*Salsola tragus*) with some cheatgrass. Areas containing buildings, larger roads, and waste sites are concentrated in the south, central and northwest parts of the EU and are kept free of vegetation (Figure J.16). Field data records at the end of this section provide lists of plants and animals observed during the May 2015 survey.

Landscape Evaluation and Resource Classification:

All of the REDOX Cribs and Ditch EU is classified as resource level 2 or below (Figure J.16,

Table J.14). Areas of level 2 resources are contiguous to the north with a patchwork of similar habitat. To south and east the EU is separated from higher quality habitat (resource levels 3 and 4) by large roads and the 200-West Area fence (Figure J.16).

Table J.13. Percent Canopy Cover and Surface Cover Estimated at the REDOX Cribs and Ditches Evaluation Unit

Vegetation/Surface Cover	Survey Area 2 (west side)	Survey Area 2 (east side)
Bare Ground	-	-
Introduced forb	-	-
Introduced grass	30	20
Native forb	-	-
Native grass	10	20
Successional shrub	5	10
Climax shrub	-	-

Note: a dash (-) indicates no percent cover data were collected

The amount and proximity of biological resources surrounding the REDOX Cribs and Ditches EU were examined within the adjacent landscape buffer area, which extends 3768 ft (1148 m) from the geometric center of the EU (Figure J.16). The buffer area north and northwest of the EU encompasses large industrial areas and successional vegetation broken into smaller patches by numerous waste sites and roads. A little over 60% of the combined EU and buffer area is classified as resource level 2 or below (

Table J.14). Additional details about biological resources can be found in sections of this report for the U and S Pond EU and U Plant Cribs and Trenches EU which are encompassed by the adjacent landscape buffer area.

On the west, south and east portions of the EU, the buffer area is dominated by level 3 resources (approximately 31% of the combined EU and buffer area), with smaller amounts of level 4 resources on the east and level 5 resources on the south (Figure J.16, Table J.14). These higher quality habitats are contiguous with similar habitats extending across the Hanford Site.

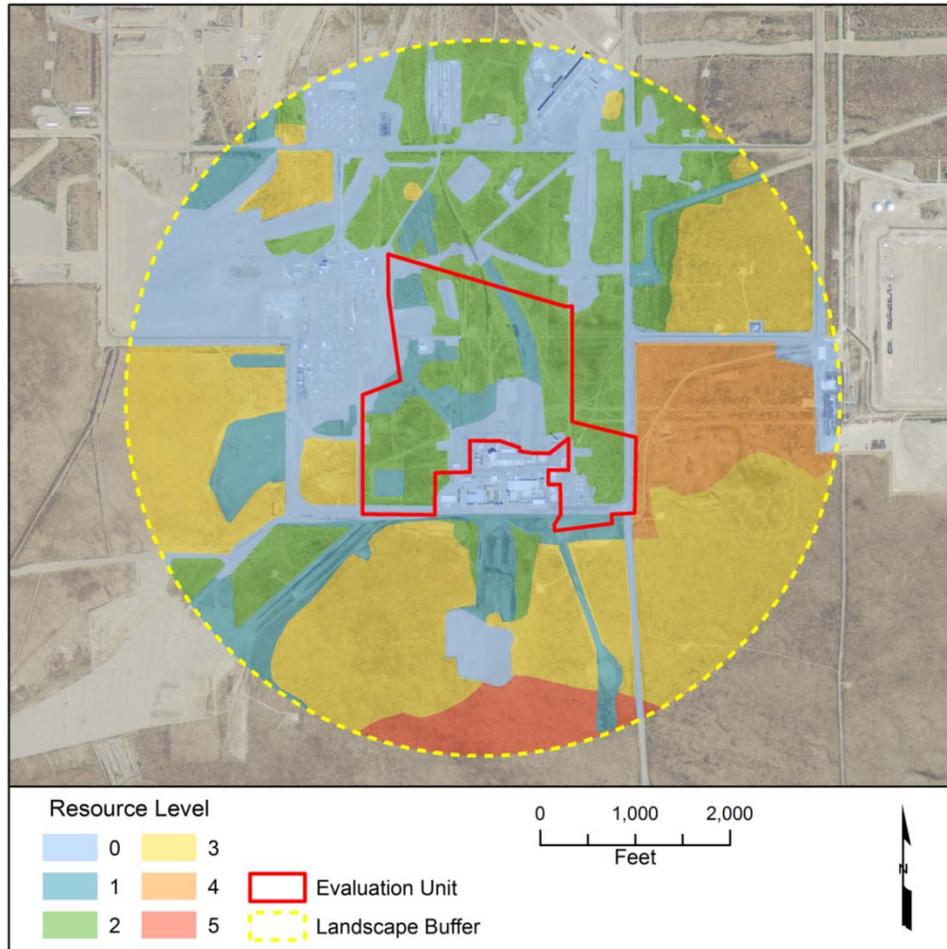


Figure J.16. Biological Resource Level Classifications Based on the May 27, 2015 Survey at the REDOX Cribs and Ditches Evaluation Unit (red solid line) and Adjacent Landscape Buffer Area (yellow dashed line).

Table J.14. Area and Proportion of Each Biological Resource Level Within the REDOX Cribs and Ditches Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources.

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
0	32.6	265.1	297.7	28.59%	36.22%	7.63%
1	21.5	95.3	116.8	11.21%	9.15%	-2.06%
2	57.9	154.0	211.9	20.35%	14.79%	-5.56%
3	0	319.7	319.7	30.70%	30.70%	0.00%
4	0	62.2	62.3	5.98%	5.98%	0.00%
5	0	33.0	33.0	3.17%	3.17%	0.00%
Total	112	929.4	1041.4	100.00%	100.00%	

¹ Resource levels for both the evaluation unit and adjacent landscape boundary were reviewed in the field and via imagery during May-August 2015 and revised to reflect current habitats conditions.

² Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.

Assumptions and Uncertainty:

Although all observations for species of concern and current conditions of biological resources were noted during surveys and evaluations conducted in 2015, the presence or absence of species cannot be assumed or predicted for future years. Field reconnaissance and surveys of evaluation units at the time of remediation will need to be conducted to verify resources and evaluation ecological conditions at that time.

Summary of Ecological Review:

- 100% of the EU consists of resources classified as level 2 or below. Loss of this habitat during cleanup activities is not likely to impact connectivity with biological resources outside the 200-West Area.
- Approximately 60% of the combined EU and adjacent landscape buffer area is dominated by habitats classified as level 2 or below. These habitats occur primarily within the 200-West Area, but are also found in the U and S Pond EU to the south and west of the REDOX Cribs and Ditches EU.
- Nearly 31% of the adjacent landscape buffer area is classified as level 3 biological resources. Another 6% of the buffer on the east is classified as a level 4 resource, and a little over 3% to the south is classified as a level 5 biological resource.

References:

- DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 0.
- U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act. <http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>
- U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington. http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902
- Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. <http://wdfw.wa.gov/conservation/phs/list/>
- Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington. <http://wdfw.wa.gov/conservation/endangered/>
- Washington Noxious Weed Control Board. 2014. Noxious Weed List. <http://www.nwcb.wa.gov/>
- Washington State Department of Natural Resources. 2014. Washington Natural Heritage Program Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

Definitions and Acronyms:

Adjacent Landscape Buffer – a circular area adjacent to and outside the EU boundary with the center of the circle at the centroid of the EU, and with a radius that is 1 times the maximum dimension (width or length—whichever is greatest). This circular buffer area is used to evaluate indirect effects and assess the remediation in relation to the landscape features and resources adjacent to the EU. This circular area is generally at least 3 times the area of the EU.

Biological Resource Levels (from DOE-RL-96-32-01) –

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats.
- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks.
- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub-steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.
- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.

- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.
- Level 0 resources consist of non-native plants and animals (unless otherwise listed at a higher level), non-vegetated areas, and industrial areas.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

MBTA – Migratory Bird Treaty Act; referring to species listed and protected under the federal Act.

PNNL ECAP (Ecological Compliance and Assessment Project) Database – PNNL performed ecological reviews for individual projects and annually surveyed selected areas and buildings on the Hanford Site for DOE-RL under the DOE's Public Safety and Resource Protection Program until 2011. The data collected during those surveys is archived in the ECAP database, and is used to supplement ecological evaluations as available.

Priority Habitats – Priority habitats are habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type (e.g., shrub-steppe) or dominant plant species (e.g., juniper savannah), a described successional stage (e.g., old-growth forest), or a specific habitat feature (e.g., cliffs).

Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

Field Data Records

Plant Species Identified During Visual Surveys May 27 2015, REDOX Cribs and Ditches EU			
Patch ID	Name	Common name	Abundance
2 (east)	<i>Astragalus caricinus</i>	buckwheat milkvetch	
2 (east)	<i>Bromus tectorum</i>	cheatgrass	20
2 (east)	<i>Ericameria nauseosa</i>	gray rabbitbrush	10
2 (east)	<i>Poa secunda</i>	Sandberg's bluegrass	20
2 (west)	<i>Achillea millefolium</i>	yarrow	
2 (west)	<i>Achnatherum hymenoides</i>	indian ricegrass	
2 (west)	<i>Ambrosia acanthicarpa</i>	bur ragweed	
2 (west)	<i>Bromus tectorum</i>	cheatgrass	30
2 (west)	<i>Calochortus macrocarpus</i>	sagebrush mariposa lily	
2 (west)	<i>Cryptantha circumscissa</i>	matted cryptantha	
2 (west)	<i>Cryptantha fendleri</i>	Fendler's cryptantha	
2 (west)	<i>Ericameria nauseosa</i>	gray rabbitbrush	5
2 (west)	<i>Grayia spinosa</i>	spiny hopsage	
2 (west)	<i>Hesperostipa comata</i>	needle-and-thread grass	
2 (west)	<i>Mentzelia albicaulis</i>	whitestem stickleaf	
2 (west)	<i>Poa secunda</i>	Sandberg's bluegrass	10
2 (west)	<i>Salsola tragus</i>	Russian thistle	
2 (west)	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	
2 (west)	<i>Tragopogon dubius</i>	Yellow salsify	

Bird, Mammal and Herpetofauna Species May 27 2015, REDOX Cribs and Ditches EU			
Patch ID	Name	Common name	Comment
2 (east)	<i>Sturnus vulgaris</i>	European starling	nest
2 (west)	<i>Sturnella neglecta</i>	western meadowlark	
2 (west)	<i>Turdus migratorius</i>	American robin	

Evaluation Unit: U and S Pond
 ID: CP-LS-5
 Group: Legacy Source
 Operable Unit Cross-Walk: 200-CW-1, 200-OA-1
 Related EU: CP-GW-2
 Sites & Facilities: Liquid waste discharges in the southern part of 200-W and outside the fence of 200 West associate with U and S ponds and closely related trenches, ditches, and cribs.
 Key Data Sources Docs: DOE-RL-96-32-01; Mission Support Alliance maps⁸
 Field Survey Date: 05/20/2015 and 09/01/2015
 Datasheet prepared by: JLD, 11/20/2015
 Datasheet reviewed by:



Figure J.17. CP-LS-5 (U and S Pond) Site Location Map

CP-LS-5: U and S Pond

⁸MSA (Mission Support Alliance) maintains biological resource information for the Hanford Site for the Department of Energy

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the current Endangered and Threatened Species (Federal and State) distribution data; priority habitats as defined by Washington Department of Fish and Wildlife; available current aerial imagery, locations of Hanford Site waste units and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data records.

The following steps were taken to assess the EU associated with U and S Ponds:

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. Pedestrian surveys were conducted within the EU boundary by experienced shrub-steppe ecologists.
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2013 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.
6. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

The U and S Ponds EU consists of several large waste site areas, borrow pit areas, buried pipelines, and revegetated areas surrounded by native shrub-steppe that has burned several times in the past 15 years. The EU boundary encompasses a relatively large amount of land around the disturbed and revegetated areas. Native vegetation on sandy soils outside the disturbed areas associated with waste sites generally has not recovered a climax shrub component, but consists of a mixture of green and gray rabbitbrush (*Chrysothamnus viciflorous* and *Ericameria nauseosa*) growing with varying amounts of native bunchgrasses such as Indian ricegrass (*Achnatherum hymenoides*), needle-and-thread grass (*Stipa comata*), and prairie junegrass (*Koeleria macrantha*). Sandberg’s bluegrass (*Poa secunda*) is very sparse on the sandy soils of the EU, and the introduced annual cheatgrass (*Bromus tectorum*) was common with percent canopy cover ranging from 10% to 50% of the understory (Table J.15). Numerous native perennial forbs were observed within the EU and are listed in the field data sheets at the end of this section.

A variety of wildlife or wildlife signs were observed within the EU including signs of badger (*Taxidea taxus*) and coyote (*Canis latrans*), pygmy short-horned lizards (*Phrynosoma douglasii*) and side-blotch lizards (*Uta stansburiana*), and northern pocket gopher (*Thomomys talpoides*) along with tracks and burrows of small mammals and rabbits. Numerous birds were observed in the area with the most common being the horned lark (*Eremophila alpestris*) and western meadowlark (*Sturnella neglecta*); other species observed are noted in the field data sheets at the end of this section. Loggerhead shrikes (*Lanius ludovicianus*), a state candidate species and federal species of concern, were also observed within the EU.

Table J.15. Percent Canopy Cover and Surface Cover Estimated and Measured at the U and S Pond Evaluation Unit

Vegetation/ Surface Cover	Survey Areas (% Cover)														
	JLD2	KH1	KH2	KH3	KL1	KL2	KL3	AB	N Waste Site	NE	NW	W	W Tile	W/ NW Side	Waste Site
Bare Ground	-	-	-	-	-	-	-	31.8	-	25	25	-	20	35	20
Introduced Forb	1	1	1	1	1	1	-	5.4	5	1	5		10	1	
Introduced Grass	30	35	40	30	25	40	45	21.9	50	25	30	20	15	25	65
Native Forb	5	1	1	1	1	2	1	1	5	5	5	5	1	5	
Native Grass	20	20	20		10	5	1	3.6	20	25	15	10	25	15	15
Successional Shrub	1	1	1	1	1	2	2	2.9	-	5	5	1	1	5	
Climax Shrub								<1	9.9			1			

Note: a dash (-) indicates no percent cover data were collected

Landscape Evaluation and Resource Classification

The EU was originally characterized as containing habitats classified as levels 0, 1, 2, and 3 and 5 (DOE/RL-96-32 2013). However, based on field observations and data collected during the 20-May 2015 field visit, portions of those areas of the EU originally classified as level 1 habitat were reclassified in this

assessment as level 2 (successional shrubs are recolonizing the borrow areas), and portions of level 2 habitats were reclassified as level 3 (containing climax shrubs or predominantly characterized by native bunchgrasses) (Figure J.18). Resource levels within the landscape buffer area outside the EU were not reclassified for this assessment. More than 60% of the EU consists of resources of level 3 or greater (Table J.16).

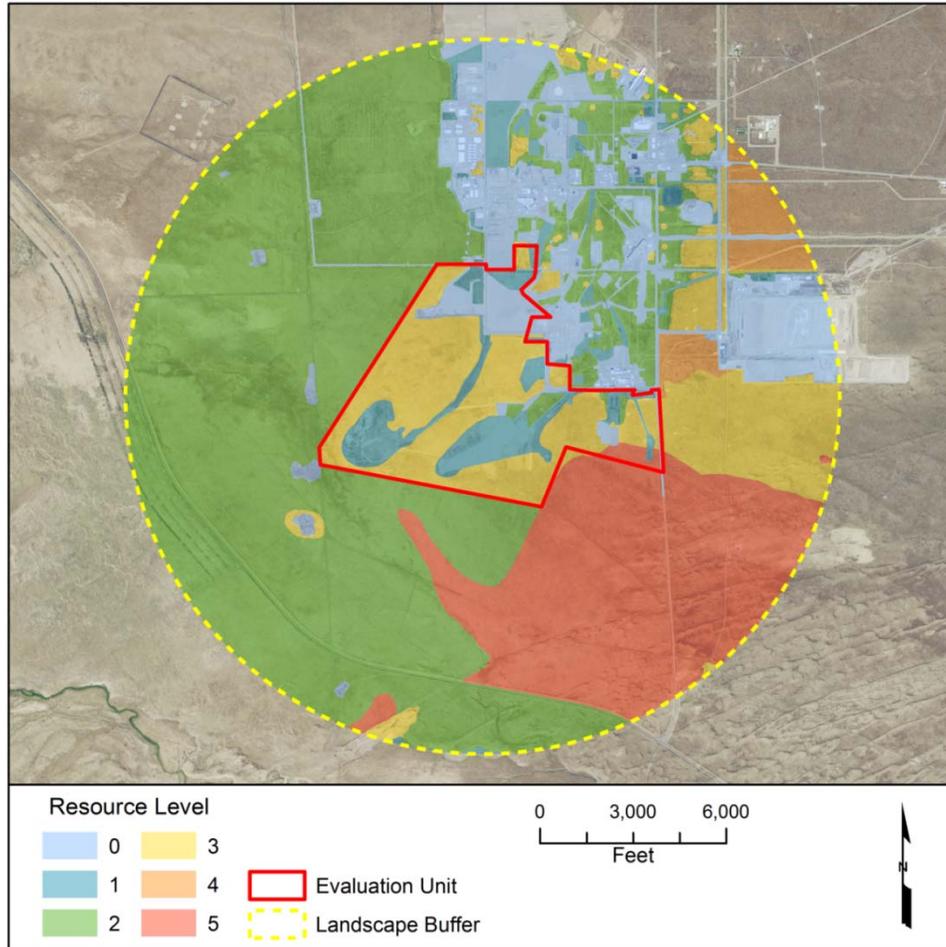


Figure J.18. Biological Resource Level Classifications Based on the May 20, 2015 Survey at the U and S Pond Evaluation Unit (red solid line) and Adjacent Landscape Buffer Area (yellow dashed line).

Table J.16. Area and Proportion of Each Biological Resource Level Within the U and S Pond Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources.

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After	Percent Difference at Landscape Scale After Cleanup ²
0						
1						
2						
3						
4						
5						

					Cleanup ²	
0	132.3	1239.8	1372.2	14.29%	24.88%	10.59%
1	284.4	180.5	464.9	4.84%	1.88%	-2.96%
2	24.5	4567.2	4591.7	47.82%	47.57%	-0.26%
3	684.5	677.1	1361.6	14.18%	7.05%	-7.13%
4	0.2	213.0	213.2	2.22%	2.22%	0.00%
5	23.4	1574.4	1597.9	16.64%	16.40%	-0.24%
Total	1149.3	8452.0	9601.4	100.00%	100.00%	

1 Resource levels for both the evaluation unit and adjacent landscape boundary were reviewed in the field and via imagery during May-August 2015 and revised to reflect current habitats conditions.

2 Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.

The amount and proximity of biological resources surrounding the U and S Ponds EU were examined within the adjacent landscape buffer area, which extends 11,483 feet (3500 m) from the geometric center of the EU (Figure J.18). Because the boundary of the EU encompasses separate pond and borrow pit areas, the total land area included in the buffer area is quite large—8452 acres. The adjacent landscape buffer area crosses highway 240 to the west and includes part of the Arid Lands Ecology Reserve as well as habitat to the south originally classified as level 4 because it is designated as a plant community element occurrence by the Washington State Natural Heritage program. Some of the EU and much of the landscape buffer area directly west of the EU were classified as level 2 habitat because it burned in 2000 and again in 2007, and the mature shrubs were lost; however, native bunchgrasses have recovered within much of the level 2 resource area included in the adjacent landscape buffer. Areas within the EU with significant recovery of native species were reclassified as level 3 resources.

Assumptions and Uncertainty:

Although all observations for species of concern and current conditions of biological resources were noted during surveys and evaluations conducted in 2015, the presence or absence of species cannot be assumed or predicted for future years. Field reconnaissance and surveys of evaluation units at the time of remediation will need to be conducted to verify resources and evaluation ecological conditions at that time.

Summary of Ecological Review:

- More than 60% of the EU consists of level 3 or greater resources; of the remaining land area, ~36% is classified as level 0 or level 1.
- Areas reclassified as level 3 resources within the EU are contiguous with level 2 and level 4 habitats in the adjacent landscape buffer area
- Loggerhead shrikes, a Washington State Candidate species and Federal species of concern were observed within the EU

- Habitats inside and outside of the EU that surround the waste site and borrow area footprints are recovering from past wildfires and contain a diverse plant community with a variety of native grasses and forbs with scattered successional and climax shrubs.

References:

- DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 0.
- U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act. <http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>
- U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington. http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902
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Adjacent Landscape Buffer – a circular area adjacent to and outside the EU boundary with the center of the circle at the centroid of the EU, and with a radius that is 1 times the maximum dimension (width or length—whichever is greatest). This circular buffer area is used to evaluate indirect effects and assess the remediation in relation to the landscape features and resources adjacent to the EU. This circular area is generally at least 3 times the area of the EU.

Biological Resource Levels (from DOE-RL-96-32-01) –

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats.
- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks.
- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub-steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify

for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.

- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.
- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.
- Level 0 resources consist of non-native plants and animals (unless otherwise listed at a higher level), non-vegetated areas, and industrial areas.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

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Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

Field Data Records

Plant Species Identified During Visual Surveys May 20 2015, U and S Pond EU			
Patch ID	Name	Common name	Abundance
E Tile	<i>Bromus tectorum</i>	cheatgrass	10
E Tile	<i>Ericameria nauseosa</i>	gray rabbitbrush	25
E Tile	<i>Hesperostipa comata</i>	needle-and-thread grass	10
E Tile	<i>Poa secunda</i>	Sandberg's bluegrass	5
E Tile	<i>Salsola tragus</i>	Russian thistle	5
JLD2	<i>Achillea millefolium</i>	yarrow	
JLD2	<i>Achnatherum hymenoides</i>	indian ricegrass	10
JLD2	<i>Agropyron dasytachyum</i>	thickspike wheatgrass	
JLD2	<i>Ambrosia acanthicarpa</i>	bur ragweed	5
JLD2	<i>Bromus tectorum</i>	cheatgrass	30
JLD2	<i>Crepis aribarba</i>	slender hawkbeard	
JLD2	<i>Elymus elymoides</i>	squirreltail	
JLD2	<i>Ericameria nauseosa</i>	gray rabbitbrush	1
JLD2	<i>Hesperostipa comata</i>	needle-and-thread grass	10
JLD2	<i>Mentzelia albicaulis</i>	whitestem stickleaf	
JLD2	<i>Phlox longifolia</i>	longleaf phlox	
JLD2	<i>Pteryxia terebinthina var. terebinthina</i>	turpentine springparsley	
JLD2	<i>Salsola tragus</i>	Russian thistle	
JLD2	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	
kh-1	<i>Achillea millefolium</i>	yarrow	
kh-1	<i>Achnatherum hymenoides</i>	indian ricegrass	
kh-1	<i>Agropyron cristatum</i>	crested wheatgrass	
kh-1	<i>Ambrosia acanthicarpa</i>	bur ragweed	
kh-1	<i>Astragalus sclerocarpus</i>	stalked-pod milkvetch	
kh-1	<i>Bromus tectorum</i>	cheatgrass	35
kh-1	<i>Calochortus macrocarpus</i>	sagebrush mariposa lily	
kh-1	<i>Chaenactis douglasii</i>	hoary falseyarrow	
kh-1	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	
kh-1	<i>Ericameria nauseosa</i>	gray rabbitbrush	1
kh-1	<i>Hesperostipa comata</i>	needle-and-thread grass	20
kh-1	<i>Holosteum umbellatum</i>	jagged chickweed	
kh-1	<i>Mentzelia albicaulis</i>	whitestem stickleaf	1
kh-1	<i>Penstemon acuminatus</i>	sand beardtongue	
kh-1	<i>Phlox longifolia</i>	longleaf phlox	
kh-1	<i>Pteryxia terebinthina var. terebinthina</i>	turpentine springparsley	
kh-1	<i>Salsola tragus</i>	Russian thistle	
kh-1	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	
kh-1	<i>Sporobolus cryptandrus</i>	sand dropseed	
kh-2	<i>Achillea millefolium</i>	yarrow	
kh-2	<i>Achnatherum hymenoides</i>	indian ricegrass	
kh-2	<i>Agropyron dasytachyum</i>	thickspike wheatgrass	
kh-2	<i>Ambrosia acanthicarpa</i>	bur ragweed	
kh-2	<i>Astragalus sclerocarpus</i>	stalked-pod milkvetch	

Plant Species Continued May 20 2015, U and S Pond EU			
Patch ID	Name	Common name	Abundance
kh-2	<i>Balsamorhiza careyana</i>	Carey's balsamroot	
kh-2	<i>Bromus tectorum</i>	cheatgrass	40
kh-2	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	
kh-2	<i>Crepis atriobarba</i>	slender hawksbeard	
kh-2	<i>Cryptantha circumscissa</i>	matted cryptantha	
kh-2	<i>Descurainia sophia</i>	flixweed	
kh-2	<i>Ericameria nauseosa</i>	gray rabbitbrush	1
kh-2	<i>Festuca microstachys</i>	small sixweeks	
kh-2	<i>Hesperostipa comata</i>	needle-and-thread grass	15
kh-2	<i>Mentzelia albicaulis</i>	whitestem stickleaf	
kh-2	<i>Microsteris gracilis</i>	pink microsteris	
kh-2	<i>Nama densum</i>	purplemat	
kh-2	<i>Phacelia linearis</i>	threadleaf scorpionweed	
kh-2	<i>Phlox longifolia</i>	longleaf phlox	
kh-2	<i>Poa secunda</i>	Sandberg's bluegrass	
kh-2	<i>Pteris terebinthina var. terebinthina</i>	turpentine springparsley	
kh-2	<i>Salsola tragus</i>	Russian thistle	
kh-2	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	
kh-2	<i>Sitanion hystrix</i>	bottlebrush grass	
kh-2	<i>Sporobolus cryptandrus</i>	sand dropseed	
kh-2	<i>Tragopogon dubius</i>	Yellow salsify	
kh-3	<i>Achillea millefolium</i>	yarrow	
kh-3	<i>Achnatherum hymenoides</i>	indian ricegrass	
kh-3	<i>Agropyron cristatum</i>	crested wheatgrass	
kh-3	<i>Ambrosia acanthicarpa</i>	bur ragweed	
kh-3	<i>Artemisia tridentata</i>	big sagebrush	
kh-3	<i>Astragalus caricinus</i>	buckwheat milkvetch	
kh-3	<i>Astragalus sclerocarpus</i>	stalked-pod milkvetch	
kh-3	<i>Balsamorhiza careyana</i>	Carey's balsamroot	
kh-3	<i>Bromus tectorum</i>	cheatgrass	30
kh-3	<i>Calochortus macrocarpus</i>	sagebrush mariposa lily	
kh-3	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	
kh-3	<i>Comandra umbellata</i>	bastard toadflax	
kh-3	<i>Crepis atriobarba</i>	slender hawksbeard	
kh-3	<i>Cryptantha circumscissa</i>	matted cryptantha	
kh-3	<i>Cryptantha fendleri</i>	Fendler's cryptantha	
kh-3	<i>Descurainia pinnata</i>	western tansymustard	
kh-3	<i>Ericameria nauseosa</i>	gray rabbitbrush	1
kh-3	<i>Hesperostipa comata</i>	needle-and-thread grass	
kh-3	<i>Machaeranthera canescens</i>	hoary aster	
kh-3	<i>Mentzelia albicaulis</i>	whitestem stickleaf	
kh-3	<i>Phlox longifolia</i>	longleaf phlox	
kh-3	<i>Poa secunda</i>	Sandberg's bluegrass	
kh-3	<i>Pteris terebinthina var. terebinthina</i>	turpentine springparsley	
kh-3	<i>Salsola tragus</i>	Russian thistle	
kh-3	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	
kl-1	<i>Achillea millefolium</i>	yarrow	
kl-1	<i>Achnatherum hymenoides</i>	indian ricegrass	
kl-1	<i>Agropyron cristatum</i>	crested wheatgrass	
kl-1	<i>Ambrosia acanthicarpa</i>	bur ragweed	

Plant Species Continued May 20 2015, U and S Pond EU			
Patch ID	Name	Common name	Abundance
kl-1	<i>Artemisia tridentata</i>	big sagebrush	
kl-1	<i>Astragalus sclerocarpus</i>	stalked-pod milkvetch	
kl-1	<i>Balsamorhiza careyana</i>	Carey's balsamroot	
kl-1	<i>Bromus tectorum</i>	cheatgrass	25
kl-1	<i>Calochortus macrocarpus</i>	sagebrush mariposa lily	
kl-1	<i>Chenopodium leptophyllum</i>	slimleaf goosefoot	
kl-1	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	
kl-1	<i>Crataegus phippisii</i>	phipp's hawthorn	
kl-1	<i>Crepis atribarba</i>	slender hawksbeard	
kl-1	<i>Cryptantha circumscissa</i>	matted cryptantha	
kl-1	<i>Descurainia pinnata</i>	western tansymustard	
kl-1	<i>Ericameria nauseosa</i>	gray rabbitbrush	1
kl-1	<i>Hesperostipa comata</i>	needle-and-thread grass	10
kl-1	<i>Koeleria macrantha</i>	prairie Junegrass	
kl-1	<i>Mentzelia albicaulis</i>	whitestem stickleaf	
kl-1	<i>Phlox longifolia</i>	longleaf phlox	
kl-1	<i>Poa secunda</i>	Sandberg's bluegrass	
kl-1	<i>Pteryxia terebinthina var. terebinthina</i>	turpentine springparsley	
kl-1	<i>Salsola tragus</i>	Russian thistle	
kl-1	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	
kl-1	<i>Sitanion hystrix</i>	bottlebrush grass	
kl-1	<i>Sporobolus cryptandrus</i>	sand dropseed	
kl-1	<i>Tragopogon dubius</i>	Yellow salsify	
kl-2	<i>Achillea millefolium</i>	yarrow	
kl-2	<i>Achnatherum hymenoides</i>	indian ricegrass	
kl-2	<i>Ambrosia acanthicarpa</i>	bur ragweed	
kl-2	<i>Astragalus sclerocarpus</i>	stalked-pod milkvetch	
kl-2	<i>Balsamorhiza careyana</i>	Carey's balsamroot	
kl-2	<i>Bromus tectorum</i>	cheatgrass	40
kl-2	<i>Calochortus macrocarpus</i>	sagebrush mariposa lily	
kl-2	<i>Chenopodium leptophyllum</i>	slimleaf goosefoot	
kl-2	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	
kl-2	<i>Cryptantha circumscissa</i>	matted cryptantha	
kl-2	<i>Descurainia pinnata</i>	western tansymustard	
kl-2	<i>Ericameria nauseosa</i>	gray rabbitbrush	
kl-2	<i>Erigeron filifolius</i>	threadleaf fleabane	
kl-2	<i>Hesperostipa comata</i>	needle-and-thread grass	
kl-2	<i>Layia glandulosa</i>	white-daisy tidytips	
kl-2	<i>Machaeranthera canescens</i>	hoary aster	
kl-2	<i>Mentzelia albicaulis</i>	whitestem stickleaf	
kl-2	<i>Nama densum</i>	purplemat	
kl-2	<i>Phacelia linearis</i>	threadleaf scorpionweed	
kl-2	<i>Phlox longifolia</i>	longleaf phlox	
kl-2	<i>Poa secunda</i>	Sandberg's bluegrass	
kl-2	<i>Pteryxia terebinthina var. terebinthina</i>	turpentine springparsley	
kl-2	<i>Salsola tragus</i>	Russian thistle	
kl-2	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	
kl-2	<i>Sporobolus cryptandrus</i>	sand dropseed	
kl-2	<i>Tragopogon dubius</i>	Yellow salsify	

Plant Species Continued May 20 2015, U and S Pond EU			
Patch ID	Name	Common name	Abundance
kl-3	<i>Achillea millefolium</i>	yarrow	
kl-3	<i>Achnatherum hymenoides</i>	indian ricegrass	
kl-3	<i>Agropyron cristatum</i>	crested wheatgrass	
kl-3	<i>Ambrosia acanthicarpa</i>	bur ragweed	
kl-3	<i>Amsinckia hycopsoides</i>	fiddleneck	
kl-3	<i>Artemisia tridentata</i>	big sagebrush	
kl-3	<i>Astragalus caricinus</i>	buckwheat milkvetch	
kl-3	<i>Astragalus sclerocarpus</i>	stalked-pod milkvetch	
kl-3	<i>Balsamorhiza careyana</i>	Carey's balsamroot	
kl-3	<i>Bromus tectorum</i>	cheatgrass	45
kl-3	<i>Calochortus macrocarpus</i>	sagebrush mariposa lily	
kl-3	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	
kl-3	<i>Crepis atriobarba</i>	slender hawksbeard	
kl-3	<i>Cryptantha circumscissa</i>	matted cryptantha	
kl-3	<i>Descurainia pinnata</i>	western tansymustard	
kl-3	<i>Ericameria nauseosa</i>	gray rabbitbrush	
kl-3	<i>Hesperostipa comata</i>	needle-and-thread grass	1
kl-3	<i>Mentzelia albicaulis</i>	whitestem stickleaf	
kl-3	<i>Penstemon acuminatus</i>	sand beardtongue	
kl-3	<i>Poa secunda</i>	Sandberg's bluegrass	
kl-3	<i>Pteryxia terebinthina var. terebinthina</i>	turpentine springparsley	
kl-3	<i>Salsola tragus</i>	Russian thistle	
kl-3	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	
kl-3	<i>Sitanion hystrix</i>	bottlebrush grass	
kl-3	<i>Sporobolus cryptandrus</i>	sand dropseed	
N Waste site	<i>Achillea millefolium</i>	yarrow	
N Waste site	<i>Achnatherum hymenoides</i>	indian ricegrass	
N Waste site	<i>Agropyron cristatum</i>	crested wheatgrass	
N Waste site	<i>Ambrosia acanthicarpa</i>	bur ragweed	
N Waste site	<i>Bromus tectorum</i>	cheatgrass	50
N Waste site	<i>Crepis atriobarba</i>	slender hawksbeard	
N Waste site	<i>Descurainia pinnata</i>	western tansymustard	
N Waste site	<i>Hesperostipa comata</i>	needle-and-thread grass	5
N Waste site	<i>Mentzelia albicaulis</i>	whitestem stickleaf	
N Waste site	<i>Oenothera pallida</i>	pale evening primrose	
N Waste site	<i>Pteryxia terebinthina var. terebinthina</i>	turpentine springparsley	
N Waste site	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	
N Waste site	<i>Tragopogon dubius</i>	Yellow salsify	
N Waste site	<i>Tragopogon dubius</i>	Yellow salsify	
NE middle	<i>Achillea millefolium</i>	yarrow	
NE middle	<i>Achnatherum hymenoides</i>	indian ricegrass	20
NE middle	<i>Ambrosia acanthicarpa</i>	bur ragweed	
NE middle	<i>Bromus tectorum</i>	cheatgrass	25
NE middle	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	
NE middle	<i>Crepis atriobarba</i>	slender hawksbeard	
NE middle	<i>Ericameria nauseosa</i>	gray rabbitbrush	
NE middle	<i>Hesperostipa comata</i>	needle-and-thread grass	
NE middle	<i>Mentzelia albicaulis</i>	whitestem stickleaf	
NE middle	<i>Phlox longifolia</i>	longleaf phlox	
NE middle	<i>Pteryxia terebinthina var. terebinthina</i>	turpentine springparsley	
NE middle	<i>Salsola tragus</i>	Russian thistle	

Plant Species Continued May 20 2015, U and S Pond EU			
Patch ID	Name	Common name	Abundance
NW side	<i>Achillea millefolium</i>	yarrow	
NW side	<i>Achnatherum hymenoides</i>	indian ricegrass	
NW side	<i>Ambrosia acanthicarpa</i>	bur ragweed	
NW side	<i>Artemisia tridentata</i>	big sagebrush	1
NW side	<i>Astragalus sclerocarpus</i>	stalked-pod milkvetch	
NW side	<i>Balsamorhiza careyana</i>	Carey's balsamroot	
NW side	<i>Bromus tectorum</i>	cheatgrass	40
NW side	<i>Calochortus macrocarpus</i>	sagebrush mariposa lily	
NW side	<i>Chaenactis douglasii</i>	hoary falseyarrow	
NW side	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	
NW side	<i>Comandra umbellata</i>	bastard toadflax	
NW side	<i>Cryptantha circumscissa</i>	matted cryptantha	
NW side	<i>Ericameria nauseosa</i>	gray rabbitbrush	
NW side	<i>Hesperostipa comata</i>	needle-and-thread grass	10
NW side	<i>Koeleria macrantha</i>	prairie Junegrass	
NW side	<i>Layia glandulosa</i>	white-daisy tidytips	
NW side	<i>Machaeranthera canescens</i>	hoary aster	
NW side	<i>Mentzelia albicaulis</i>	whitestem stickleaf	
NW side	<i>Microsteris gracilis</i>	pink microsteris	
NW side	<i>Nama densum</i>	purplemat	
NW side	<i>Phlox longifolia</i>	longleaf phlox	
NW side	<i>Poa secunda</i>	Sandberg's bluegrass	
NW side	<i>Pteryxia terebinthina var. terebinthina</i>	turpentine springparsley	
NW side	<i>Sisymbrium altissimum</i>	Jim Hill's tumblemustard	
NW side	<i>Tragopogon dubius</i>	Yellow salsify	
W side	<i>Achnatherum hymenoides</i>	indian ricegrass	10
W side	<i>Agropyron cristatum</i>	crested wheatgrass	5
W side	<i>Ambrosia acanthicarpa</i>	bur ragweed	5
W side	<i>Bromus tectorum</i>	cheatgrass	15
W side	<i>Eriogonum vimineum</i>	broom buckwheat	
W side	<i>Poa secunda</i>	Sandberg's bluegrass	
W side	<i>Salsola tragus</i>	Russian thistle	
W side	<i>Sporobolus cryptandrus</i>	sand dropseed	
W Tile	<i>Achnatherum hymenoides</i>	indian ricegrass	
W Tile	<i>Artemisia tridentata</i>	big sagebrush	8
W Tile	<i>Bromus tectorum</i>	cheatgrass	15
W Tile	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	
W Tile	<i>Ericameria nauseosa</i>	gray rabbitbrush	5
W Tile	<i>Hesperostipa comata</i>	needle-and-thread grass	10
W Tile	<i>Poa secunda</i>	Sandberg's bluegrass	10
W Tile	<i>Salsola tragus</i>	Russian thistle	10
W/NW side	<i>Achillea millefolium</i>	yarrow	
W/NW side	<i>Achnatherum hymenoides</i>	indian ricegrass	10
W/NW side	<i>Agropyron cristatum</i>	crested wheatgrass	
W/NW side	<i>Agropyron dasytachyum</i>	thickspike wheatgrass	
W/NW side	<i>Ambrosia acanthicarpa</i>	bur ragweed	
W/NW side	<i>Astragalus sclerocarpus</i>	stalked-pod milkvetch	
W/NW side	<i>Bromus tectorum</i>	cheatgrass	30
W/NW side	<i>Ericameria nauseosa</i>	gray rabbitbrush	5
W/NW side	<i>Hesperostipa comata</i>	needle-and-thread grass	
W/NW side	<i>Holosteum umbellatum</i>	jagged chickweed	

Plant Species Continued May 20 2015, U and S Pond EU			
Patch ID	Name	Common name	Abundance
W/NW side	<i>Oenothera pallida</i>	pale evening primrose	
W/NW side	<i>Pteryxia terebinthina var. terebinthina</i>	turpentine springparsley	
W/NW side	<i>Salsola tragus</i>	Russian thistle	
W/NW side	<i>Sisymbrium altissimum</i>	Jim Hill's tumblemustard	
Waste Site	<i>Agropyron cristatum</i>	crested wheatgrass	50
Waste Site	<i>Bromus tectorum</i>	cheatgrass	25
Waste Site	<i>Hesperostipa comata</i>	needle-and-thread grass	16
Waste Site	no vegetation	no vegetation	30
Waste Site	<i>Poa secunda</i>	Sandberg's bluegrass	25
Waste Site	<i>Salsola tragus</i>	Russian thistle	

Percent Canopy Cover of Herbaceous Species Measured in 0.5 m2 quadrats May 20 2015, U and S Pond EU - AB Patch																		
Survey Area	Species	Origin & Class	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	sum	Mean Canopy Cover	Freq	
AB	Artr	NCS	50			4				6	6				66	5.5	0.4	
AB	Brte	IG	25		18		1	4	4	30	5	18	70	80	255	21.3	0.9	
AB	Pose	NG	2	1					4			6		2	15	1.3	0.5	
AB	Saka	IF	10			1	10	8	3			14	10	4	1	61	5.1	0.8
AB	Bare	Bare	8	92	24	81		78	10			66	14	2	7	382	31.8	0.9
AB	Litter	Litter	5	6	21	2	88	2	77	62	7	41	26	10	347	28.9	1.1	
AB	Stco	NG		1	2	12		8							23	1.9	0.4	
AB	Chna	NSS			35										35	2.9	0.2	
AB	Cama	NF					1								1	0.1	0.2	
AB	Femi	NG							2		1				3	0.3	0.3	
AB	Adga	NG								1					1	0.1	0.2	
AB	Sial	OF								1		3			4	0.3	0.3	
AB	Orhy	NG									1				1	0.1	0.2	
AB	Agcr	IG											8		8	0.7	0.2	

Shrub Canopy Measured by Line-Intercept Methods on 100m Transect May 20 2015, U and S Pond EU - AB Patch					
Survey Area	Species	Transect distance (total)	Start	Stop	Dif
AB	Artr	100	83.5	84	0.5
AB	Artr	100	80.6	81.9	1.3
AB	Artr	100	72.6	74.2	1.6
AB	Artr	100	65.5	66.9	1.4
AB	Artr	100	25.1	30.2	5.1

Bird, Mammal and Herpetofauna Species May 20 2015, U and S Pond EU			
Patch ID	Name	Common name	Comment
AB	<i>Lanius ludovicianus</i>	loggerhead shrike	2
AB	<i>Sturnella neglecta</i>	western meadowlark	
AB	<i>Eremophila alpestris</i>	horned lark	
AB	<i>Uta stansburiana</i>	side-blotched lizard	
JLD2	<i>Sturnella neglecta</i>	western meadowlark	
JLD2	<i>Eremophila alpestris</i>	horned lark	multiple observed
JLD2	<i>Canis latrans</i>	coyote	tracks
JLD2	<i>Uta stansburiana</i>	side-blotched lizard	
kh-1	<i>Eremophila alpestris</i>	horned lark	flying, singing
kh-1	<i>Canis latrans</i>	coyote	scat, old digs
kh-1	<i>Uta stansburiana</i>	side-blotched lizard	1
kh-1		unidentified small mammal	holes
kh-2	<i>Eremophila alpestris</i>	horned lark	several flying, singing
kh-2	<i>Sturnella neglecta</i>	western meadowlark	1 perched on Artr singing
kh-2	<i>Tyrannus verticalis</i>	western kingbird	perched on shrub
kh-2	<i>Canis latrans</i>	coyote	tracks
kh-2	<i>Uta stansburiana</i>	side-blotched lizard	2
kh-2		unidentified small mammal	holes
kh-3	<i>Eremophila alpestris</i>	horned lark	several flying, singing
kh-3	<i>Sturnella neglecta</i>	western meadowlark	1 perched on Artr singing
kh-3	<i>Canis latrans</i>	coyote	tracks
kh-3	<i>Uta stansburiana</i>	side-blotched lizard	1
kh-3		unidentified small mammal	holes
kl-1	<i>Eremophila alpestris</i>	horned lark	
kl-1	<i>Uta stansburiana</i>	side-blotched lizard	
kl-1	<i>Canis latrans</i>	coyote	scat, tracks
kl-1	<i>Taxidea taxus</i>	badger	burrow
kl-1	<i>Thomomys talpoides</i>	northern pocket gopher	jaw bone
kl-1		unidentified small mammal	hole
kl-2	<i>Eremophila alpestris</i>	horned lark	
kl-2	<i>Sturnella neglecta</i>	western meadowlark	
kl-2	<i>Corvus corax</i>	common raven	
kl-2	<i>Uta stansburiana</i>	side-blotched lizard	
kl-2	<i>Taxidea taxus</i>	badger	burrow
kl-2		unidentified small mammal	hole
kl-3	<i>Eremophila alpestris</i>	horned lark	
kl-3	<i>Sturnella neglecta</i>	western meadowlark	
kl-3	<i>Canis latrans</i>	coyote	tracks
kl-3	<i>Uta stansburiana</i>	side-blotched lizard	
kl-3	<i>Taxidea taxus</i>	badger	burrow
kl-3		unidentified small mammal	hole
NE middle	<i>Canis latrans</i>	coyote	
NE middle	<i>Eremophila alpestris</i>	horned lark	
NE middle	<i>Phrynosoma douglassii</i>	short-horned lizard	
W/NW side	<i>Uta stansburiana</i>	side-blotched lizard	1
W/NW side	<i>Eremophila alpestris</i>	horned lark	
W/NW side	<i>unidentified rabbit</i>	could not ID to genus	
Waste Site	<i>Eremophila alpestris</i>	horned lark	

Evaluation Unit: T Plant Cribs and Ditches
 ID: CP-LS-6
 Group: Legacy Source
 Operable Unit Cross-Walk: 200-WA-1, 200-DV-1
 Related EU: CP-GW-2
 Sites & Facilities: Liquid waste sites on the northern end of 200-W area (associated with T Plant operations).
 Key Data Sources Docs: DOE-RL-96-32-01; Mission Support Alliance maps⁹
 Field Survey Date: 05/27/2015
 Datasheet prepared by: MAC, KDH, SAM 11/11/2015
 Datasheet reviewed by:

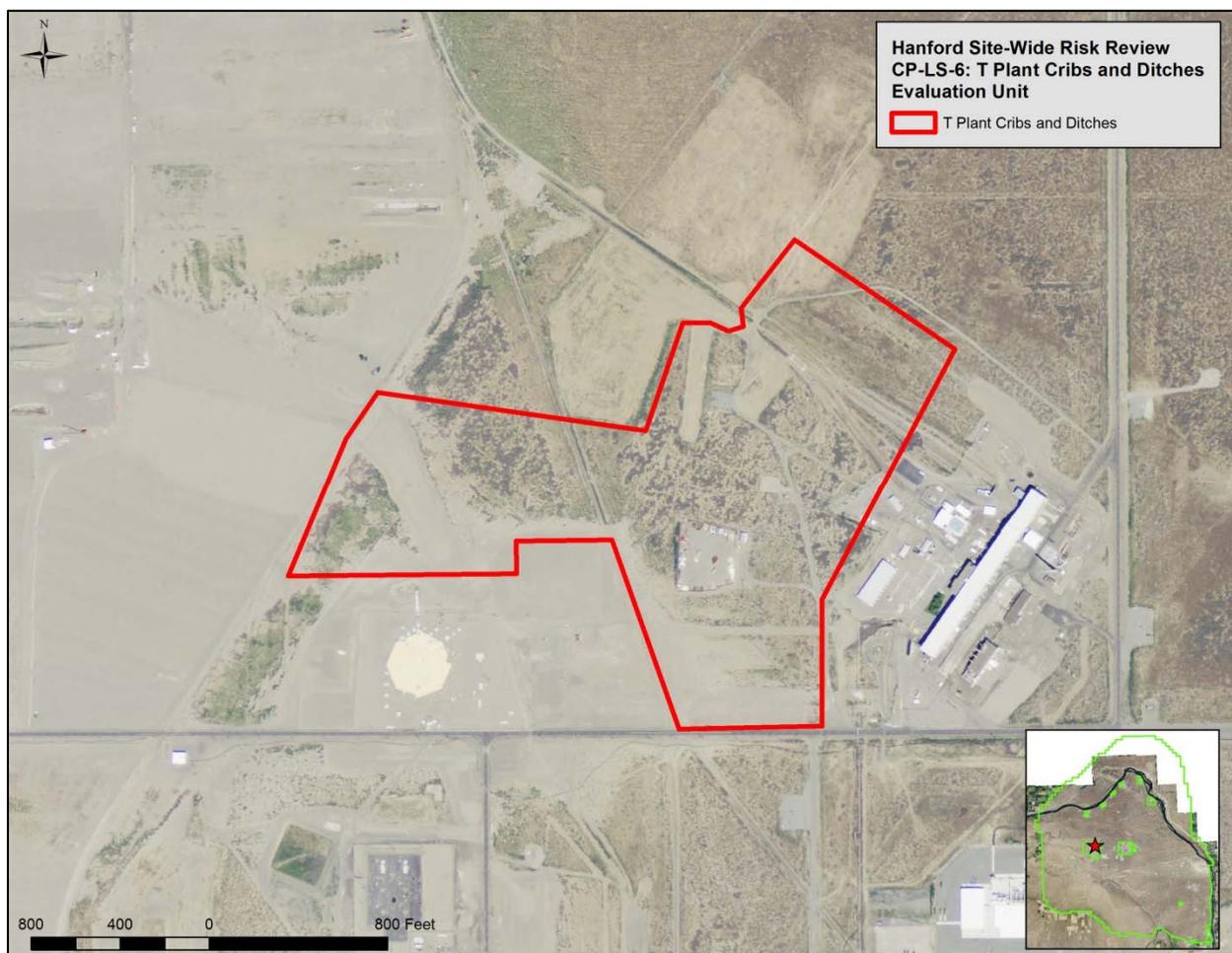


Figure J.19. CP-LS-6 (T Plant Cribs and Ditches) Site Location Map

CP-LS-6: T Plant Cribs and Ditches

⁹MSA (Mission Support Alliance) maintains biological resource information for the Hanford Site for the Department of Energy.

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the current Endangered and Threatened Species (Federal and State) distribution data; priority habitats as defined by Washington Department of Fish and Wildlife; available current aerial imagery, locations of Hanford Site waste units and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data records.

The following steps were taken to assess the EU associated with T Plant Cribs and Ditches:

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. A pedestrian survey was conducted within the EU boundary by experienced shrub-steppe ecologists.
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2013 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.
6. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

The T-Plant Cribs and Ditches EU encompasses a patchwork of different habitats including waste sites and roads kept free of vegetation and remnants patches of shrub-steppe. A crib in the northern part of the EU has been revegetated with crested wheatgrass (*Agropyron cristatum*). Level 2 habitat (Figure J.20) in the EU typically contains 25% successional shrub cover and up to 5% climax shrub cover in the overstory with a mixture of native and introduced grasses and forbs in the understory (Table J.17).

Table J.17. Percent Canopy Cover and Surface Cover Estimated at the T Plant Cribs and Ditches Evaluation Unit

Vegetation/Surface Cover	Survey Area 2b (%)	Survey Area 3a (%)	Survey Area 3b (%)
Bare Ground	-	79	-
Introduced forb	15	-	10
Introduced grass	30	-	25
Native forb	-	-	-
Native grass	15	1	10
Successional shrub	25	-	10
Climax shrub	5	20	15

Note: a dash (-) indicates no percent cover data were collected

Some of the level 3 habitat surrounding the laydown/storage yard in the center of the EU consists of big sagebrush (*Artemisia tridentata*) (Table J.17, 3a) with only very sparse Sandberg's bluegrass (*Poa secunda*) or no herbs in the understory. In these areas, the understory may have been denuded by rabbits; black-tailed jackrabbits (*Lepus californicus*), a state candidate species, were observed in the area. Another state candidate species, sage sparrows (*Amphispiza belli*) were observed perched and singing in the EU. Field data records at the end of this section provide lists of the animals and plants observed during the May 2015 survey.

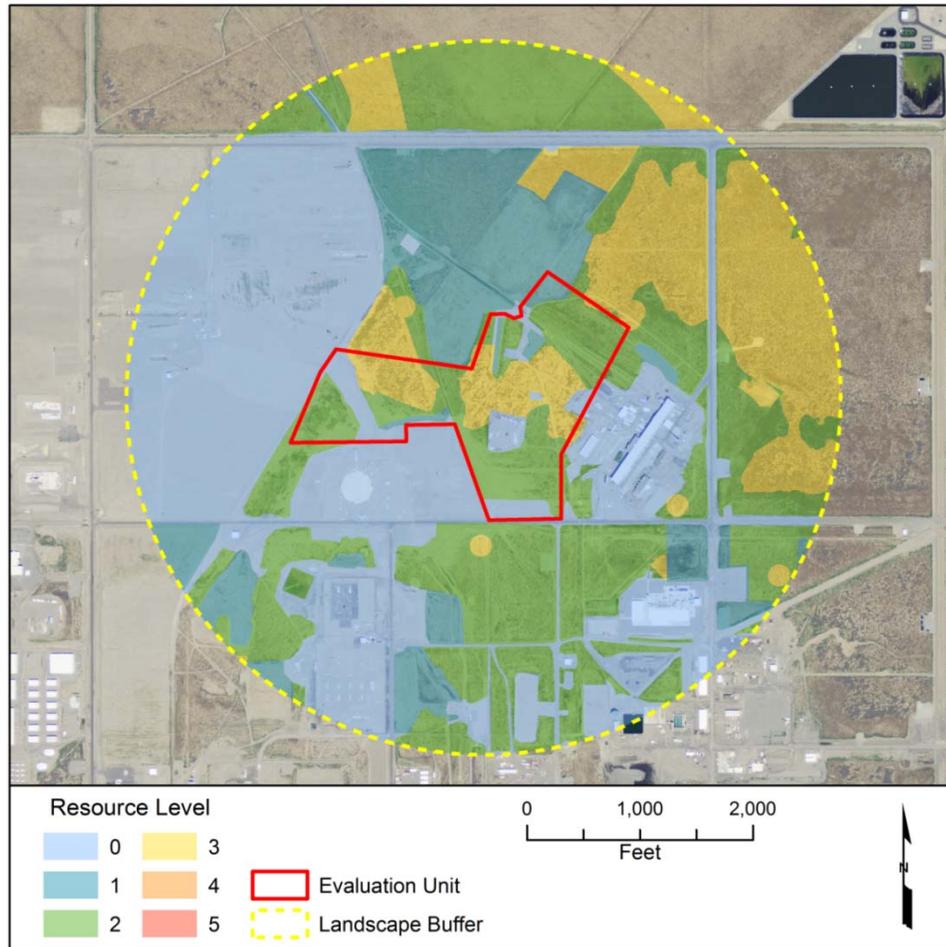


Figure J.20. Biological Resource Level Classifications Based on the May 27, 2015 Survey at the T Plant Cribs and Ditches Evaluation Unit (red solid line) and Adjacent Landscape Buffer Area (yellow dashed line).

Landscape Evaluation and Resource Classification:

A patchwork of vegetated and non-vegetated habitat occurs within the T Plant Cribs and Ditches EU. Approximately 72% of the EU is classified as resource level 2 or below, the remaining 28% is classified as level 3 habitat (Figure J.20, Table J.18). The level 3 and level 2 habitats extending from the center of the EU toward the northeast provide a corridor to the level 3 habitat within the buffer area and higher quality shrub-steppe habitats to the northwest.

The amount and proximity of biological resources surrounding the EU were examined within the adjacent landscape buffer area, which extends 3162 ft (964 m) from the geometric center of the EU (Figure J.20). Over 83% of the combined EU and buffer area is classified as resource level 2 or below (Table J.18). Nearly 17% is classified as a level 3 resource. High-quality habitat in the northwest portion of the buffer area includes several different shrub-steppe and steppe plant communities.

Table J.18. Area and Proportion of Each Biological Resource Level Within T-Plant Cribs and Ditches EU in Relation to Adjacent Landscape and Potential Maximum Change in Resources.

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
0	11.9	282.7	294.7	40.86%	48.51%	7.65%
1	3.4	89.9	93.4	12.95%	12.47%	-0.47%
2	33.1	180.5	213.7	29.63%	25.04%	-4.59%
3	18.6	100.8	119.4	16.56%	13.98%	-2.58%
4	0	0	0	0.00%	0.00%	0.00%
5	0	0	0	0.00%	0.00%	0.00%
Total	67.1	654.0	721.1	100.00%	100.00%	

1 Resource levels for both the evaluation unit and adjacent landscape boundary were reviewed in the field and via imagery during May-August 2015 and revised to reflect current habitats conditions.

2 Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.

Assumptions and Uncertainty:

Although all observations for species of concern and current conditions of biological resources were noted during surveys and evaluations conducted in 2015, the presence or absence of species cannot be assumed or predicted for future years. Field reconnaissance and surveys of evaluation units at the time of remediation will need to be conducted to verify resources and evaluate ecological conditions at that time.

Summary of Ecological Review:

- 72% of the EU is characterized as a level 2, level 1 or level 0 resource.
- Level 3 resources within the EU provide habitat for black-tailed jackrabbits and sage sparrows, both Washington state candidate species. Because this is a relatively small acreage compared to the available level 3 resources around the EU, it is unlikely that removal of this habitat would significantly impact these species; however, it would represent a reduction of available habitat for sagebrush obligate species.
- Over 83% of the combined EU and adjacent landscape buffer area is considered resource level 2 or below.
- Level 3 sources near the center of the buffer area are isolated from other high-quality habitat, but similar habitat inside the buffer on the east and northeast are a part of larger expanses of level 3 resources.

References:

- DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 0.
- U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act. <http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>
- U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington. http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902
- Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. <http://wdfw.wa.gov/conservation/phs/list/>
- Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington. <http://wdfw.wa.gov/conservation/endangered/>
- Washington Noxious Weed Control Board. 2014. Noxious Weed List. <http://www.nwcb.wa.gov/>
- Washington State Department of Natural Resources. 2014. Washington Natural Heritage Program Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

Definitions and Acronyms:

Adjacent Landscape Buffer – a circular area adjacent to and outside the EU boundary with the center of the circle at the centroid of the EU, and with a radius that is 1 times the maximum dimension (width or length—whichever is greatest). This circular buffer area is used to evaluate indirect effects and assess the remediation in relation to the landscape features and resources adjacent to the EU. This circular area is generally at least 3 times the area of the EU.

Biological Resource Levels (from DOE-RL-96-32-01) –

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats.
- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks.
- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub-steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.

- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.
- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.
- Level 0 resources consist of non-native plants and animals (unless otherwise listed at a higher level), non-vegetated areas, and industrial areas.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

MBTA – Migratory Bird Treaty Act; referring to species listed and protected under the federal Act.

PNNL ECAP (Ecological Compliance and Assessment Project) Database – PNNL performed ecological reviews for individual projects and annually surveyed selected areas and buildings on the Hanford Site for DOE-RL under the DOE's Public Safety and Resource Protection Program until 2011. The data collected during those surveys is archived in the ECAP database, and is used to supplement ecological evaluations as available.

Priority Habitats – Priority habitats are habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type (e.g., shrub-steppe) or dominant plant species (e.g., juniper savannah), a described successional stage (e.g., old-growth forest), or a specific habitat feature (e.g., cliffs).

Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

Field Data Records

Plant Species Identified During Visual Surveys May 27 2015, T Plant Cribs and Ditches EU			
Patch ID	Name	Common name	Abundance
2b	<i>Artemisia tridentata</i>	big sagebrush	5
2b	<i>Bromus tectorum</i>	cheatgrass	30
2b	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	
2b	<i>Ericameria nauseosa</i>	gray rabbitbrush	25
2b	<i>Machaeranthera canescens</i>	hoary aster	
2b	<i>Poa bulbosa</i>	bulbous bluegrass	
2b	<i>Poa secunda</i>	Sandberg's bluegrass	15
2b	<i>Salsola tragus</i>	Russian thistle	15
3	<i>Achillea millefolium</i>	yarrow	
3	<i>Artemisia tridentata</i>	big sagebrush	
3	<i>Bromus tectorum</i>	cheatgrass	
3	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	
3	<i>Ericameria nauseosa</i>	gray rabbitbrush	
3	<i>Machaeranthera canescens</i>	hoary aster	
3	<i>Poa secunda</i>	Sandberg's bluegrass	
3	<i>Pteroxia terebinthina</i> var. <i>terebinthina</i>	turpentine springparsley	
3	<i>Salsola tragus</i>	Russian thistle	
3	<i>Sisymbrium altissimum</i>	Jim Hill's tumbled mustard	
3a	<i>Ericameria nauseosa</i>	gray rabbitbrush	
3a	<i>Artemisia tridentata</i>	big sagebrush	20
3a	<i>Salsola tragus</i>	Russian thistle	
3a	<i>Astragalus carvicinus</i>	buckwheat milkvetch	
3a	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	
3a	<i>Achillea millefolium</i>	yarrow	
3b	<i>Achillea millefolium</i>	yarrow	
3b	<i>Agropyron cristatum</i>	crested wheatgrass	
3b	<i>Artemisia tridentata</i>	big sagebrush	15
3b	<i>Balsamorhiza careyana</i>	Carey's balsamroot	
3b	<i>Bromus tectorum</i>	cheatgrass	25
3b	<i>Chaenactis douglasii</i>	hoary falseyarrow	
3b	<i>Comandra umbellata</i>	bastard toadflax	
3b	<i>Ericameria nauseosa</i>	gray rabbitbrush	10
3b	<i>Grayia spinosa</i>	spiny hopsage	
3b	<i>Phlox longifolia</i>	longleaf phlox	
3b	<i>Poa secunda</i>	Sandberg's bluegrass	10
3b	<i>Pteroxia terebinthina</i> var. <i>terebinthina</i>	turpentine springparsley	
3b	<i>Salsola tragus</i>	Russian thistle	10

Bird, Mammal and Herpetofauna Species May 27 2015, T Plant Cribs and Ditches EU			
Patch ID	Name	Common name	Comment
2b	<i>Sturnella neglecta</i>	western meadowlark	flying
2b	<i>Eremophila alpestris</i>	horned lark	
2b		unidentified lizard	
2b	<i>Pituiphis melanoleucus</i>	Great Basin gopher snake	
3	<i>Amphispiza belli</i>	sage sparrow	singing
3	<i>Sturnella neglecta</i>	western meadowlark	singing
3	<i>Eremophila alpestris</i>	horned lark	
3	<i>Lepus californicus</i>	black-tailed jackrabbit	animal, scat
3	<i>Uta stansburiana</i>	side-blotched lizard	
3a	<i>Amphispiza belli</i>	sage sparrow	
3a	<i>Columba livia</i>	rock dove	on plant
3a	<i>Canis latrans</i>	coyote	tracks, dig
3a	<i>Uta stansburiana</i>	side-blotched lizard	
3b	<i>Tyrannus verticalis</i>	western kingbird	
3b	<i>Sturnella neglecta</i>	western meadowlark	
3b		unidentified small mammal	holes
3b	<i>Canis latrans</i>	coyote	scat, dig

Evaluation Unit: 200 Area Transfer Pipeline
 ID: CP-LS-7
 Group: Legacy Source
 Operable Unit Cross-Walk: 200-IS-1
 Related EU: CP-TF-1 through CP-TF-9
 Sites & Facilities: Pipelines outside of Tank Farms evaluation units. Includes 200 East-West transfer lines, IMUSTS, catch tanks, diversion boxes, etc.
 Key Data Sources Docs: DOE-RL-96-32-01; Mission Support Alliance maps¹⁰
 Field Survey Date: 06/15/2015
 Datasheet prepared by: MAC, SAM, KDH 10/29/2015
 Datasheet reviewed by:

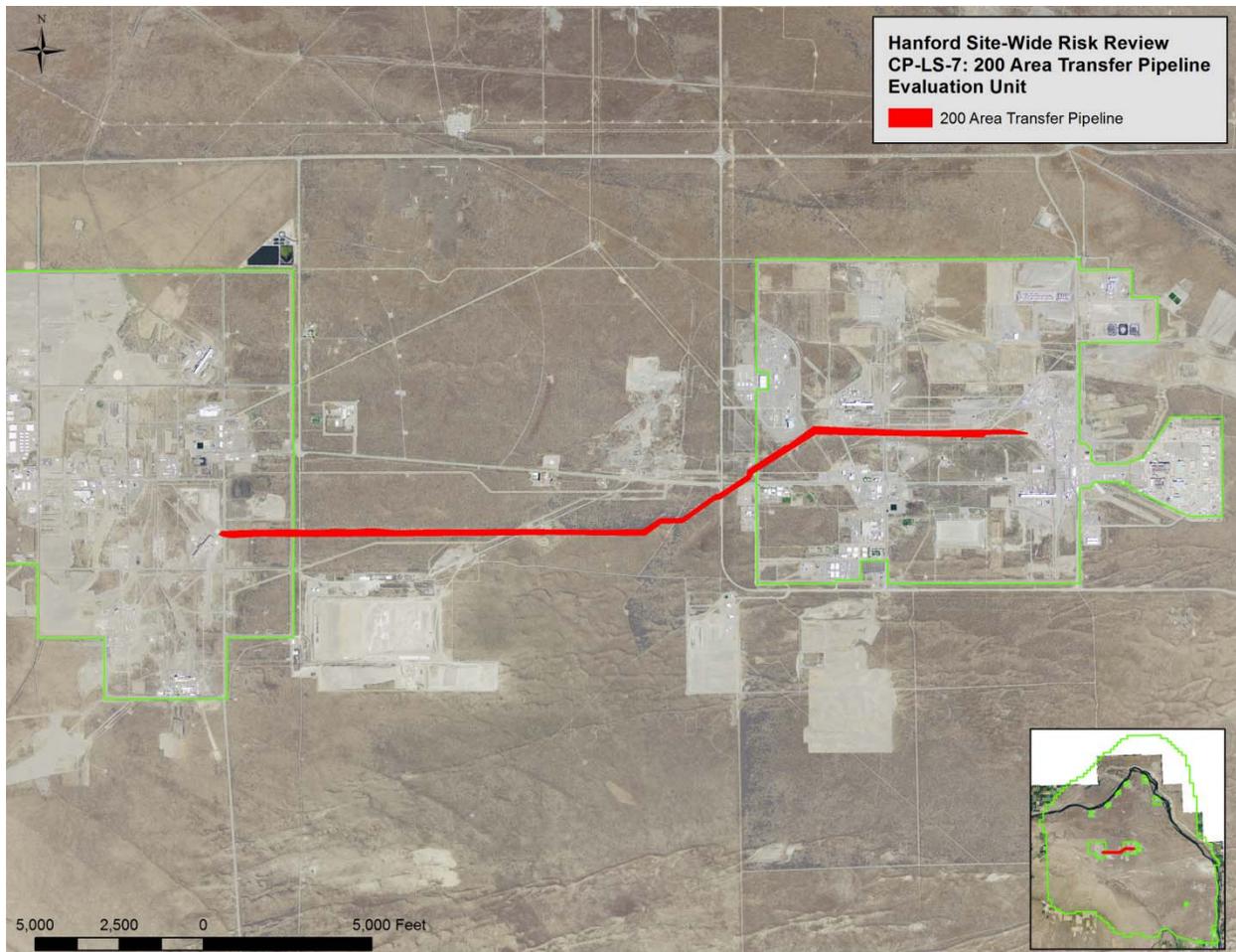


Figure J.21. CP-LS-7 (200 Area Transfer Pipeline) Site Location Map

¹⁰MSA (Mission Support Alliance) maintains biological resource information for the Hanford Site for the Department of Energy

CP-LS-7: 200 Area Transfer Pipeline

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the current Endangered and Threatened Species (Federal and State) distribution data; priority habitats as defined by Washington Department of Fish and Wildlife; available current aerial imagery, locations of Hanford Site waste units and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data records.

The following steps were taken to assess the EU associated with 200 Area Transfer Pipeline EU

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. A visual survey was conducted within the EU boundary by experienced shrub-steppe ecologists. PNNL biologists also reviewed the observations and biological survey data available in the Ecological Compliance and Assessment Project (ECAP) database from 2009 and 2010 for the EU to determine the status and resource level of the habitats within the EU and supplement the evaluation with previous wildlife or plant species observations.
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2013 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat

within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.

6. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

The EU is long and narrow, with a length of over 4.7 miles (7.6 km) and a width varying from 55 ft to 245 ft (16.5 to 74.5 m) wide. PNNL ecologists conducted a driving survey to confirm the resource levels within and adjacent to the 200 Area Transfer Pipeline EU. Percent canopy cover data in Table J.19 are based on previous ECAP data, photographs taken in June 2015 at various points along the pipeline, and a visual survey in October 2015.

Table J.19. Percent Canopy Cover and Surface Cover Estimated Within the 200 Area Transfer Pipeline Evaluation Unit

Vegetation/Surface Cover	Survey Areas 200-East Level 2 (%)	Survey Areas 200-East Level 3 (%)	Survey Areas Burned Level 4 (%)	Survey Areas Unburned Level 4 (%)	Survey Areas 200-West Level 2 (%)	Survey Areas 200-West Level 3 (%)
Bare Ground	-	-	10	30	-	-
Introduced Forb	25	-	25	20	15	15
Introduced Grass	20	35	45	10	25	25
Native Forb	-	-	-	-	-	-
Native Grass	20	-	1	-	15	10
Successional Shrubs	10	-	-	-	15	-
Climax Shrubs	-	20	-	30	<1	20

Note: a dash (-) indicates no percent cover data were collected

The driving survey was performed on June 15, 2015. The area immediately above and adjacent to the pipeline is kept free of vegetation through regular applications of herbicides, and the EU polygon is centered on this vegetation free area (Figure J.22). Along either side of the vegetation free zone is a band of Russian thistle (*Salsola tragus*), an introduced forb, where herbicides have been applied. Beyond the area impacted by herbicide, a narrow strip of habitat occurs within the EU that is contiguous with habitats located beyond the EU boundary. The following discussion addresses these narrow habitat bands within the 200-East and 200-West Areas and the segment between them (Figure J.22).

Inside the 200-East Area, the 200 Area Transfer Pipeline EU is bounded on the south by the 200E Miscellaneous Waste Sites and on the north by the CSB, B Plant Cribs and Trenches, and 200E Burial Ground EUs. Summaries for each of these EUs provide additional details and species lists for the vegetation, birds and other animals occurring near the 200 Area Transfer Pipeline EU. Throughout most of the portion of the EU that lies within 200-East, the EU is almost entirely

bare ground bordered by a band of habitat with varying amounts of Russian thistle. However, in several places the EU boundary extends beyond this band of weeds into surrounding habitat. On the north side of the EU, the native habitat consists of successional shrubs, primarily gray rabbitbrush (*Ericameria nauseosa*) with a mix of Sandberg's bluegrass (*Poa secunda*) and introduced cheatgrass (*Bromus tectorum*) in the understory and Russian thistle scattered throughout. On the south side of the EU within 200-East, a few patches of mature shrub-steppe dominated by big sagebrush (*Artemisia tridentata*) lie within the EU boundary and contain cheatgrass and a mixture of sand-loving native and introduced forbs in the understory.

Habitat between the 200-East and 200-West Areas is primarily undisturbed shrub-steppe that is bisected by an increasing number of pipelines and roads constructed to support Hanford Site cleanup activities. In 2000, a large wildfire burned up to the south side of the pipeline removing much of the shrub cover between ERDF and 200-East. The burned area habitat within the EU is dominated now by cheatgrass and Russian thistle with scattered native grasses and forbs (Table J.19). In areas not burned, the climax community is dominated by big sagebrush (30% cover) with a mixed understory of cheatgrass (10%), Russian thistle (20%) and native grasses and forbs (Table J.19). Sand has blown in around the sagebrush bordering the cleared areas, resulting in a high percentage of bare ground with very little understory vegetation. Evidence of recent use by black-tailed jackrabbits (*Lepus californicus*) was observed in several locations along this segment of the EU. Black-tailed jackrabbits are a Washington state candidate species. Lists of observed plant and animal species are provided in the Field Data Records at the end of this section.

The portion of the EU within the 200-West boundary abuts the 200W Miscellaneous Waste Sites and U Plant Cribs and Trenches EUs. Summaries for those EUs provide additional details and species lists for the vegetation, birds and other animals. Near the 200-West fence, the 200 Area Transfer Pipeline EU runs through mature shrub-steppe where sagebrush cover is approximately 20% with an understory of native and introduced grasses (Table J.19). The EU also includes a patch of successional vegetation consisting of gray rabbitbrush (around 15%) with an understory of Sandberg's bluegrass (15%) and cheatgrass (25%) and Russian thistle before terminating in graveled and disturbed area at the west end of the EU (Table J.19).

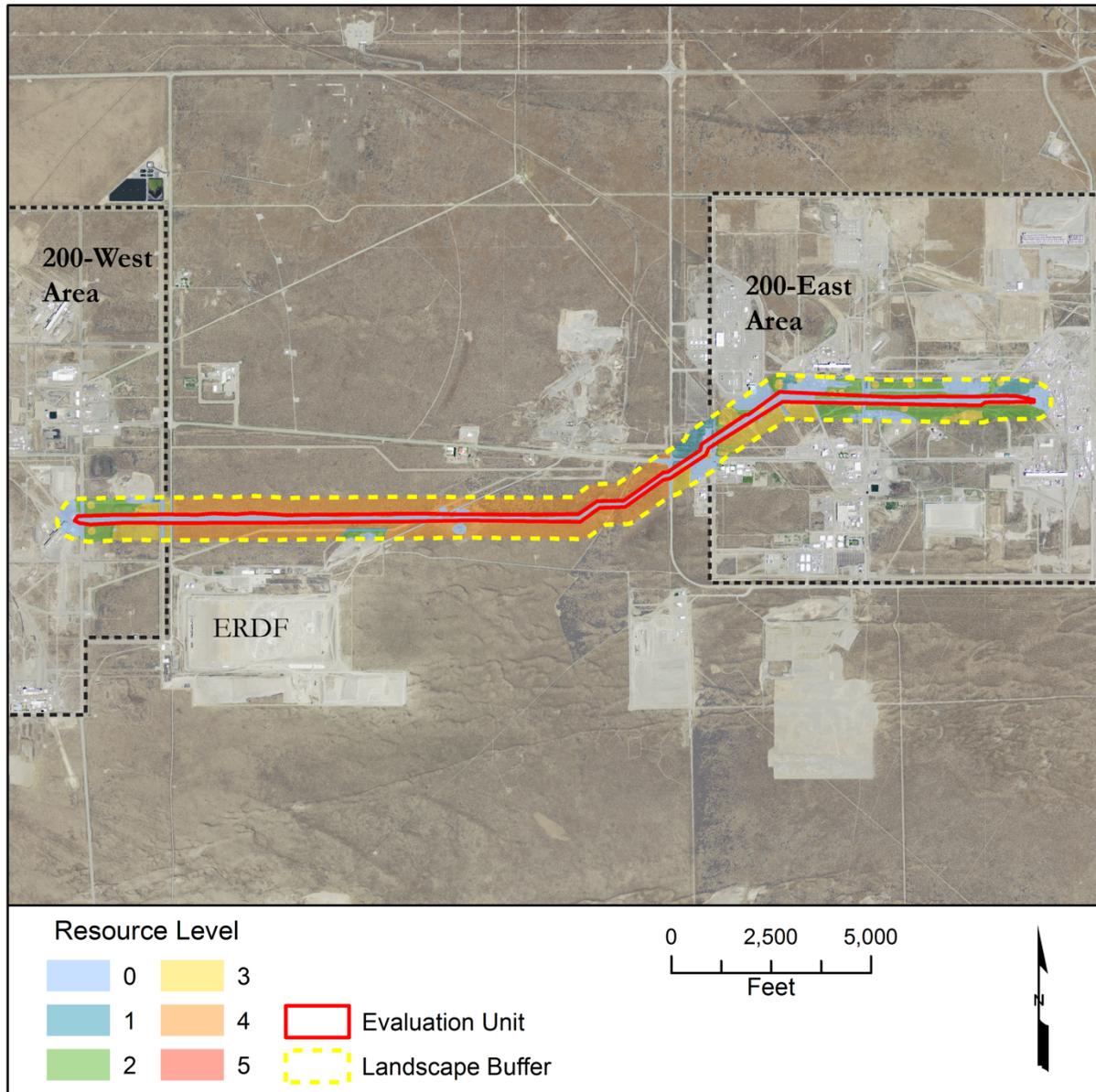


Figure J.22. Biological Resource Level Classifications Based on the June 15, 2015 Survey at the 200 Area Transfer Pipeline EU Evaluation Unit (red solid line) and Adjacent Landscape Buffer Area (yellow dashed line).

Landscape Evaluation and Resource Classification:

The 200 Area Transfer Pipeline EU comprises almost 79 acres of biological resources classified as level 2 or lower (Table J.20). Less than 5 % of the EU is classified as level 3 resources, while 22.5% (24.5 acres) is classified as level 4. The latter area is in the segment of pipeline between 200-East and 200-West areas, where there is a large expanse of relatively continuous higher level biological resources.

Table J.20. Area and Proportion of Each Biological Resource Level Within the 200 Area Transfer Pipeline EU Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources.

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
0	71.8	90.9	162.7	26.34%	32.31%	5.97%
1	1.3	27.8	29.1	4.71%	4.50%	-0.21%
2	5.7	85.2	90.9	14.73%	13.80%	-0.93%
3	5.3	64.3	69.6	11.28%	10.41%	-0.86%
4	24.5	240.7	265.2	42.95%	38.98%	-3.97%
5	0	0	0	0.00%	0.00%	0.00%
Total	108.7	508.9	617.5	100.00%	100.00%	

¹ Resource levels for both the evaluation unit and adjacent landscape boundary were reviewed in the field and via imagery during May-August 2015 and revised to reflect current habitats conditions.

² Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.

The amount and proximity of biological resources surrounding the 200 Area Transfer Pipeline EU were examined within the adjacent landscape buffer area. A circular buffer area around such a long and narrow EU was not reasonable; therefore a strip 2 times the average width of the EU (430 ft [131 m]) was added to all sides of the EU boundary (Figure J.22). Nearly 283 acres (~46%) of the combined EU and buffer area is classified as a level 2 or lower resource. Of the remaining 335 acres of combined EU and buffer area, 79% is classified as level 4 and 21% as level 3 habitat.

Assumptions and Uncertainty:

Although all observations for species of concern and current conditions of biological resources were noted during surveys and evaluations conducted in 2015, the presence or absence of species cannot be assumed or predicted for future years. Field reconnaissance and surveys of evaluation units at the time of remediation will need to be conducted to verify resources and evaluation ecological conditions at that time.

Summary of Ecological Review:

- Approximately 72.5% (78.8 acres) of the EU consists of level 2 or lower biological resources, while 27.4% (29.8 acres) consists of level 3 or higher resources.
- Remediation actions could result in a 4.8% change (loss) of level 3 or higher resources at the landscape level.

- Loss of the level 3 and level 4 resources within the EU during cleanup activities represents a relatively small (~10%) loss of habitat at the landscape level considered, and part of this acreage is recovering from fires; however, it does decrease the mature shrub-steppe habitat resources in the area.
- Evidence of black-tailed jackrabbits was observed in several places along the segment of the EU lying between 200-East and ERDF. This species is a Washington state candidate species.

References:

- DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 0.
- U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act. <http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>
- U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington. http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902
- Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. <http://wdfw.wa.gov/conservation/phs/list/>
- Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington. <http://wdfw.wa.gov/conservation/endangered/>
- Washington Noxious Weed Control Board. 2014. Noxious Weed List. <http://www.nwcb.wa.gov/>
- Washington State Department of Natural Resources. 2014. Washington Natural Heritage Program Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

Definitions and Acronyms:

Adjacent Landscape Buffer – a circular area adjacent to and outside the EU boundary with the center of the circle at the centroid of the EU, and with a radius that is 1 times the maximum dimension (width or length—whichever is greatest). This circular buffer area is used to evaluate indirect effects and assess the remediation in relation to the landscape features and resources adjacent to the EU. This circular area is generally at least 3 times the area of the EU.

Biological Resource Levels (from DOE-RL-96-32-01) –

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats.
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- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub-steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.
- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.
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MBTA – Migratory Bird Treaty Act; referring to species listed and protected under the federal Act.

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Priority Habitats – Priority habitats are habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type (e.g., shrub-steppe) or dominant plant species (e.g., juniper savannah), a described successional stage (e.g., old-growth forest), or a specific habitat feature (e.g., cliffs).

Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

Field Data Records

Plant Species Identified During Visual Surveys June 15 2015, 200 Area Transfer Pipeline EU			
Patch ID	Name	Common name	Abundance
3-1 unburned	<i>Artemisia tridentata</i>	big sagebrush	30
3-1 unburned	<i>bare</i>	no vegetation	30
3-1 unburned	<i>Bromus tectorum</i>	cheatgrass	10
3-1 unburned	<i>Salsola tragus</i>	Russian thistle	20
3-1 burned	<i>Artemisia tridentata</i>	big sagebrush	
3-1 burned	<i>bare</i>	no vegetation	10
3-1 burned	<i>Bromus tectorum</i>	cheatgrass	45
3-1 burned	<i>Salsola tragus</i>	Russian thistle	25
3-1 burned	<i>Poa secunda</i>	Sandberg's bluegrass	1

Bird, Mammal and Herpetofauna Species June 15 2015, 200 Area Transfer Pipeline EU			
Patch ID	Name	Common name	Comment
0-1	<i>Chondestes grammacus</i>	lark sparrow	on pole at east end of EU

ECAP Database Query Vegetation Results for Areas within the 200 Area Transfer Pipeline EU					
Observer	Date	Patch ID	Name	Common name	Abundance
KDH	6/9/09	2009-200-022	<i>Comandra umbellata</i>	bastard toadflax	
KDH	6/9/09	2009-200-022	<i>Artemisia tridentata</i>	big sagebrush	20
KDH	6/9/09	2009-200-022	<i>Sitanion hystrix</i>	bottlebrush grass	
KDH	6/9/09	2009-200-022	<i>Astragalus caricinus</i>	buckwheat milkvetch	
KDH	6/9/09	2009-200-022	<i>Bromus tectorum</i>	cheatgrass	30
KDH	6/9/09	2009-200-022	<i>Agropyron cristatum</i>	crested wheatgrass	
KDH	6/9/09	2009-200-022	<i>Orobancha corymbosa</i>	flattop broomrape	
KDH	6/9/09	2009-200-022	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	
KDH	6/9/09	2009-200-022	<i>Machaeranthera canescens</i>	hoary aster	
KDH	6/9/09	2009-200-022	<i>Oryzopsis hymenoides</i>	indian ricegrass	
KDH	6/9/09	2009-200-022	<i>Oryzopsis hymenoides</i>	indian ricegrass	
KDH	6/9/09	2009-200-022	<i>Holosteum umbellatum</i>	jagged chickweed	
KDH	6/9/09	2009-200-022	<i>Sisymbrium altissimum</i>	Jim Hill's tumbled mustard	
KDH	6/9/09	2009-200-022	<i>Phlox longifolia</i>	longleaf phlox	
KDH	6/9/09	2009-200-022	<i>Cryptantha circumscissa</i>	matted cryptantha	
KDH	6/9/09	2009-200-022	<i>Stipa comata</i>	needle-and-thread grass	
KDH	6/9/09	2009-200-022	<i>Microsteris gracilis</i>	pink microsteris	
KDH	6/9/09	2009-200-022	<i>Koeleria cristata</i>	prairie Junegrass	
KDH	6/9/09	2009-200-022	<i>Salsola kali</i>	Russian thistle	
KDH	6/9/09	2009-200-022	<i>Poa sandbergii</i>	Sandberg's bluegrass	15
KDH	6/9/09	2009-200-022	<i>Crepis atrarbarba</i>	slender hawksbeard	
KDH	6/9/09	2009-200-022	<i>Cymopterus terebinthinus</i>	turpentine springparsley	
KDH	6/9/09	2009-200-022	<i>Achillea millefolium</i>	yarrow	
KDH	10/14/10	2010-200-060	<i>Salsola kali</i>	Russian thistle	1
KDH	10/14/10	2010-200-060	<i>Calochortus macrocarpus</i>	sagebrush mariposa lily	
KDH	10/14/10	2010-200-060	<i>Poa sandbergii</i>	Sandberg's bluegrass	15
KDH	10/14/10	2010-200-060	<i>Cymopterus terebinthinus</i>	turpentine springparsley	
KDH	10/14/10	2010-200-060	<i>Descurainia pinnata</i>	western tansymustard	
KDH	10/14/10	2010-200-060	<i>Agropyron cristatum</i>	crested wheatgrass	
KDH	10/14/10	2010-200-060	<i>Chrysothamnus nauseosus</i>	gray rabbitbrush	
KDH	10/14/10	2010-200-060	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	
KDH	10/14/10	2010-200-060	<i>Machaeranthera canescens</i>	hoary aster	
KDH	10/14/10	2010-200-060	<i>Cryptantha circumscissa</i>	matted cryptantha	
KDH	10/14/10	2010-200-060	<i>Artemisia tridentata</i>	big sagebrush	20
KDH	10/14/10	2010-200-060	<i>Ambrosia acanthicarpa</i>	bur ragweed	
KDH	10/14/10	2010-200-060	<i>Balsamorhiza careyana</i>	Carey's balsamroot	
KDH	10/14/10	2010-200-060	<i>Bromus tectorum</i>	cheatgrass	25

ECAP Database Query Bird and Other Animal Results for Areas within the 200 Area Transfer Pipeline EU					
Observer	Date	Patch ID	Name	Common name	Abundance
KDH	6/9/09	2009-200-022	<i>Lepus californicus</i>	black-tailed jackrabbit	Present
KDH	6/9/09	2009-200-022	<i>Canis latrans</i>	coyote	Present
KDH	6/9/09	2009-200-022	<i>Eremophila alpestris</i>	horned lark	1
KDH	6/9/09	2009-200-022		Unidentified lizard	Present
KDH	6/9/09	2009-200-022	<i>Sturnella neglecta</i>	western meadowlark	1
KDH	10/14/10	2010-200-060	<i>Lepus californicus</i>	black-tailed jackrabbit	Present
KDH	10/14/10	2010-200-060	<i>Canis latrans</i>	coyote	Present
KDH	10/14/10	2010-200-060	<i>No birds</i>	No birds observed	

Evaluation Unit: B Plant Cribs and Trenches
 ID: CP-LS-8
 Group: Legacy Source
 Operable Unit Cross-Walk: 200-EA-1, 200-DV-1, 200-OA-1
 Related EU: CP-DD-2, CP-GW-1
 Sites & Facilities: Liquid waste sites on the west side of 200-East (associated with B Plant operations).
 Key Data Sources Docs: DOE/RL-96-32 2013; Mission Support Alliance maps¹¹
 Field Survey Date: 06/15/2015
 Datasheet prepared by: MAC, KDH, SAM 10/12/2015
 Datasheet reviewed by:



Figure J.23. CP-LS-8 (B Plant Cribs and Trenches) Site Location Map

CP-LS-8: B Plant Cribs and Trenches

¹¹ MSA (Mission Support Alliance) maintains biological resource information for the Hanford Site for the Department of Energy.

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the current Endangered and Threatened Species (Federal and State) distribution data; priority habitats as defined by Washington Department of Fish and Wildlife; available current aerial imagery, locations of Hanford Site waste units and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data records.

The following steps were taken to assess the EU associated with B Plant Cribs and Trenches:

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. A pedestrian survey was conducted within the EU boundary by experienced shrub-steppe ecologists.
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2013 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.
6. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

Within the B Plant Cribs and Trenches EU boundary, nearly half the landscape is bare or graveled ground on or adjacent to waste sites, pipelines, and roads and is generally kept free of vegetation by spraying. Some areas occasionally hit by herbicides contain Russian thistle (*Salsola tragus*) as the dominant species. Fragments of successional and climax shrub-steppe habitat occur around the edges of the EU. Successional patches range from stands of the native grass Sandberg's bluegrass (*Poa secunda*) in the southwest and east parts of the EU to patches of gray rabbitbrush (*Ericameria nauseosa*) with an understory mixture of native and introduced grasses (Table J.21). Climax vegetation patches, classified as level 3 resources, are dominated by 10 to 25% big sagebrush (*Artemisia tridentata*) with an understory composed of introduced and native grasses and forbs (Table J.21). Small circular patches of level 3 resources (**Figure J.24**) indicate locations where the state sensitive species, Piper's daisy (*Erigeron piperianus*), has been observed in the past, although none was noted this year.

Four loggerhead shrikes (*Lanius ludovicianus*), 1 adult and 3 food-begging juveniles, were observed in mature sagebrush in the northwest portion of the EU. Loggerhead shrikes are a Washington state candidate species. Field data records at the end of this section provide lists of plants and animals observed during the June 2015 survey.

Table J.21. Percent Canopy Cover and Surface Cover Estimated at the B Plant Cribs and Trenches Evaluation Unit

Vegetation/Surface Cover	Survey Area 2-1 (%)	Survey Area 2-2 (%)	Survey Area 2-3 (%)	Survey Area 2-4 (%)	Survey Area 3-1 (%)	Survey Area 3-2 (%)	Survey Area 3-3 (%)
Bare Ground	-	-	-	-	-	-	-
Introduced forb	15	-	-	25	-	10	10
Introduced grass	20	25	20	20	25	30	30
Native forb	-	-	-	-	-	-	-
Native grass	40	5	15	20	10	10	20
Successional shrub	1	10	20	10	5	1	-
Climax shrub	2	<1	-	-	10	20	25

Note: a dash (-) indicates no percent cover data was collected

Landscape Evaluation and Resource Classification:

The B Plant Cribs and Trenches EU encompasses a large contiguous area of bare ground containing buildings, waste sites and roads centered around the B Plant EU (**Figure J.24**). Approximately 41% of the EU is classified as level 1 or 2 resources that are cut by roads and pipelines kept clear of vegetation. Altogether, more than 82% of the EU is classified as resource level 2 or below (Table J.22). Habitat classified as level 3 occurs primarily in the west and north sections and comprises over 17% of the EU resources.

The amount and proximity of biological resources surrounding the B Plant Cribs and Trenches EU were examined within the adjacent landscape buffer area, which extends 4152 feet (1266 m) from the geometric center of the EU. Within the combined EU and adjacent buffer area, over 79% of the is classified as level 2 or lower, while over 20% is classified as level 3 and level

4 (Table J.22). Level 3 resources are primarily found in the southwest section of the combined area, where it is broken by facilities, roads and waste sites into several large patches (Figure J.24).

Assumptions and Uncertainty:

Although all observations for species of concern and current conditions of biological resources were noted during surveys and evaluations conducted in 2015, the presence or absence of species cannot be assumed or predicted for future years. Field reconnaissance and surveys of evaluation units at the time of remediation will need to be conducted to verify resources and evaluate ecological conditions at that time.

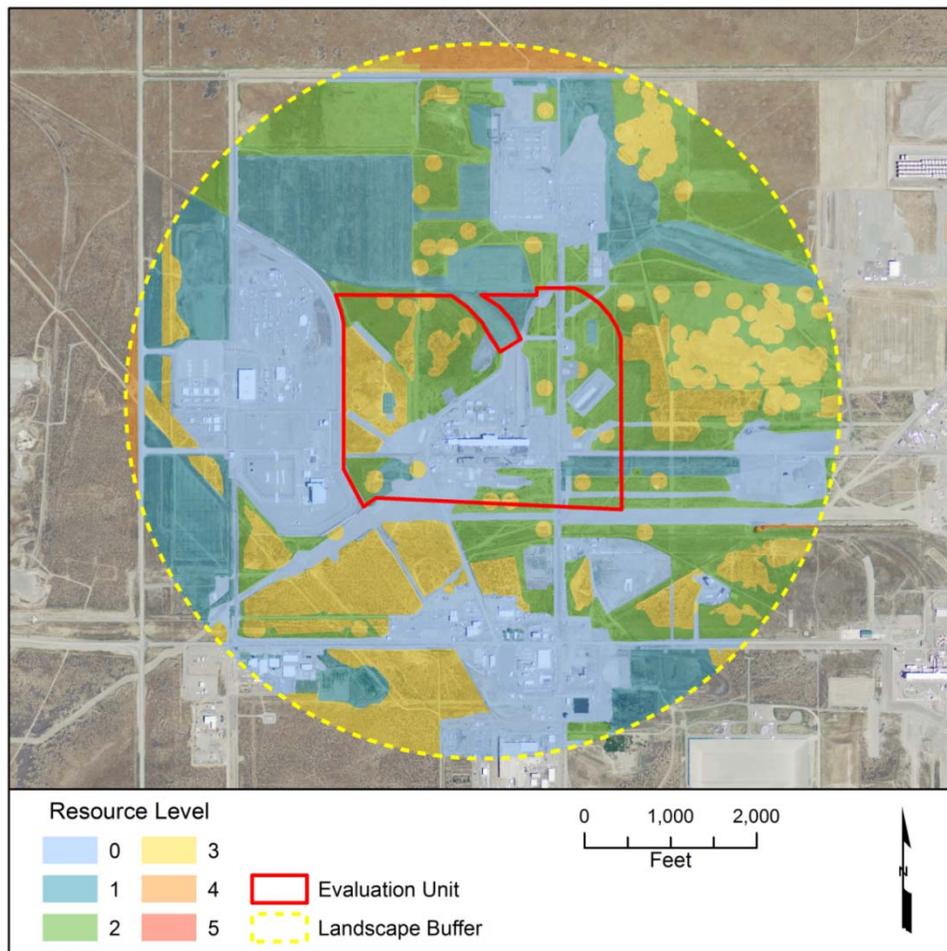


Figure J.24. Biological Resource Level Classifications Based on the June 15, 2015 Survey at the B Plant Cribs and Trenches Evaluation Unit (red solid line) and Adjacent Landscape Buffer Area (yellow dashed line).

Table J.22. Area and Proportion of Each Biological Resource Level Within the B Plant Cribs and Trenches Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources.

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
0	71.3	365.2	436.5	35.11%	43.31%	8.20%
1	10.4	223.9	234.3	18.85%	18.01%	-0.84%
2	61.4	256.4	317.8	25.56%	20.62%	-4.94%
3	30.2	204.5	234.6	18.87%	16.45%	-2.42%
4	0	20.1	20.1	1.62%	1.62%	0.00%
5	0	0	0	0.00%	0.00%	0.00%
Total	173.3	1070.1	1243.3	100.00%	100.00%	

¹ Resource levels for both the evaluation unit and adjacent landscape boundary were reviewed in the field and via imagery during May-August 2015 and revised to reflect current habitats conditions.

² Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.

Summary of Ecological Review:

- The B Plant Cribs and Trenches EU encompasses and borders large industrial areas that have no vegetation (e.g., B Plant, E-W transfer line and CSB EUs) and is crossed by several pipelines. Cleanup activities resulting in loss of all vegetation within the EU is not expected to impact habitat connectivity with areas outside the 200-East Area.
- Removal of mature sagebrush in the west and north parts of the EU will reduce overall habitat available to loggerhead shrikes, a Washington state candidate for listing as a threatened or endangered species.
- In the past, Piper's daisy, a state sensitive species, has been observed at numerous locations within the EU, and although none were observed in 2015, it is considered likely to occur in the area. Loss of individual Piper's daisies is not expected to affect population viability.
- Large areas of level 3 resources in the southwest part of the adjacent buffer area are near contact with similar or higher quality biological resources beyond the 200-East Area.

References:

DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 0.

U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act. <http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>

U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington. http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902

Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. <http://wdfw.wa.gov/conservation/phs/list/>

Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington. <http://wdfw.wa.gov/conservation/endangered/>

Washington Noxious Weed Control Board. 2014. Noxious Weed List. <http://www.nwcb.wa.gov/>

Washington State Department of Natural Resources. 2014. Washington Natural Heritage Program Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

Definitions and Acronyms:

Adjacent Landscape Buffer – a circular area adjacent to and outside the EU boundary with the center of the circle at the centroid of the EU, and with a radius that is 1 times the maximum dimension (width or length—whichever is greatest). This circular buffer area is used to evaluate indirect effects and assess the remediation in relation to the landscape features and resources adjacent to the EU. This circular area is generally at least 3 times the area of the EU.

Biological Resource Levels (from DOE-RL-96-32-01) –

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats.
- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks.
- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub-steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.
- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.
- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.

- Level 0 resources consist of non-native plants and animals (unless otherwise listed at a higher level), non-vegetated areas, and industrial areas.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

MBTA – Migratory Bird Treaty Act; referring to species listed and protected under the federal Act.

PNNL ECAP (Ecological Compliance and Assessment Project) Database – PNNL performed ecological reviews for individual projects and annually surveyed selected areas and buildings on the Hanford Site for DOE-RL under the DOE's Public Safety and Resource Protection Program until 2011. The data collected during those surveys is archived in the ECAP database, and is used to supplement ecological evaluations as available.

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Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

Field Data Records:

Plant Species Identified During Visual Surveys June 15 2015, B Plant Cribs and Trenches EU			
Patch ID	Name	Common name	Abundance
0	<i>no vegetation</i>	no vegetation	
2-1	<i>Artemisia tridentata</i>	big sagebrush	2
2-1	<i>Bromus tectorum</i>	cheatgrass	20
2-1	<i>Ericameria nauseosa</i>	gray rabbitbrush	1
2-1	<i>Poa secunda</i>	Sandberg's bluegrass	40
2-1	<i>Salsola tragus</i>	Russian thistle	15
2-2	<i>Amsinckia species</i>		
2-2	<i>Artemisia tridentata</i>	big sagebrush	
2-2	<i>Bromus tectorum</i>	cheatgrass	25
2-2	<i>Ericameria nauseosa</i>	gray rabbitbrush	10
2-2	<i>Poa secunda</i>	Sandberg's bluegrass	5
2-2	<i>Salsola tragus</i>	Russian thistle	
2-2	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	
2-3	<i>Bromus tectorum</i>	cheatgrass	20
2-3	<i>Ericameria nauseosa</i>	gray rabbitbrush	20
2-3	<i>Machaeranthera canescens</i>	hoary aster	
2-3	<i>Poa secunda</i>	Sandberg's bluegrass	15
2-3	<i>Salsola tragus</i>	Russian thistle	
2-3	<i>Salsola tragus</i>	Russian thistle	
2-4	<i>Achillea millefolium</i>	yarrow	
2-4	<i>Bromus tectorum</i>	cheatgrass	20
2-4	<i>Ericameria nauseosa</i>	gray rabbitbrush	10
2-4	<i>Machaeranthera canescens</i>	hoary aster	
2-4	<i>Poa secunda</i>	Sandberg's bluegrass	20
2-4	<i>Salsola tragus</i>	Russian thistle	25
2-4	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	
2-4	<i>Sporobolus cryptandrus</i>	sand dropseed	
3-1	<i>Achnatherum hymenoides</i>	indian ricegrass	
3-1	<i>Ambrosia acanthicarpa</i>	bur ragweed	
3-1	<i>Amsinckia species</i>		
3-1	<i>Artemisia tridentata</i>	big sagebrush	10
3-1	<i>Balsamorhiza careyana</i>	Carey's balsamroot	
3-1	<i>Bromus tectorum</i>	cheatgrass	25
3-1	<i>Chaenactis douglasii</i>	hoary falseyarrow	
3-1	<i>Ericameria nauseosa</i>	gray rabbitbrush	5
3-1	<i>Festuca microstachys</i>	small sixweeks	
3-1	<i>Hesperostipa comata</i>	needle-and-thread grass	
3-1	<i>Machaeranthera canescens</i>	hoary aster	
3-1	<i>Orobanche species</i>		
3-1	<i>Poa bulbosa</i>	bulbous bluegrass	
3-1	<i>Poa secunda</i>	Sandberg's bluegrass	10
3-1	<i>Pteryxia terebinthina var. terebinthina</i>	turpentine springparsley	
3-1	<i>Salsola tragus</i>	Russian thistle	
3-1	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	

Plant Species Continued			
June 15 2015, B Plant Cribbs and Trenches EU			
Patch ID	Name	Common name	Abundance
3-1	<i>Vulpia octoflora</i>	sixweeks fescue	
3-2	<i>Artemisia tridentata</i>	big sagebrush	20
3-2	<i>Astragalus caricinus</i>	buckwheat milkvetch	
3-2	<i>Balsamorhiza careyana</i>	Carey's balsamroot	
3-2	<i>Bromus tectorum</i>	cheatgrass	30
3-2	<i>Chaenactis douglasii</i>	hoary falseyarrow	
3-2	<i>Ericameria nauseosa</i>	gray rabbitbrush	1
3-2	<i>Erigeron filifolius</i>	threadleaf fleabane	
3-2	<i>Machaeranthera canescens</i>	hoary aster	
3-2	<i>Poa secunda</i>	Sandberg's bluegrass	10
3-2	<i>Salsola tragus</i>	Russian thistle	10
3-2	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledmustard	
3-2	<i>Tragopogon dubius</i>	Yellow salsify	
3-3	<i>Artemisia tridentata</i>	big sagebrush	25
3-3	<i>Astragalus caricinus</i>	buckwheat milkvetch	
3-3	<i>Balsamorhiza careyana</i>	Carey's balsamroot	
3-3	<i>Bromus tectorum</i>	cheatgrass	30
3-3	<i>Chaenactis douglasii</i>	hoary falseyarrow	
3-3	<i>Erigeron pumilis</i>	shaggy fleabane	
3-3	<i>Grayia spinosa</i>	spiny hopsage	
3-3	<i>Grayia spinosa</i>	spiny hopsage	
3-3	<i>Machaeranthera canescens</i>	hoary aster	
3-3	<i>Poa secunda</i>	Sandberg's bluegrass	20
3-3	<i>Pteryxia terebinthina</i> var. <i>terebinthina</i>	turpentine springparsley	
3-3	<i>Salsola tragus</i>	Russian thistle	10
3-3	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledmustard	
3-3	<i>Tragopogon dubius</i>	Yellow salsify	

Bird, Mammal and Herpetofauna Species June 15 2015, B Plant Cribs and Trenches EU			
Patch ID	Name	Common name	Comment
2-1	<i>Hirundo pyrrhonota</i>	cliff swallow	foraging
2-2	<i>Lanius ludovicianus</i>	loggerhead shrike	flew between Artr patches
2-2	<i>Sturnella neglecta</i>	western meadowlark	1 singing
2-4	<i>Sturnella neglecta</i>	western meadowlark	1 perched on shrub
2-4	<i>Eremophila alpestris</i>	horned lark	perched on post singing
3-1	<i>Hirundo pyrrhonota</i>	cliff swallow	3 foraging
3-1	<i>Chordeiles minor</i>	common nighthawk	overhead
3-1		unidentified lizard	tracks
3-1		unidentified small mammal	tracks
3-1	<i>Sturnella neglecta</i>	western meadowlark	2
3-1	<i>Canis latrans</i>	coyote	tracks
3-1	<i>Sylvilagus nutalli</i>	mountain cottontail	scat
3-2	<i>Hirundo pyrrhonota</i>	cliff swallow	foraging
3-2	<i>Sturnella neglecta</i>	western meadowlark	1
3-2	<i>Lanius ludovicianus</i>	loggerhead shrike	1 adult, 3 juv., foraging/begging
3-2		unidentified lizard	tracks
3-2		unidentified small mammal	holes
3-2	<i>Eremophila alpestris</i>	horned lark	sing in vicinity
3-2	<i>Sylvilagus nutalli</i>	mountain cottontail	scat

Evaluation Unit: PUREX Cribs and Trenches (inside 200-E)
ID: CP-LS-9
Group: Legacy Source
Operable Unit Cross-Walk: 200-EA-1, 200-PW-3
Related EU: CP-DD-1, CP-GW-1
Sites & Facilities: Liquid waste sites on the east side of 200-East (associated with PUREX Operations and immediately surrounding PUREX).
Key Data Sources Docs: DOE-RL-96-32-01; PNNL ECAP Database¹² ; Mission Support Alliance maps¹³
Field Survey Date: 06/16/2015
Datasheet prepared by: MAC, KDH, SAM 10/27/2015
Datasheet reviewed by:

¹² The Ecological Compliance and Assessment Project (ECAP) database was developed and maintained by Pacific Northwest National Laboratory (PNNL) to manage and archive ecological assessment data collected on Hanford until 2011.

¹³ MSA (Mission Support Alliance) maintains biological resource information for the Hanford Site for the Department of Energy.

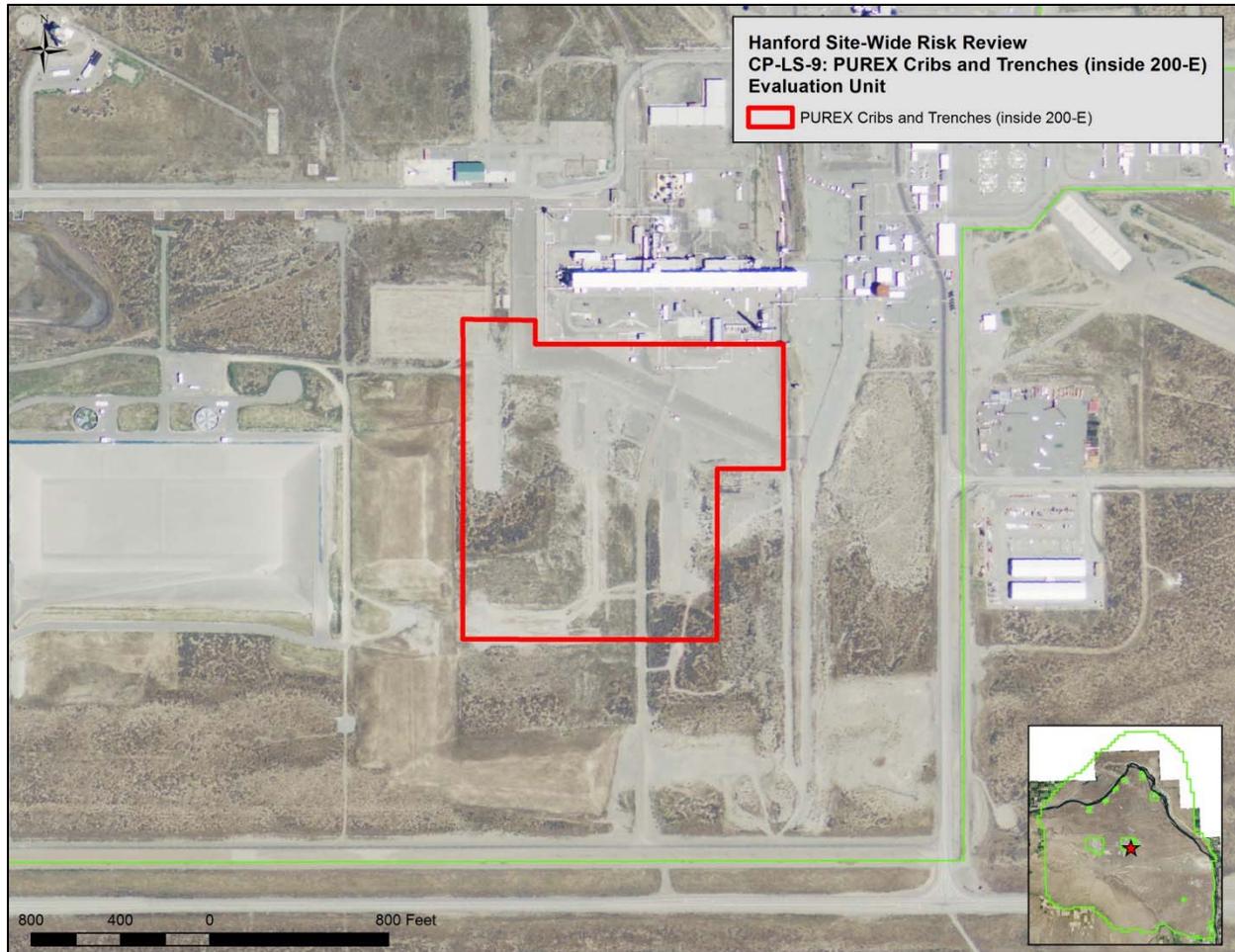


Figure J.25. CP-LS-9 [PUREX Cribs and Trenches (inside 200-E)] Site Location Map

CP-LS-9: PUREX and Tank Farms Cribs and Trenches (Inside 200-E)

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the current Endangered and Threatened Species (Federal and State) distribution data; priority habitats as defined by Washington Department of Fish and Wildlife; available current aerial imagery, locations of Hanford Site waste units and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data records.

The following steps were taken to assess the EU associated with PUREX Cribs and Trenches (inside 200-E):

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. A visual survey was conducted within the EU boundary by experienced shrub-steppe ecologists. PNNL biologists also reviewed the observations and biological survey data available in the Ecological Compliance and Assessment Project (ECAP) database from 2009 and 2010 for the area within the EU to supplement the evaluation with previous percent vegetation cover.
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2013 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.
6. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

Level 0 resources in the PUREX Cribs and Trenches EU occur primarily in the north (Figure J.24) and are mostly kept vegetation-free through use of herbicides. However, approximately 10% of the level 0 habitat is covered by small sand dunes with a low density of native grasses and in good years also has a few native annual forbs. Areas between those sprayed with herbicides and existing vegetation further away usually have a higher incidence of Russian thistle (*Salsola tragus*). Abutting the sand dune area in the northeast corner of the EU is an area containing mature successional vegetation with scattered gray rabbitbrush (*Ericameria nauseosa*) as the

dominant shrub and native Sandberg's bluegrass (*Poa secunda*) and introduced cheatgrass (*Bromus tectorum*) the dominant understory species (Table J.23).

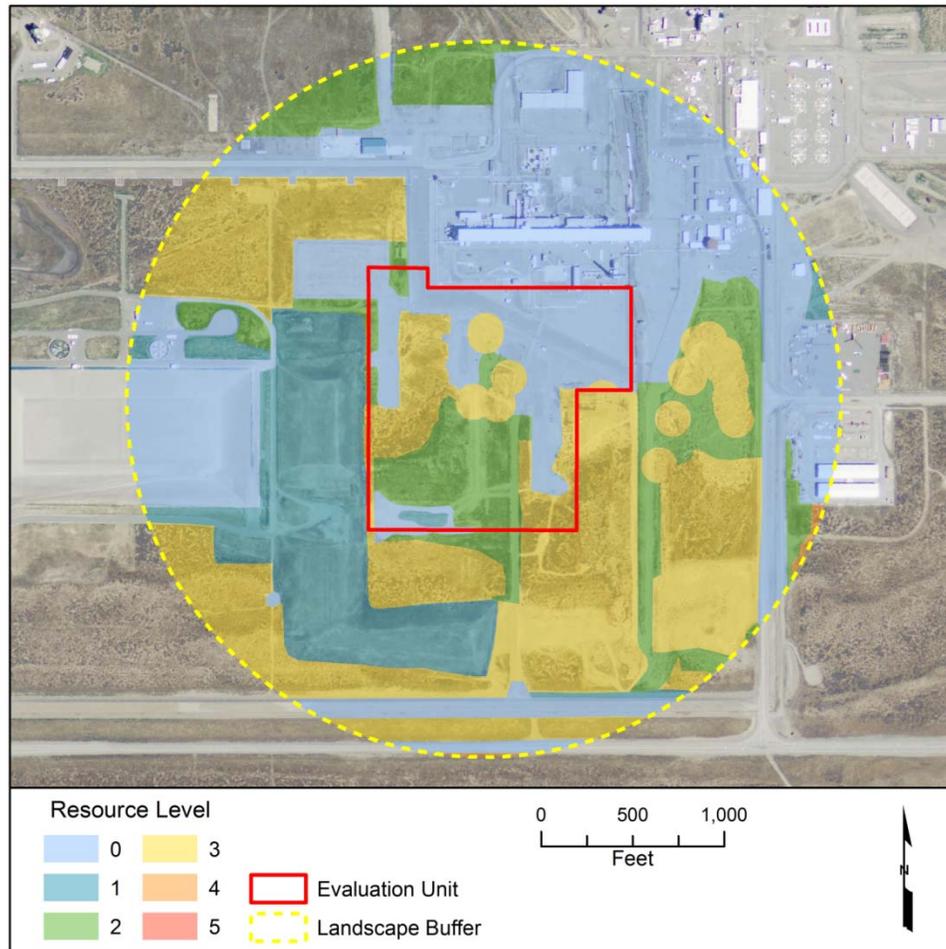


Figure J.26. Biological Resource Level Classifications Based on the June 16, 2015 Survey at the PUREX Cribs and Trenches (inside 200-E) Evaluation Unit (red solid line) and Adjacent Landscape Buffer Area (yellow dashed line).

Habitat in the southwest corner of the EU contains a mosaic of areas with and without gray rabbitbrush; both have an understory of native and introduced grasses and Russian thistle. Big sagebrush (*Artemisia tridentata*) is starting to spread into this area from nearby climax shrub habitat.

In the southeast corner and in an area along the west side are remnants of climax vegetation with big sagebrush providing up to 35% cover; the understory was dominated in 2015 by cheatgrass. Circular patches of level 3 resources (Figure J.26) are locations of a state sensitive species observed in past years, although none were noted in the 2015 survey. Percentages of dominant vegetation in Table J.23 are based on field observations and photographs taken during the June 16, 2015 survey and on older 2009 and 2010 ECAP data.

Table J.23. Percent Canopy Cover and Surface Cover Estimated at the PUREX Cribs and Trenches (inside 200-E) Evaluation Unit

Vegetation/Surface Cover	Survey Area 2-1 (%)	Survey Area 3-0 (%)	Survey Area 3-1 (%)	Survey Area 3-2 (%)
Bare Ground	-	-	-	-
Introduced forb	40	-	-	10
Introduced grass	30	10	40	20
Native forb	-	-	-	-
Native grass	15	15	-	2
Successional shrub	2	25	-	-
Climax shrub	<1	10	30	35

Landscape Evaluation and Resource Classification:

About 44% of the PUREX Cribs and Trenches EU is characterized as level 0 resources, although approximately 10% is actually dunes of coarse sand that are naturally have very sparse vegetation. Overall, roughly 71% of the habitat in the EU is classified as resource level 2 or below (Table J.24).

The amount and proximity of biological resources surrounding the PUREX Cribs and Trenches EU were examined within the adjacent landscape buffer area, which extends 1953 ft (595 m) from the geometric center of the EU. Approximately 68% of the combined EU and adjacent landscape buffer area is characterized as level 2 resources or lower (Table J.24). Level 3 and 4 resources comprise 32% of the EU with climax shrub cover (i.e., sagebrush) up to 35% in places.

Assumptions and Uncertainty:

Although all observations for species of concern and current conditions of biological resources were noted during surveys and evaluations conducted in 2015, the presence or absence of species cannot be assumed or predicted for future years. Field reconnaissance and surveys of evaluation units at the time of remediation will need to be conducted to verify resources and evaluation ecological conditions at that time.

Table J.24. Area and Proportion of Each Biological Resource Level Within the PUREX Cribs and Trenches (inside 200-E) Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources.

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
0	17.4	98.8	116.1	42.21%	50.16%	7.96%
1	0.4	34.5	34.9	12.69%	12.54%	-0.15%
2	10.1	25.1	35.1	12.77%	9.11%	-3.66%
3	11.4	77.0	88.4	32.13%	27.98%	-4.15%
4	0	0.6	0.6	0.20%	0.20%	0.00%
5	0	0	0	0.00%	0.00%	0.00%
Total	39.2	235.8	275.1	100.00%	100.00%	

¹ Resource levels for both the evaluation unit and adjacent landscape boundary were reviewed in the field and via imagery during May-August 2015 and revised to reflect current habitats conditions.

² Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.

Summary of Ecological Review:

- Approximately 34% (~13 acres) of the PUREX Cribs and Trenches EU (over waste sites and roads) is kept at resource level 0 by applications of herbicides. Another 10% (~4 acres) of the EU is characterized as level 0 because of its very low plant density, but is actually wind-blown, relatively coarse sand with very sparse perennial and annual native vegetation.
- 29% of the EU is classified as level 3 habitat most of which occurs along the south side of the EU, where it is contiguous with similar habitat outside the EU. Loss of all habitat within the EU is not expected to impact connectivity to habitats outside the 200-East Area.
- In the past, Piper's daisy, a state sensitive species, has been observed at numerous locations within the EU, and although none were observed in 2015, it is considered likely to occur in the area. Loss of individual Piper's daisies is not expected to affect population viability.
- Over 32% of the combined EU and adjacent landscape buffer area are classified as level 3 habitat. Wide roadways to the south of the EU may restrict some species movement to habitat outside the 200-East Area.

References:

- DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 0.
- U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act. <http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>
- U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington. http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902
- Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. <http://wdfw.wa.gov/conservation/phs/list/>
- Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington. <http://wdfw.wa.gov/conservation/endangered/>
- Washington Noxious Weed Control Board. 2014. Noxious Weed List. <http://www.nwcb.wa.gov/>
- Washington State Department of Natural Resources. 2014. Washington Natural Heritage Program Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

Definitions and Acronyms:

Adjacent Landscape Buffer – a circular area adjacent to and outside the EU boundary with the center of the circle at the centroid of the EU, and with a radius that is 1 times the maximum dimension (width or length—whichever is greatest). This circular buffer area is used to evaluate indirect effects and assess the remediation in relation to the landscape features and resources adjacent to the EU. This circular area is generally at least 3 times the area of the EU.

Biological Resource Levels (from DOE-RL-96-32-01) –

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats.
- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks.
- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub-steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.
- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.

- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.
- Level 0 resources consist of non-native plants and animals (unless otherwise listed at a higher level), non-vegetated areas, and industrial areas.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

MBTA – Migratory Bird Treaty Act; referring to species listed and protected under the federal Act.

PNNL ECAP (Ecological Compliance and Assessment Project) Database – PNNL performed ecological reviews for individual projects and annually surveyed selected areas and buildings on the Hanford Site for DOE-RL under the DOE's Public Safety and Resource Protection Program until 2011. The data collected during those surveys is archived in the ECAP database, and is used to supplement ecological evaluations as available.

Priority Habitats – Priority habitats are habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type (e.g., shrub-steppe) or dominant plant species (e.g., juniper savannah), a described successional stage (e.g., old-growth forest), or a specific habitat feature (e.g., cliffs).

Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

Field Data Records

Plant Species Identified During Visual Surveys June 16 2015, PUREX Cribs and Trenches EU (inside 200-E)			
Patch ID	Name	Common name	Abundance
2-1	<i>Achillea millefolium</i>	yarrow	
2-1	<i>Agropyron cristatum</i>	crested wheatgrass	
2-1	<i>Artemisia tridentata</i>	big sagebrush	<1
2-1	<i>Bromus tectorum</i>	cheatgrass	30
2-1	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	
2-1	<i>Cryptantha circumscissa</i>	matted cryptantha	
2-1	<i>Ericameria nauseosa</i>	gray rabbitbrush	2
2-1	<i>Hesperostipa comata</i>	needle-and-thread grass	
2-1	<i>Machaeranthera canescens</i>	hoary aster	
2-1	<i>Poa bulbosa</i>	bulbous bluegrass	
2-1	<i>Poa secunda</i>	Sandberg's bluegrass	10
2-1	<i>Salsola tragus</i>	Russian thistle	40
2-1	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledmustard	
2-1	<i>Sporobolus cryptandrus</i>	sand dropseed	
2-1	<i>Tragopogon dubius</i>	Yellow salsify	
2-1	<i>Vulpia microstachys</i>	small fescue	
3-0	<i>Artemisia tridentata</i>	big sagebrush	10
3-0	<i>Bromus tectorum</i>	cheatgrass	10
3-0	<i>Cryptantha circumscissa</i>	matted cryptantha	
3-0	<i>Ericameria nauseosa</i>	gray rabbitbrush	25
3-0	<i>Poa secunda</i>	Sandberg's bluegrass	15
3-0	<i>Salsola tragus</i>	Russian thistle	
3-1	<i>Achillea millefolium</i>	yarrow	
3-1	<i>Amsinckia species</i>		
3-1	<i>Artemisia tridentata</i>	big sagebrush	30
3-1	<i>Bromus tectorum</i>	cheatgrass	40
3-1	<i>Chaenactis douglasii</i>	hoary falseyarrow	
3-1	<i>Cryptantha circumscissa</i>	matted cryptantha	
3-1	<i>Ericameria nauseosa</i>	gray rabbitbrush	
3-1	<i>Poa secunda</i>	Sandberg's bluegrass	
3-1	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledmustard	
3-1	<i>Vulpia microstachys</i>	small fescue	
3-2	<i>Achillea millefolium</i>	yarrow	
3-2	<i>Artemisia tridentata</i>	big sagebrush	35
3-2	<i>Bromus tectorum</i>	cheatgrass	20
3-2	<i>Poa secunda</i>	Sandberg's bluegrass	
3-2	<i>Salsola tragus</i>	Russian thistle	
3-2	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledmustard	

Bird, Mammal and Herpetofauna Species June 16 2015, PUREX Cribs and Trenches EU (inside 200-E)			
Patch ID	Name	Common name	Comment
2-1a	<i>Zenaidura macroura</i>	mourning dove	1 adult flew over
2-1a		unidentified lizard	1
2-1a		unidentified rabbit	scat, could not identify to genus
2-1a	<i>Thomomys talpoides</i>	northern pocket gopher	mound
3-0		unidentified lizard	
3-1	<i>Sturnella neglecta</i>	western meadowlark	1 adult, 1 juvenile
3-1	<i>Chondestes grammacus</i>	lark sparrow	perched on pole singing
3-1		unidentified rabbit	scat, could not identify to genus
3-1		unidentified lizard	tracks
3-1		unidentified small mammal	tracks
3-1	<i>Canis latrans</i>	coyote	scat
3-2		unidentified rabbit	scat, could not identify to genus
3-2		unidentified lizard	tracks
3-2		unidentified small mammal	tracks
3-2	<i>Canis latrans</i>	coyote	scat

Evaluation Unit: PUREX and Tank Farms Cribs and Trenches (outside 200-E)
 ID: CP-LS-10
 Group: Legacy Source
 Operable Unit Cross-Walk: 200-EA-1
 Related EU: CP-GW-1
 Sites & Facilities: Liquid waste sites on the east side of 200-East (associated with PUREX and Tank Farm operations, but outside the 200-E area fence).
 Key Data Sources Docs: DOE-RL-96-32-01; Mission Support Alliance maps¹⁴
 Field Survey Date: 06/17/2015
 Datasheet prepared by: MAC, SAM, KDH 10/26/2015
 Datasheet reviewed by:



Figure J.27. CP-LS-10 (PUREX and Tank Farms Cribs and Trenches (outside 200-E)) Site Location Map

¹⁴MSA (Mission Support Alliance) maintains biological resource information for the Hanford Site for the Department of Energy.

CP-LS-10: PUREX and Tank Farms Cribs and Trenches (Outside 200-E)

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the current Endangered and Threatened Species (Federal and State) distribution data; priority habitats as defined by Washington Department of Fish and Wildlife; available current aerial imagery, locations of Hanford Site waste units and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data records.

The following steps were taken to assess the EU associated with PUREX and Tank Farms Cribs and Trenches:

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. A pedestrian survey was conducted within the EU boundary by experienced shrub-steppe ecologists.
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2013 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.

6. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

In the PUREX and Tank Farms Cribs and Trenches EU, nearly 82% consists of several elongate waste sites and access roads kept free of all vegetation (Figure J.28). On the west side of the EU a few native grasses such as Indian ricegrass (*Achnatherum hymenoides*) and needle-and-thread grass (*Hesperostipa comata*) are growing in a wind-blown sandy area.

Between and adjacent to the linear stretches of bare ground are patches of shrub-steppe where big sagebrush (*Artemisia tridentata*), a climax shrub, provides up to 30% canopy cover (Table J.25). Cheatgrass (*Bromus tectorum*) and Russian thistle (*Salsola tragus*) are both introduced species and comprise the dominant understory species. The outer 10 to 20 ft (3 to 6 m) of these patches has lost most of the understory species resulting in sagebrush above bare dirt and/or Russian thistle. It appears sand from the adjacent waste site has blown in and may have covered the previous understory plants. Field data records at the end of this section provide lists of plant and animal species observed during the June survey.

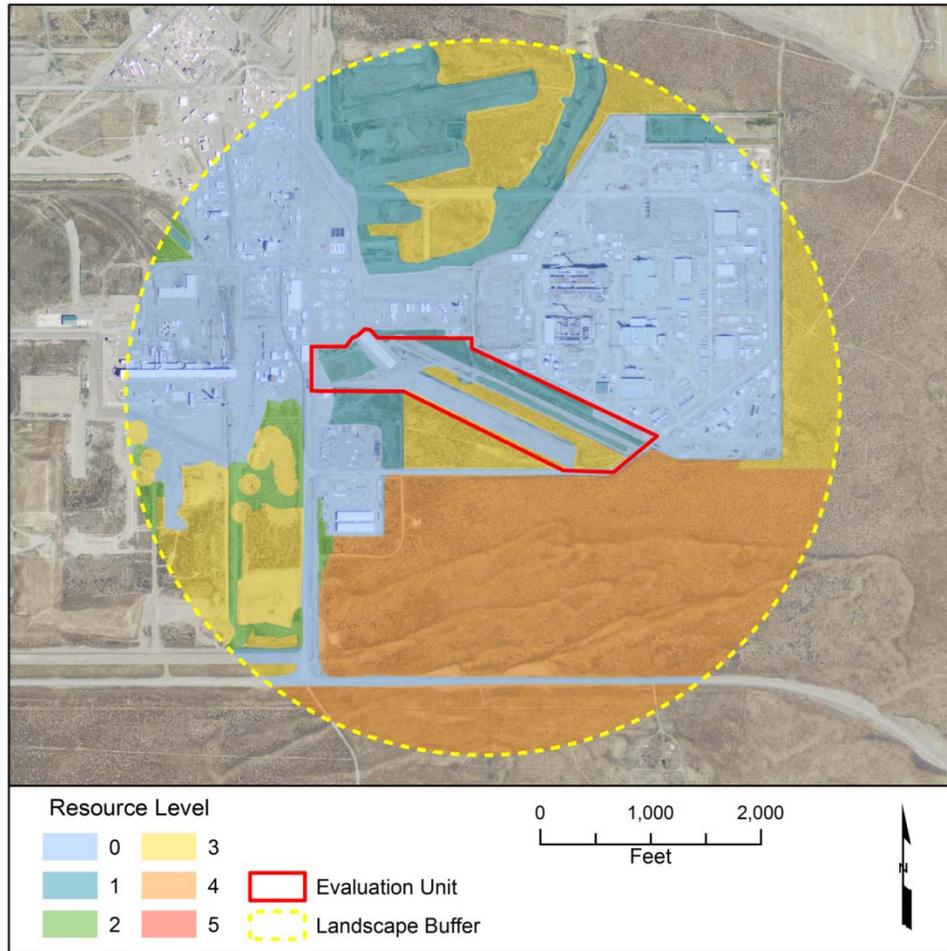


Figure J.28. Biological Resource Level Classifications Based on the June 17, 2015 Survey at the PUREX and Tank Farms Cribs and Trenches Evaluation Unit (red solid line) and Adjacent Landscape Buffer Area (yellow dashed line).

Table J.25. Percent Canopy Cover and Surface Cover Estimated at the PUREX and Tank Farms Cribs and Trenches Evaluation Unit

Vegetation/Surface Cover	Survey Area 3-1
Bare Ground	-
Introduced forb	30
Introduced grass	25
Native forb	-
Native grass	1
Successional shrub	<1
Climax shrub	30

Note: a dash (-) indicates no percent cover data were collected

Landscape Evaluation and Resource Classification:

The PUREX and Tank Farms Cribs and Trenches EU encompasses several inactive and active waste sites and roadways. Over half of the EU is bare or graveled ground where vegetation is controlled by use of herbicides and another quarter of the EU has been disturbed in the past and is now dominated by non-native species such as Russian thistle (*Salsola tragus*) (Table J.26). Approximately 7% of the EU contains remnants of climax community shrub-steppe containing big sagebrush (*Artemisia tridentata*), although the quality of the habitat where these patches abut bare areas has been significantly impacted by disturbances that have killed most of the understory and some of the sagebrush.

Table J.26. Area and Proportion of Each Biological Resource Level Within the PUREX and Tank Farms Cribs and Trenches Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources.

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
0	21.8	301.7	323.5	42.73%	45.16%	2.43%
1	11.0	71.4	82.4	10.89%	9.43%	-1.46%
2	0	16.3	16.3	2.16%	2.16%	0.00%
3	7.4	115.3	122.6	16.20%	15.23%	-0.97%
4	0	212.2	212.2	28.03%	28.03%	0.00%
5	0	0	0	0.00%	0.00%	0.00%
Total	40.2	716.9	757.1	100.00%	100.00%	

¹ Resource levels for both the evaluation unit and adjacent landscape boundary were reviewed in the field and via imagery

during May-August 2015 and revised to reflect current habitats conditions.

- 2 Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.

The amount and proximity of biological resources surrounding the PUREX and Tank Farms Cribs and Trenches EU were examined within the adjacent landscape buffer area, which extends 3240 ft (988 m) from the geometric center of the EU (Figure J.28). Of the 757 acres within the combined EU and adjacent buffer area, 43% is classified as level 0 and almost 56% of the habitat is classified as level 2 or below (Table J.26). Most of this lower quality habitat lies to the north, east and west of the EU. To the south and southeast of the EU higher quality habitat dominated by sagebrush and various native and introduced forbs and grasses is contiguous with level 3 resources inside the EU. These level 3 and level 4 resources in the southeast portion of the buffer area are contiguous with similar high-quality habitat extending across the Hanford Site and include an area considered habitat for black-tailed jackrabbits (*Lepus californicus*), a Washington state candidate species (MSA maps 2015).

Assumptions and Uncertainty:

Although all observations for species of concern and current conditions of biological resources were noted during surveys and evaluations conducted in 2015, the presence or absence of species cannot be assumed or predicted for future years. Field reconnaissance and surveys of evaluation units at the time of remediation will need to be conducted to verify resources and evaluate ecological conditions at that time.

Summary of Ecological Review:

- Nearly 82% of the resources in the PUREX and Tank Farms Cribs and Trenches EU are classified as level 1 or below. There is no level 2 habitat identified in the EU.
- 18% of the EU is classified as level 3 habitat, although over half of this has been significantly impacted by herbicide or other disturbance factors.
- Loss of habitat within the EU is not like to impact connectivity between fragmented habitats in the EU and high-quality habitats outside the 200-East Area.

References:

DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 0.

U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act. <http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>

U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington. http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902

Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. <http://wdfw.wa.gov/conservation/phs/list/>

Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington. <http://wdfw.wa.gov/conservation/endangered/>

Washington Noxious Weed Control Board. 2014. Noxious Weed List. <http://www.nwcb.wa.gov/>

Washington State Department of Natural Resources. 2014. Washington Natural Heritage Program Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

Definitions and Acronyms:

Adjacent Landscape Buffer – a circular area adjacent to and outside the EU boundary with the center of the circle at the centroid of the EU, and with a radius that is 1 times the maximum dimension (width or length—whichever is greatest). This circular buffer area is used to evaluate indirect effects and assess the remediation in relation to the landscape features and resources adjacent to the EU. This circular area is generally at least 3 times the area of the EU.

Biological Resource Levels (from DOE-RL-96-32-01) –

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats.
- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks.
- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub-steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.
- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.
- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.
- Level 0 resources consist of non-native plants and animals (unless otherwise listed at a higher level), non-vegetated areas, and industrial areas.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

MBTA – Migratory Bird Treaty Act; referring to species listed and protected under the federal Act.

PNNL ECAP (Ecological Compliance and Assessment Project) Database – PNNL performed ecological reviews for individual projects and annually surveyed selected areas and buildings on the Hanford Site for DOE-RL under the DOE's Public Safety and Resource Protection Program until 2011. The data collected during those surveys is archived in the ECAP database, and is used to supplement ecological evaluations as available.

Priority Habitats – Priority habitats are habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type (e.g., shrub-steppe) or dominant plant species (e.g., juniper savannah), a described successional stage (e.g., old-growth forest), or a specific habitat feature (e.g., cliffs).

Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

Field Data Records

Plant Species Identified During Visual Surveys June 17 2015, PUREX and Tank Farms Cribs and Trenches EU			
Patch ID	Name	Common name	Abundance
3-1	<i>Achnatherum hymenoides</i>	indian ricegrass	
3-1	<i>Agropyron cristatum</i>	crested wheatgrass	
3-1	<i>Artemisia tridentata</i>	big sagebrush	5
3-1	<i>Bromus tectorum</i>	cheatgrass	15
3-1	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	
3-1	<i>Ericameria nauseosa</i>	gray rabbitbrush	
3-1	<i>Hesperostipa comata</i>	needle-and-thread grass	
3-1	<i>Poa secunda</i>	Sandberg's bluegrass	
3-1	<i>Salsola tragus</i>	Russian thistle	60
3-1	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	

Bird, Mammal and Herpetofauna Species June 17 2015, PUREX and Tank Farms Cribs and Trenches EU			
Patch ID	Name	Common name	Comment
3-1	<i>Sturnella neglecta</i>	western meadowlark	perched
3-1	<i>Tyrannus verticalis</i>	western kingbird	perched, feeding
3-1	<i>Sturnus vulgaris</i>	European starling	flew over

Evaluation Unit: B Pond
 ID: CP-LS-11
 Group: Legacy Source
 Operable Unit Cross-Walk: 200-EA-1, 200-CW-1, 200-OA-1, 200-IS-1
 Related EU: CP-LS-7, CP-GW-1
 Sites & Facilities: B pond and associated ditches, where liquid wastes were discharged in the northern and western part of 200-E and outside the fence of 200-E.
 Key Data Sources Docs: DOE-RL-96-32-01; Mission Support Alliance maps¹⁵
 Field Survey Date: 06/10, 17 and 18/2015
 Datasheet prepared by: MAC, KDH, SAM 11/4/15
 Datasheet reviewed by:



Figure J.29. CP-LS-11 (B Pond) Site Location Map

¹⁵MSA (Mission Support Alliance) maintains biological resource information for the Hanford Site for the Department of Energy.

CP-LS-11: B Pond

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the current Endangered and Threatened Species (Federal and State) distribution data; priority habitats as defined by Washington Department of Fish and Wildlife; available current aerial imagery, locations of Hanford Site waste units and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data records.

The following steps were taken to assess the EU associated with B Pond:

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. Visual and transect surveys were conducted within the EU boundary by experienced shrub-steppe ecologists.
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2013 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.

6. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

The B Pond EU encompasses waste sites that already have undergone various levels of remedial action. The majority of the remediated sites (over 71%) have undergone stabilization or revegetation of the surface with crested wheatgrass (*Agropyron cristatum*). These areas typically include varying amounts of cheatgrass and Russian thistle (*Bromus tectorum* and *Salsola tragus*, respectively), both invasive introduced species.

A berm of gravelly soil at the far east end of the EU is being colonized by successional shrubs, primarily gray rabbitbrush (*Ericameria nauseosa*) and a mixture of native grasses and forbs and is classified as level 2 habitat. Field data records at the end of this section provide a complete list of species observed.

Note: a dash (-) indicates no percent cover data were collected

There are several areas between or around the edges of waste sites where shrub-steppe habitat still occurs that is dominated by big sagebrush (*Artemisia tridentata*) with an understory of native grass (mostly Sandberg's bluegrass [*Poa secunda*]), Russian thistle and cheatgrass (Table J.27). Evidence for the presence of black-tailed jackrabbits (*Lepus californicus*) was observed on the southeast side of the EU. Black-tailed jackrabbits are a Washington state candidate species.

Table J.27. Percent Canopy Cover and Surface Cover Estimated or Measured at the B Pond Evaluation Unit

Vegetation/Surface Cover	Survey Area 2-1 (%)	Survey Area 3-1 (%)	Survey Area 3-2 (%)	Survey Area 3-3 (%)
Bare Ground	-	-	11.08	11.08
Introduced forb	-	-	0.33	15.66
Introduced grass	5	30	13.75	15.58
Native forb	-	-	1.17	0.5
Native grass	-	-	14.08	8.58
Successional shrub	2	-	0	1.75
Climax shrub	-	20	19.42	16.75

Note: a dash (-) indicates no percent cover data were collected

Landscape Evaluation and Resource Classification:

The B Pond EU follows the paths of ditches within the 200-East Area that led to ponds outside the 200-East Area fence (Figure J.30). More than 71% of the EU has been remediated and the surface stabilized by revegetating with crested wheatgrass, and is therefore classified as level 1 habitat (Table J.28). Overall, 80% of the EU is classified as resource level 2 or below.

Level 3 resources comprise 20% of the EU, and include one isolated patch inside the 200-East Area, strips around the exterior of the easternmost waste sites/remediated areas, and clusters of individual locations of a state sensitive plant species within the 200-East Area. These resources are dominated by big sagebrush and a mixture of native and introduced grasses and forbs.

The amount and proximity of biological resources surrounding the B Pond EU were examined within the adjacent landscape buffer area. A circular buffer area around such a long and narrow EU was not reasonable; therefore a strip 2 times the average width of the EU (1675 ft [511 m]) was added to all sides of the EU boundary (Figure J.30). The combined EU and adjacent landscape buffer area encompass 1170 acres (approximately 58%) classified as resource level 2 or below.

The combined area also encompasses 688.1 acres (34%) of level 3 habitat, primarily in the eastern half between the EU boundary and the buffer boundary. There are two concentrations of Piper's daisy (*Erigeron piperianus*) within the 200-East Area near the western end of the buffer area, shown as clusters of small circular level 3 patches representing previously noted locations of this Washington state sensitive species. Piper's daisy was not actively searched for during the 2015 surveys and was not observed. However it is considered like to still occur in the area. Around the eastern edge of the buffer area are patches of level 4 resources which comprise about 8% of the combined EU and buffer area.

Level 3 and 4 resources in the eastern portion of the combined EU and buffer area are contiguous with similar or better habitat covering much of the Hanford Site. No habitat characterized as a level 5 resource was identified within the EU or buffer area.

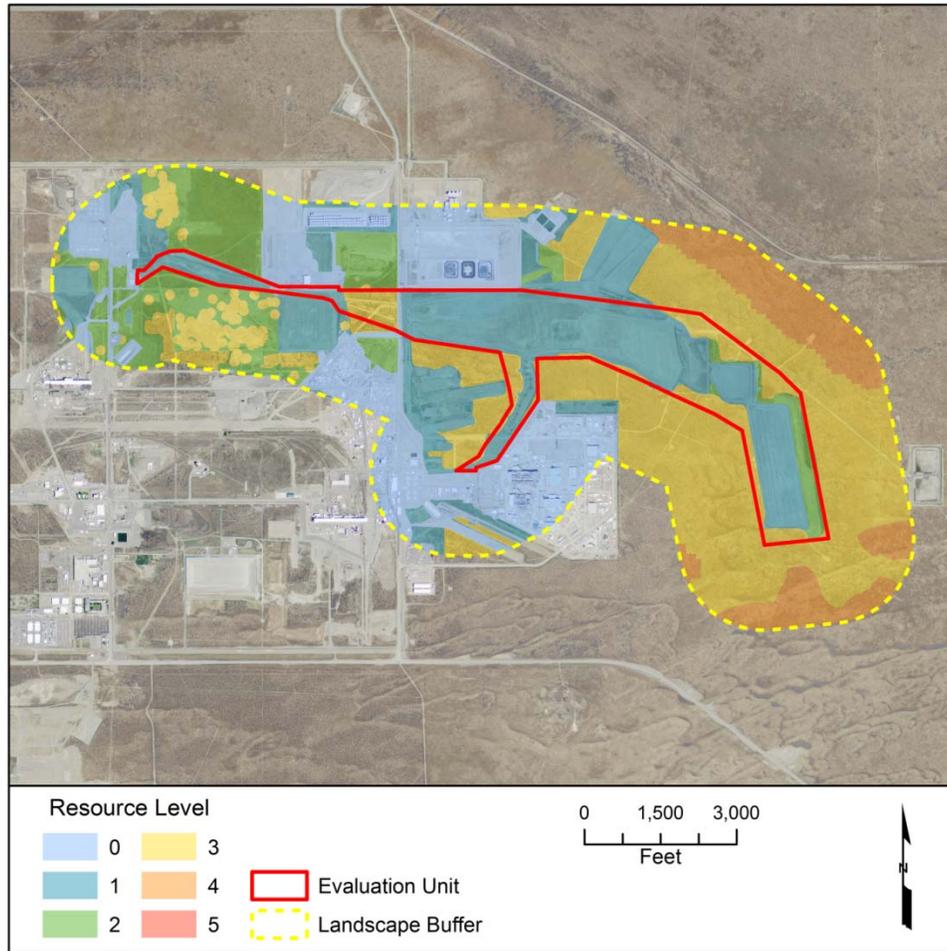


Figure J.30. Biological Resource Level Classifications Based on June 10, 17 and 18, 2015 Surveys at the B Pond Evaluation Unit (red solid line) and Adjacent Landscape Buffer Area (yellow dashed line).

Table J.28. Area and Proportion of Each Biological Resource Level Within the B Pond Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources.

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
0	5.1	435.0	440.1	21.72%	40.06%	18.33%
1	267.8	221.6	489.4	24.16%	10.94%	-13.22%
2	28.2	212.4	240.6	11.88%	10.48%	-1.39%
3	75.4	612.7	688.1	33.97%	30.24%	-3.72%
4	0	167.6	167.6	8.27%	8.27%	0.00%
5	0	0	0	0.00%	0.00%	0.00%
Total	376.5	1649.3	2025.8	100.00%	100.00%	

¹ Resource levels for both the evaluation unit and adjacent landscape boundary were reviewed in the field and via imagery during May-August 2015 and revised to reflect current habitats conditions.

² Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.

Assumptions and Uncertainty:

Although all observations for species of concern and current conditions of biological resources were noted during surveys and evaluations conducted in 2015, the presence or absence of species cannot be assumed or predicted for future years. Field reconnaissance and surveys of evaluation units at the time of remediation will need to be conducted to verify resources and evaluate ecological conditions at that time.

Summary of Ecological Review:

- 71% of the surface area within the B Pond EU has been stabilized or revegetated, and is classified as a level 1 biological resource.
- 80% of the EU is characterized as a resource level 2 or below.
- Within the combined EU and buffer area, 58% of habitat is characterized as level 2 or below.
- 75.4 acres within the EU and an additional 612.7 acres with the adjacent landscape buffer area are characterized as resource level 3. Loss of this habitat during cleanup actions will not significantly impact the connectivity of resources within the EU to those outside the 200-East Area.
- Signs of black-tailed jackrabbits were observed in the eastern portion of the combined EU and buffer area. This species is a Washington state candidate species.
- Level 3 and level 4 resources at the eastern end of the buffer area are contiguous with similar habitat covering much of the Hanford Site.

- Two relatively large populations of Piper’s daisy, a state sensitive species, occur within the combined area, but are outside the EU boundary. Piper’s daisy is relatively common in habitats outside of this EU, and remediation actions within the EU are unlikely to affect population viability.

References:

- DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 0.
- U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act. <http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>
- U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington. http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902
- Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. <http://wdfw.wa.gov/conservation/phs/list/>
- Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington. <http://wdfw.wa.gov/conservation/endangered/>
- Washington Noxious Weed Control Board. 2014. Noxious Weed List. <http://www.nwcb.wa.gov/>
- Washington State Department of Natural Resources. 2014. Washington Natural Heritage Program Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

Definitions and Acronyms:

Adjacent Landscape Buffer – a circular area adjacent to and outside the EU boundary with the center of the circle at the centroid of the EU, and with a radius that is 1 times the maximum dimension (width or length—whichever is greatest). This circular buffer area is used to evaluate indirect effects and assess the remediation in relation to the landscape features and resources adjacent to the EU. This circular area is generally at least 3 times the area of the EU.

Biological Resource Levels (from DOE-RL-96-32-01) –

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats.
- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks.
- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub-steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake

hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.

- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.
- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.
- Level 0 resources consist of non-native plants and animals (unless otherwise listed at a higher level), non-vegetated areas, and industrial areas.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

MBTA – Migratory Bird Treaty Act; referring to species listed and protected under the federal Act.

PNNL ECAP (Ecological Compliance and Assessment Project) Database – PNNL performed ecological reviews for individual projects and annually surveyed selected areas and buildings on the Hanford Site for DOE-RL under the DOE's Public Safety and Resource Protection Program until 2011. The data collected during those surveys is archived in the ECAP database, and is used to supplement ecological evaluations as available.

Priority Habitats – Priority habitats are habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type (e.g., shrub-steppe) or dominant plant species (e.g., juniper savannah), a described successional stage (e.g., old-growth forest), or a specific habitat feature (e.g., cliffs).

Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

Field Data Records

Plant Species Identified During Visual Surveys June 10, 17 and 18, 2015 B Pond EU			
Patch ID	Name	Common name	Abundance
2-1	<i>Achillea millefolium</i>	yarrow	
2-1	<i>Achnatherum hymenoides</i>	indian ricegrass	
2-1	<i>Artemisia tridentata</i>	big sagebrush	
2-1	<i>Bromus tectorum</i>	cheatgrass	5
2-1	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	
2-1	<i>Ericameria nauseosa</i>	gray rabbitbrush	2
2-1	<i>Hesperostipa comata</i>	needle-and-thread grass	
2-1	<i>Lactuca serriola</i>	prickly lettuce	
2-1	<i>Machaeranthera canescens</i>	hoary aster	
2-1	<i>Mentzelia albicaulis</i>	whitestem stickleaf	
2-1	no vegetation	no vegetation	90
2-1	<i>Poa secunda</i>	Sandberg's bluegrass	
2-1	<i>Salsola tragus</i>	Russian thistle	
2-1	<i>Sporobolus cryptandrus</i>	sand dropseed	
2-1	<i>Tragopogon dubius</i>	Yellow salsify	
2-1	<i>Verbascum thapsus</i>	common mullein	
3-1	<i>Achillea millefolium</i>	yarrow	
3-1	<i>Achnatherum hymenoides</i>	indian ricegrass	
3-1	<i>Agropyron cristatum</i>	crested wheatgrass	
3-1	<i>Ambrosia acanthicarpa</i>	bur ragweed	
3-1	<i>Amsinckia species</i>		
3-1	<i>Artemisia tridentata</i>	big sagebrush	20
3-1	<i>Astragalus caricinus</i>	buckwheat milkvetch	
3-1	<i>Balsamorhiza careyana</i>	Carey's balsamroot	
3-1	<i>Bromus tectorum</i>	cheatgrass	30
3-1	<i>Cryptantha circumscissa</i>	matted cryptantha	
3-1	<i>Eriogonum vimineum</i>	broom buckwheat	
3-1	<i>Ipomopsis minutiflora</i>	littleflower ipomopsis	
3-1	<i>Lactuca serriola</i>	prickly lettuce	
3-1	<i>Machaeranthera canescens</i>	hoary aster	
3-1	<i>Microsteris gracilis</i>	pink microsteris	
3-1	<i>Phlox longifolia</i>	longleaf phlox	
3-1	<i>Poa secunda</i>	Sandberg's bluegrass	
3-1	<i>Populus species</i>	unidentified poplar tree	
3-1	<i>Pteryxia terebinthina var. terebinthina</i>	turpentine springparsley	
3-1	<i>Salsola tragus</i>	Russian thistle	
3-1	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	
3-1	<i>Sitanion hystrix</i>	bottlebrush grass	
3-1	<i>Sporobolus cryptandrus</i>	sand dropseed	
3-1	<i>Tiquilia nuttallii</i>	desert mat	
3-1	<i>Tragopogon dubius</i>	Yellow salsify	
3-1	<i>Vulpia octoflora</i>	sixweeks fescue	

Bird, Mammal and Herpetofauna Species June 10, 17 and 18, 2015 B Pond EU			
Patch ID	Name	Common name	Comment
1-1	<i>Sturnella neglecta</i>	western meadowlark	sing
1-3	<i>Eremophila alpestris</i>	horned lark	2
3-1	<i>Eremophila alpestris</i>	horned lark	sing, 3 fly by
3-1	<i>Chondestes grammacus</i>	lark sparrow	perch pole at SE corner
3-1	<i>Carpodacus mexicanus</i>	house finch	fly over
3-1	<i>Sturnella neglecta</i>	western meadowlark	flew to ground
3-1	<i>Hirundo rustica</i>	barn swallow	foraging
3-1		unidentified snake	shed skin
3-1	<i>Canis latrans</i>	coyote	scat, tracks
3-1		Unidentified lizard	tracks
3-1	<i>Sylvilagus nutalli</i>	mountain cottontail	scat
3-1	<i>Thomomys talpoides</i>	northern pocket gopher	mounds
3-1		unidentified small mammal	holes
3-2	<i>Chondestes grammacus</i>	lark sparrow	1 perched shrub
3-2	<i>Thomomys talpoides</i>	northern pocket gopher	mounds
3-2	<i>Lepus californicus</i>	black-tailed jackrabbit	scat
3-2	<i>Canis latrans</i>	coyote	scat
3-3		unidentified small mammal	holes

Percent Canopy Cover of Herbaceous Species Measured in 0.5 m2 quadrats June 18 2015, B Pond EU																	
Survey Area	Species	Origin & Class	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	sum	Mean Canopy Cover	Freq
3-2	Artr	NS			48	18	28	3	6		95			35	233	19.42	0.58
3-2	Pose	NG	45	34	2	2	18	12	25	18	1	12			169	14.08	0.83
3-2	Brte	IG	2	4	22	10	4	5	8	16	18	24	48	4	165	13.75	1
3-2	Bare	Bare	6	10		8	12	15	9	14	10	10	11	28	133	11.08	0.92
3-2	Litter	Litter	18	43	75	35	30	22	40	32	40	15	38	40	428	35.67	1
3-2	Crust	Crust	30	25	5	55	65	67	35	65	25	70	8	22	472	39.33	1
3-2	Artr(dead)	NS	35	50	40	28		18	26						197	16.42	0.5
3-2	Saka	IF							1					3	4	0.33	0.17
3-2	Migr	NF										12		2	14	1.17	0.17
3-2	Depi	NF												1	1	0.08	0.08

Shrub Canopy Measured by Line-Intercept Methods on 50m Transect June 18 2015, B Pond EU					
Survey Area	Species	Transect Distance (total)	Start	Stop	Dif
3-2	Artr	50	9.7	10.4	0.7
3-2	Artr	50	12.75	13.35	0.6
3-2	Artr	50	16.6	17	0.4
3-2	Artr	50	18.8	20	1.2
3-2	Artr	50	23.3	23.9	0.6
3-2	Artr	50	31.8	32.2	0.4
3-2	Artr	50	36.2	37.9	1.7
3-2	Artr	50	38.1	39.1	1
3-2	Artr	50	39.5	41.35	1.85
3-2	Artr	50	41.3	41.55	0.25

Percent Canopy Cover of Herbaceous Species Measured in 0.5 m2 quadrats June 18 2015, B Pond EU																	
Survey Area	Species	Origin & Class	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	sum	Mean Canopy Cover	Freq
3-3	Artr	NS	16				4	60				11	10	100	201	16.75	0.5
3-3	Saka	IF	35	22	28	11	24	4	4	3	19	1			151	12.58	0.83
3-3	Brte	IG	25	30	30	14		3	30	27	14		4	10	187	15.58	0.83
3-3	Litter	Litter	10	12	17	16	12	50	15	20	15	10	100	30	307	25.58	1
3-3	Bare	Bare	14	6	15	14	8		15	22	21	18			133	11.08	0.75
3-3	Pose	NG		8	4	28	20		10	4	9	15			98	8.17	0.67
3-3	Crust	Crust		22	6	16	50		16	20	33	34			197	16.42	0.67
3-3	Maca	NF				1					3				4	0.33	0.17
3-3	Migr	NF					1					1			2	0.17	0.17
3-3	Stco	NG								4					4	0.33	0.08
3-3	Elcl	NG									1				1	0.08	0.08
3-3	Chvi	NS										20	1		21	1.75	0.17
3-3	Sial	IF												1	1	0.08	0.08

No shrub intercept data was collected for patch 3-3.

Evaluation Unit: 200-W Burial Grounds
 ID: CP-LS-12
 Group: Legacy Source
 Operable Unit Cross-Walk: 200-SW-2
 Related EU: NA
 Sites & Facilities: Past practice radioactive waste burial grounds, including retrievable stored TRU trenches.
 Key Data Sources Docs: DOE-RL-96-32-01; Mission Support Alliance maps¹⁶
 Field Survey Date: 05/27 and 09/03/2015
 Datasheet prepared by: MAC, KDH, SAM 11/3/2015
 Datasheet reviewed by:

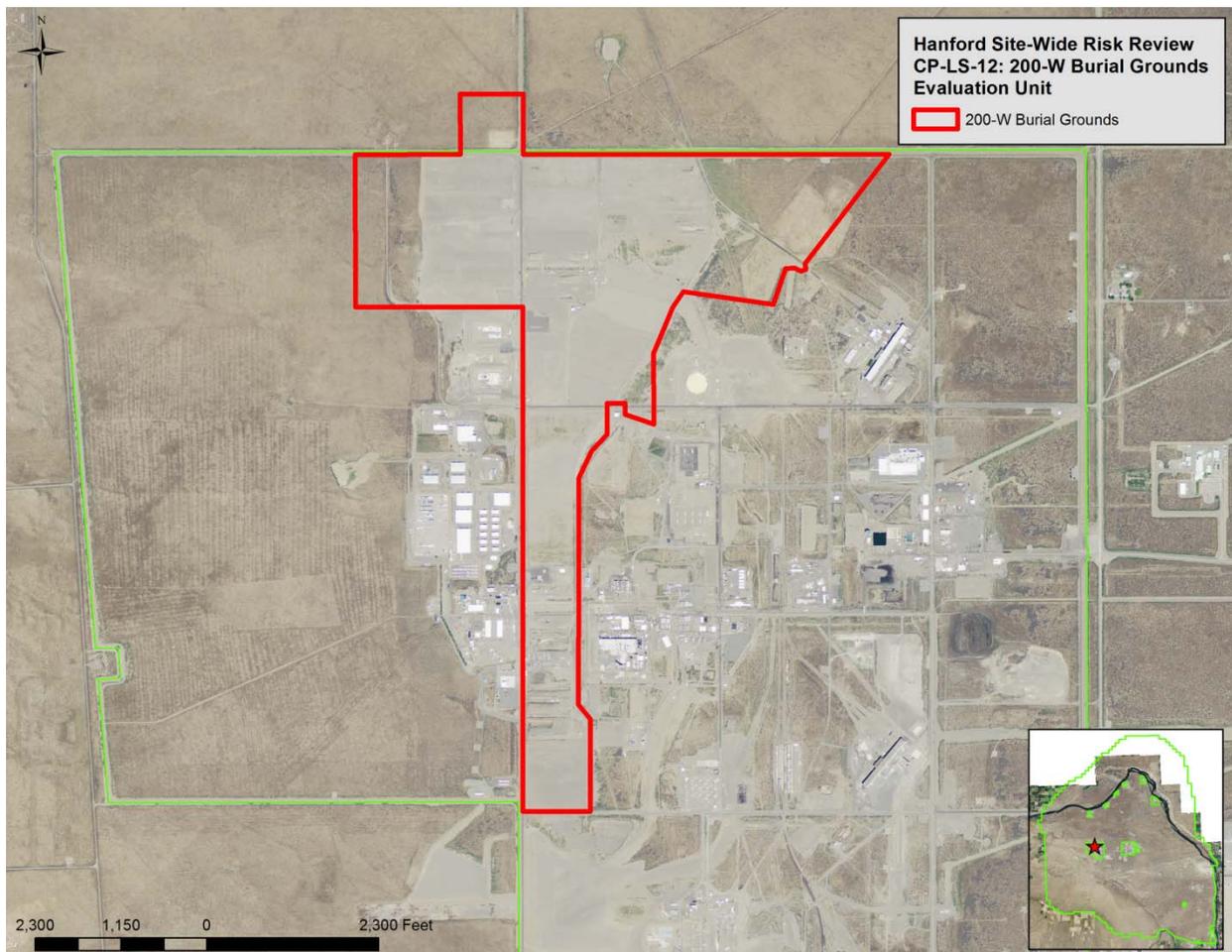


Figure J.31. CP-LS-12 (200-W Burial Grounds) Site Location Map

CP-LS-12: 200-W Burial Grounds

¹⁶MSA (Mission Support Alliance) maintains biological resource information for the Hanford Site for the Department of Energy.

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the current Endangered and Threatened Species (Federal and State) distribution data; priority habitats as defined by Washington Department of Fish and Wildlife; available current aerial imagery, locations of Hanford Site waste units and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data records.

The following steps were taken to assess the EU associated with 200-W Burial Grounds:

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. A pedestrian survey was conducted within the EU boundary by experienced shrub-steppe ecologists.
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2013 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.
6. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

Surveys of the 200-W Burial Grounds EU were conducted on May 27, 2015 and were re-checked on 9/3/15. Approximately 64% of the EU is used as burial grounds for contaminated waste and both paved and dirt roads which are kept clear of vegetation (Figure J.32). Another 20% of the EU, primarily in the northeast corner and middle of the EU, is dominated by crested wheatgrass (*Agropyron cristatum*) sown to control erosion and blowing dust.

Portions of this EU burned in 2000; those along the northwest side of the EU were revegetated with a mixture of crested wheatgrass, saltbush (unidentified non-native *Atriplex* species), and native grasses (Table J.29, patches 2-1 and 2-2). The extension of the EU north of 200-W was not revegetated and contains a successional community dominated by green rabbitbrush (*Chrysothamnus viscidiflorus*) with an understory of cheatgrass (*Bromus tectorum*) and Sandberg's bluegrass (*Poa secunda*) with a mixture of native and introduced forbs. Field data records at the end of this section provide lists of the plant and animal species observed.

On the northeast side of the EU, several patches of habitat contain up to 20% of the climax shrub, big sagebrush (*Artemisia tridentata*), and are therefore classified as level 3 resources (Figure J.32). The understory of this is somewhat degraded appears to be dominated by cheatgrass and Russian thistle (*Salsola tragus*).

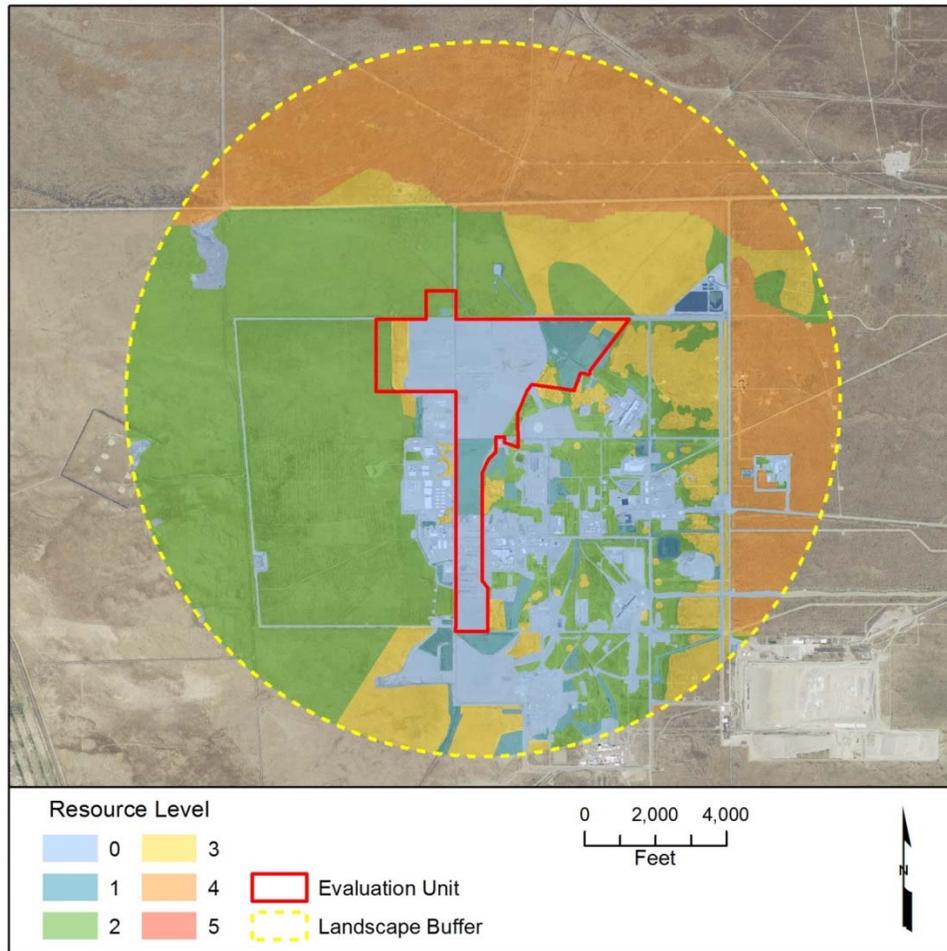


Figure J.32. Biological Resource Level Classifications Based on May 27 and September 3, 2015 Surveys at the 200-W Burial Grounds Evaluation Unit (red solid line) and Adjacent Landscape Buffer Area (yellow dashed line).

Table J.29. Percent Canopy Cover and Surface Cover Estimated at the 200-W Burial Grounds Evaluation Unit

Vegetation/Surface Cover	Survey Area 2 (north) (%)	Survey Area 2-1 (%)	Survey Area 2-2 (%)	Survey Area 3-1 (%)
Bare Ground	-	-	-	-
Introduced forb	2	15	15	25
Introduced grass	40	40	35	20
Introduced shrub	-	5	2	-
Native forb	-	-	-	-
Native grass	15	-	10	-
Successional shrub	10	-	-	-
Climax shrub	-	-	15	20

Note: a dash (-) indicates no percent cover data were collected

Landscape Evaluation and Resource Classification:

Eighty-four percent of the habitat of the 200-W Burial Grounds EU is associated with waste sites and roads and is classified as either a level 0 or a level 1 resource (Table J.30). Remnant shrub-steppe habitat (level 2 and level 3 resources) cover the remaining 16% of the EU (Figure J.32).

Table J.30. Area and Proportion of Each Biological Resource Level Within the 200-W Burial Grounds Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources.

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
0	298.7	1017.9	1316.6	17.91%	20.23%	2.31%
1	95.0	174.7	269.7	3.67%	2.38%	-1.29%
2	41.6	2952.2	2993.8	40.73%	40.17%	-0.57%
3	33.4	906.4	939.7	12.79%	12.33%	-0.45%
4	0.0	1830.0	1830.0	24.90%	24.90%	0.00%
5	0	0	0	0	0	0.00%
Total	468.7	6881.1	7349.8	100.00%	100.00%	

¹ Resource levels for both the evaluation unit and adjacent landscape boundary were reviewed in the field and via imagery during May-August 2015 and revised to reflect current habitats conditions.

² Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.

The amount and proximity of biological resources surrounding the 200-W Burial Grounds EU were examined within the adjacent landscape buffer area, which extends 10,078 ft (3072 m) from the geometric center of the EU. The buffer area encompasses nearly all of the 200-W Area (Figure J.32) and relatively undisturbed areas north and east of the Area fence. The areas within the 200-W area comprise a mosaic of highly disturbed industrial areas, pockets of successional habitat (primarily level 2 resources) and remnants of higher quality climax shrub-steppe vegetation along the eastern edge of the 200-W Area (Figure J.32). Habitat to the east and north of the 200-W fence comprises all of the level 4 resources within the combined EU and buffer area (1830 acres) and nearly all of the 940 acres of level 3 resources (96%).

Part of the west side of the combined EU and buffer area was revegetated with a mixture of native and non-native grasses and shrubs classified as a level 2 resource. There are no level 5 resources identified within the combined EU and buffer area.

Assumptions and Uncertainty:

Although all observations for species of concern and current conditions of biological resources were noted during surveys and evaluations conducted in 2015, the presence or absence of species cannot be assumed or predicted for future years. Field reconnaissance and surveys of evaluation units at the time of remediation will need to be conducted to verify resources and evaluate ecological conditions at that time.

Summary of Ecological Review:

- Approximately 93% of the EU consists of biological resources classified as level 2 resources or below.
- Level 3 resources within the EU contain big sagebrush, but the understory is dominated by introduced and invasive forb and grass. Loss of these isolated patches of habitat is not expected to significantly affect connectivity with habitat outside the 200-W Area.
- 62% of the combined EU and adjacent landscape buffer area is classified as level 2 resources or below.

References:

- DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 0.
- U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act. <http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>
- U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington. http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902
- Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. <http://wdfw.wa.gov/conservation/phs/list/>
- Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington. <http://wdfw.wa.gov/conservation/endangered/>
- Washington Noxious Weed Control Board. 2014. Noxious Weed List. <http://www.nwcb.wa.gov/>
- Washington State Department of Natural Resources. 2014. Washington Natural Heritage Program Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

Definitions and Acronyms:

Adjacent Landscape Buffer – a circular area adjacent to and outside the EU boundary with the center of the circle at the centroid of the EU, and with a radius that is 1 times the maximum

dimension (width or length—whichever is greatest). This circular buffer area is used to evaluate indirect effects and assess the remediation in relation to the landscape features and resources adjacent to the EU. This circular area is generally at least 3 times the area of the EU.

Biological Resource Levels (from DOE-RL-96-32-01) –

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats.
- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks.
- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub-steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.
- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.
- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.
- Level 0 resources consist of non-native plants and animals (unless otherwise listed at a higher level), non-vegetated areas, and industrial areas.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

MBTA – Migratory Bird Treaty Act; referring to species listed and protected under the federal Act.

PNNL ECAP (Ecological Compliance and Assessment Project) Database – PNNL performed ecological reviews for individual projects and annually surveyed selected areas and buildings on the Hanford Site for DOE-RL under the DOE's Public Safety and Resource Protection Program until 2011. The data collected during those surveys is archived in the ECAP database, and is used to supplement ecological evaluations as available.

Priority Habitats – Priority habitats are habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type (e.g., shrub-steppe) or dominant plant species (e.g., juniper savannah), a described successional stage (e.g., old-growth forest), or a specific habitat feature (e.g., cliffs).

Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being

threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

Field Data Records

Plant Species Identified During Visual Surveys May 27 and September 3, 2015 200-West Burial Grounds EU			
Patch ID	Name	Common name	Abundance
0-1	<i>Agropyron cristatum</i>	crested wheatgrass	25
1-1	<i>Bromus tectorum</i>	cheatgrass	20
1-1	<i>Salsola tragus</i>	Russian thistle	30
1-2	<i>Agropyron cristatum</i>	crested wheatgrass	30
2-1	<i>Bromus tectorum</i>	cheatgrass	35
2-1	<i>Agropyron cristatum</i>	crested wheatgrass	5
2-1	<i>Hesperostipa comata</i>	needle-and-thread grass	
2-1	<i>Salsola tragus</i>	Russian thistle	15
2-1	<i>Atriplex species</i>		5
2-2	<i>Artemisia tridentata</i>	big sagebrush	15
2-2	<i>Bromus tectorum</i>	cheatgrass	30
2-2	<i>Agropyron cristatum</i>	crested wheatgrass	5
2-2	<i>Salsola tragus</i>	Russian thistle	15
2-2	<i>Penstemon acuminatus</i>	sand beardtongue	
2-2	<i>Poa secunda</i>	Sandberg's bluegrass	10
2-2	<i>Atriplex species</i>		2
2 N	<i>Sitanion hystrix</i>	bottlebrush grass	
2 N	<i>Astragalus caricinus</i>	buckwheat milkvetch	
2 N	<i>Bromus tectorum</i>	cheatgrass	40
2 N	<i>Descurainia sophia</i>	flixweed	
2 N	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	10
2 N	<i>Machaeranthera canescens</i>	hoary aster	
2 N	<i>Chaenactis douglasii</i>	hoary falseyarrow	
2 N	<i>Achnatherum hymenoides</i>	indian ricegrass	
2 N	<i>Phlox longifolia</i>	longleaf phlox	
2 N	<i>Cryptantha circumscissa</i>	matted cryptantha	
2 N	<i>Hesperostipa comata</i>	needle-and-thread grass	
2 N	<i>Salsola tragus</i>	Russian thistle	2
2 N	<i>Sporobolus cryptandrus</i>	sand dropseed	
2 N	<i>Poa secunda</i>	Sandberg's bluegrass	15
2 N	<i>Crepis atriobarba</i>	slender hawksbeard	
2 N	<i>Agropyron dasytachyum</i>	thickspike wheatgrass	
2 N	<i>Achillea millefolium</i>	yarrow	
2 N	<i>Tragopogon dubius</i>	Yellow salsify	
2 N	<i>Melilotus altissimus</i>		
2 N	<i>unknown Chenopod</i>		
3-1	<i>Artemisia tridentata</i>	big sagebrush	20
3-1	<i>Bromus tectorum</i>	cheatgrass	20
3-1	<i>Salsola tragus</i>	Russian thistle	25

Bird, Mammal and Herpetofauna Species May 27 and September 3, 2015 200-West Burial Grounds EU			
Patch ID	Name	Common name	Comment
2 North	<i>Eremophila alpestris</i>	horned lark	
2 North	<i>Sturnella neglecta</i>	western meadowlark	
2 North	<i>Uta stansburiana</i>	side-blotched lizard	
2 North	<i>Thomomys talpoides</i>	northern pocket gopher	burrow

Evaluation Unit: 200-W Miscellaneous Waste Sites
ID: CP-LS-13
Group: Legacy Source
Operable Unit Cross-Walk: 200-QA-1, 200-WA-1, 200-IS-1
Related EU: CP-LS-7
Sites & Facilities: Waste sites, buildings, and structures associated with maintenance operations, laundry, and coal power plant in the west/central portion of 200-W.
Key Data Sources Docs: DOE-RL-96-32-01; PNNL ECAP Database¹⁷; Mission Support Alliance maps¹⁸
Field Survey Dates: 05/27 and 28/2015
Datasheet prepared by: MAC, KDH, SAM 11/3/2015
Datasheet reviewed by:

¹ The Ecological Compliance and Assessment Project (ECAP) database was developed and maintained by Pacific Northwest National Laboratory (PNNL) to manage and archive ecological assessment data collected on Hanford until 2011.

¹⁸MSA (Mission Support Alliance) maintains biological resource information for the Hanford Site for the Department of Energy.

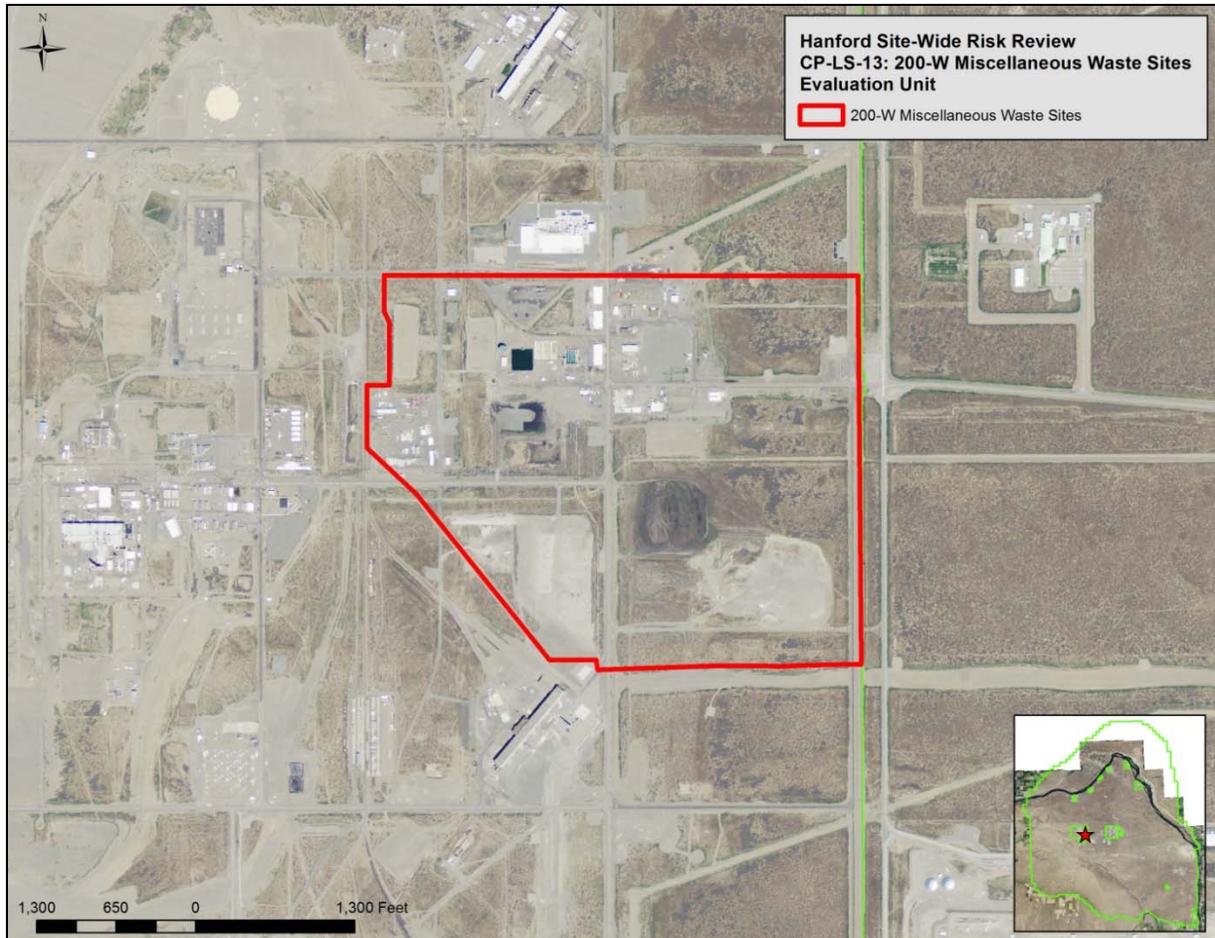


Figure J.33. CP-LS-13 (200-W Miscellaneous Waste Sites) Site Location Map

CP-LS-13: 200-W Miscellaneous Waste Sites

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the current Endangered and Threatened Species (Federal and State) distribution data; priority habitats as defined by Washington Department of Fish and Wildlife; available current aerial imagery, locations of Hanford Site waste units and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data records.

The following steps were taken to assess the EU associated with 200-W Miscellaneous Waste Sites:

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. A visual survey was conducted within the EU boundary by experienced shrub-steppe ecologists. PNNL biologists also reviewed the observations and biological survey data available in the Ecological Compliance and Assessment Project (ECAP) database from 2009 and 2010 for areas within the EU to supplement the evaluation with previous percent vegetation cover.
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2013 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.
6. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

Pedestrian surveys of the 200-W Miscellaneous Waste Sites EU were performed over two days in May, 2015. The EU habitat is fragmented by waste sites, pipelines, buildings, well pads and roads that are all free of vegetation. Part of the EU contains highly disturbed habitat where cheatgrass (*Bromus tectorum*), *Amsinckia* species (a native weedy forb) and several introduced forbs typically occur. About a third of the EU is classified as a level 2 resource dominated by native grasses (primarily Sandberg's bluegrass [*Poa secunda*]) (Table J.31). Gray rabbitbrush (*Ericameria nauseosa*) is also present in many of the level 2 patches, where it forms a stable long-term community with the grasses.

Table J.31. Percent Canopy Cover and Surface Cover Estimated at the 200-W Miscellaneous Waste Sites Evaluation Unit

Survey Areas (% cover)							
Vegetation/Surface Cover	2-1	2-2	2-3	2-4	2-6	2-7	2-8
Bare Ground	-	-	-	-	-	-	-
Introduced forb	20	20	25	40	60	-	5
Introduced grass	40	40	25	15	-	10	-
Native forb	-	-	-	5	-	-	-
Native grass	25	25	10	-	15	5	20
Successional shrub	10	2	-	-	-	15	15
Climax shrub	-	-	-	-	-	-	-
Survey Areas (% cover)							
Vegetation/Surface Cover	2-9	2-10	2-11	2-12c	3-1	3-2	3-3
Bare Ground	-	-	-	-	-	-	-
Introduced forb	5	-	-	5	-	-	-
Introduced grass	20	5	10	20	40	30	25
Native forb	-	-	-	-	-	-	-
Native grass	10	25	28	10	8	15	5
Successional shrub	5	15	20	-	-	-	-
Climax shrub	-	-	-	-	25	20	20

Note: a dash (-) indicates no percent cover data were collected

Large patches of level 3 biological resources occur along the east side of the EU where big sagebrush (*Artemisia tridentata*) provides up to 25% cover and cheatgrass and native grasses are the dominant understory species (Table J.31). Field data records at the end of this section provide lists of the plants and animals observed during the May 2015 surveys.

Landscape Evaluation and Resource Classification:

Habitat within the EU is fragmented by the numerous buildings, roads, pipelines and waste sites (Figure J.34). Over 87% of the EU is classified as a level 2 or below resource (Table J.32). Level 3 resources form the remaining 13% biological resources, occurring primarily along the east side of the EU and 200-W Area.

Approximately 350 ft (106 m) separates level 3 habitat in the EU from level 4 habitat outside the 200-W Area. Several small circular patches of level 3 resources within the EU indicate previous locations of Piper's daisy (*Erigeron piperianus*), a Washington state sensitive species. Although none were observed in 2015, it is considered likely to occur in the EU.

The amount and proximity of biological resources surrounding the 200-W Miscellaneous Waste Sites EU were examined within the adjacent landscape buffer area, which extends 5027 ft (1532 m) from the geometric center of the EU. Much of the buffer area falls within the 200-W Area (Figure J.34). Within the combined EU and adjacent buffer area, 65% of the biological resources

are classified as level 2 or below. Most of these lower quality resources occur within the EU and are also fragmented by buildings, roads and waste sites.

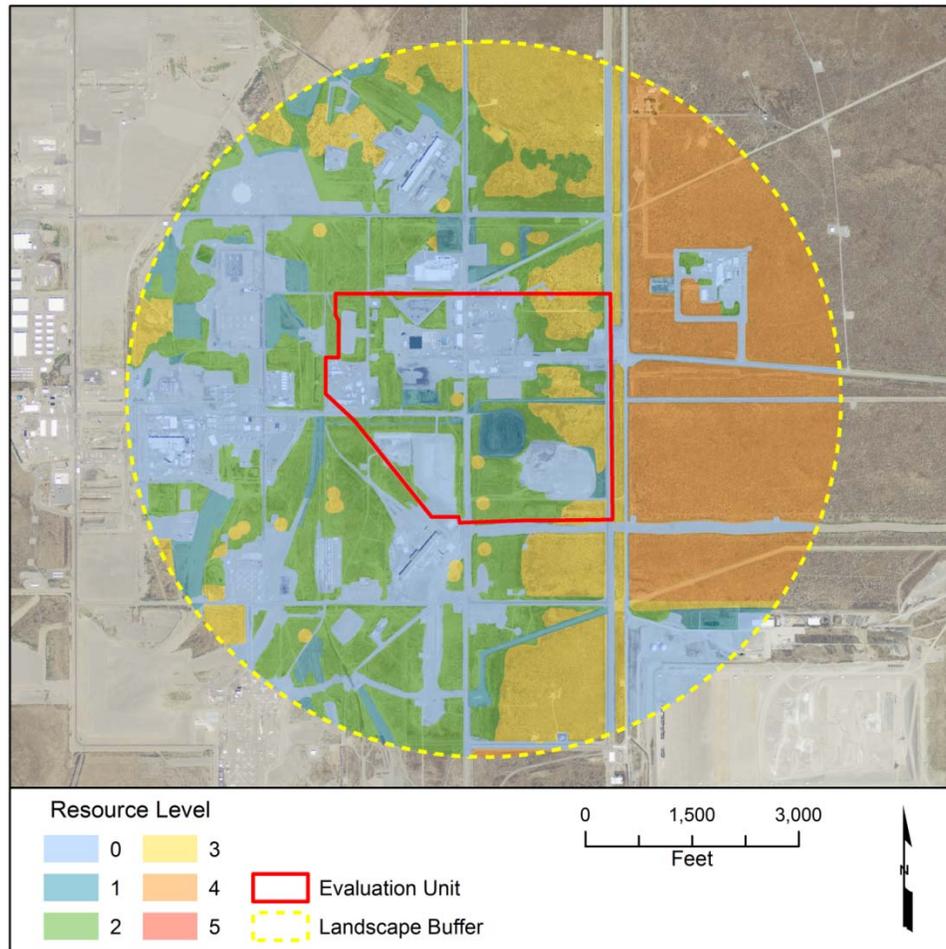


Figure J.34. Biological Resource Level Classifications Based on May 27 and 28, 2015 Surveys at the 200-W Miscellaneous Waste Sites Evaluation Unit (red solid line) and Adjacent Landscape Buffer Area (yellow dashed line).

Level 3 resources (15% of the combined EU and buffer area) occur in a north-south band in the middle of the combined EU and buffer area. These patches contain shrub-steppe communities dominated by big sagebrush (~25% cover) with cheatgrass and a mixture of native forbs and grasses in the understory. Level 4 resources occur outside the EU and 200-W Area boundaries within the eastern portion of the buffer area and cover nearly 20% of the combined EU and buffer area.

Table J.32. Area and Proportion of Each Biological Resource Level Within the 200-W Miscellaneous Waste Sites Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources.

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
0	128.1	481.9	610.1	33.03%	40.68%	7.65%
1	19.3	78.0	97.3	5.27%	4.22%	-1.04%
2	88.1	402.9	491.0	26.58%	21.81%	-4.77%
3	34.0	252.3	286.3	15.50%	13.66%	-1.84%
4	0	362.6	362.6	19.63%	19.63%	0.00%
5	0	0	0	0.00%	0.00%	0.00%
Total	269.6	1577.7	1847.3	100.00%	100.00%	

¹ Resource levels for both the evaluation unit and adjacent landscape boundary were reviewed in the field and via imagery during May-August 2015 and revised to reflect current habitats conditions.

² Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.

Assumptions and Uncertainty:

Although all observations for species of concern and current conditions of biological resources were noted during surveys and evaluations conducted in 2015, the presence or absence of species cannot be assumed or predicted for future years. Field reconnaissance and surveys of evaluation units at the time of remediation will need to be conducted to verify resources and evaluate ecological conditions at that time.

Summary of Ecological Review:

- 87% of the 200-W Miscellaneous Waste Sites EU is classified as resource level 2 or below. The remaining EU landscape is classified as a level 3 resource dominated by big sagebrush. Loss of this habitat during cleanup activities is not expected to significantly impact connectivity with habitats outside the 200-W Area, represents a decrease in the available level 3 habitat.
- 65% of the combined EU and adjacent landscape buffer area is classified as resource level 2 or below.
- Approximately 35% of the combined EU and buffer area is classified as a resource level 3 or level 4. Most of this habitat occurs along the east half of the combined area.
- In the past, Piper's daisy, a state sensitive species, has been observed at numerous locations within the EU, however, none were observed in 2015. It is considered likely to occur in the area. Loss of individual Piper's daisies is not expected to affect population viability.

- The southeastern most edge of the buffer area falls within habitat identified as black-tailed jackrabbit habitat (MSA 2015).

References:

- DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 0.
- U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act. <http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>
- U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington. http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902
- Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. <http://wdfw.wa.gov/conservation/phs/list/>
- Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington. <http://wdfw.wa.gov/conservation/endangered/>
- Washington Noxious Weed Control Board. 2014. Noxious Weed List. <http://www.nwcb.wa.gov/>
- Washington State Department of Natural Resources. 2014. Washington Natural Heritage Program Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

Definitions and Acronyms:

Adjacent Landscape Buffer – a circular area adjacent to and outside the EU boundary with the center of the circle at the centroid of the EU, and with a radius that is 1 times the maximum dimension (width or length—whichever is greatest). This circular buffer area is used to evaluate indirect effects and assess the remediation in relation to the landscape features and resources adjacent to the EU. This circular area is generally at least 3 times the area of the EU.

Biological Resource Levels (from DOE-RL-96-32-01) –

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats.
- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks.
- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub-steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.

- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.
- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.
- Level 0 resources consist of non-native plants and animals (unless otherwise listed at a higher level), non-vegetated areas, and industrial areas.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

MBTA – Migratory Bird Treaty Act; referring to species listed and protected under the federal Act.

PNNL ECAP (Ecological Compliance and Assessment Project) Database – PNNL performed ecological reviews for individual projects and annually surveyed selected areas and buildings on the Hanford Site for DOE-RL under the DOE's Public Safety and Resource Protection Program until 2011. The data collected during those surveys is archived in the ECAP database, and is used to supplement ecological evaluations as available.

Priority Habitats – Priority habitats are habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type (e.g., shrub-steppe) or dominant plant species (e.g., juniper savannah), a described successional stage (e.g., old-growth forest), or a specific habitat feature (e.g., cliffs).

Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

Field Data Records

Plant Species Identified During Visual Surveys May 27 and 28, 2015 200-West Maintenance Waste Sites EU			
Patch ID	Name	Common name	Abundance
0-1	<i>Amsinckia lycopsoides</i>	fiddleneck	
0-1	<i>Artemisia tridentata</i>	big sagebrush	1
1-1	<i>Bromus tectorum</i>	cheatgrass	35
1-1	<i>Salsola tragus</i>	Russian thistle	
1-1	<i>Stephanomeria paniculata</i>	stiff wirelettuce	
1-2	<i>Amsinckia species</i>		
1-2	<i>Bromus tectorum</i>	cheatgrass	
1-2	<i>Ericameria nauseosa</i>	gray rabbitbrush	
1-2	<i>Lactuca serriola</i>	prickly lettuce	
1-2	<i>Mentzelia albicaulis</i>	whitestem stickleaf	
1-2	<i>Poa secunda</i>	Sandberg's bluegrass	
1-2	<i>Salsola tragus</i>	Russian thistle	
1-2	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	
1-2	<i>Tragopogon dubius</i>	Yellow salsify	
2-1	<i>Achillea millefolium</i>	yarrow	
2-1	<i>Achnatherum hymenoides</i>	indian ricegrass	
2-1	<i>Agropyron cristatum</i>	crested wheatgrass	
2-1	<i>Amsinckia lycopsoides</i>	fiddleneck	
2-1	<i>Amsinckia species</i>		
2-1	<i>Artemisia tridentata</i>	big sagebrush	
2-1	<i>Astragalus caricinus</i>	buckwheat milkvetch	
2-1	<i>Balsamorhiza careyana</i>	Carey's balsamroot	
2-1	<i>Bromus tectorum</i>	cheatgrass	40
2-1	<i>Bromus tectorum</i>	cheatgrass	5
2-1	<i>Chenopodium leptophyllum</i>	slimleaf goosefoot	
2-1	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	
2-1	<i>Cryptantha fendleri</i>	Fendler's cryptantha	
2-1	<i>Descurainia pinnata</i>	western tansymustard	
2-1	<i>Ericameria nauseosa</i>	gray rabbitbrush	10
2-1	<i>Hesperostipa comata</i>	needle-and-thread grass	
2-1	<i>Machaeranthera canescens</i>	hoary aster	
2-1	<i>Mentzelia albicaulis</i>	whitestem stickleaf	
2-1	<i>Poa bulbosa</i>	bulbous bluegrass	
2-1	<i>Poa secunda</i>	Sandberg's bluegrass	25
2-1	<i>Pteryxia terebinthina var. terebinthina</i>	turpentine springparsley	
2-1	<i>Rumex venosus</i>	winged dock	
2-1	<i>Salsola tragus</i>	Russian thistle	20
2-1	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	
2-1	<i>Sporobolus cryptandrus</i>	sand dropseed	
2-1	<i>Stephanomeria paniculata</i>	stiff wirelettuce	
2-1	<i>Tragopogon dubius</i>	Yellow salsify	
2-2	<i>Achillea millefolium</i>	yarrow	
2-2	<i>Achnatherum hymenoides</i>	indian ricegrass	

Plant Species Continued			
May 27 and 28, 2015 200-West Maintenance Waste Sites EU			
Patch ID	Name	Common name	Abundance
2-2	<i>Amsinckia lycopsoides</i>	fiddleneck	
2-2	<i>Artemisia tridentata</i>	big sagebrush	
2-2	<i>Astragalus caricinus</i>	buckwheat milkvetch	
2-2	<i>Bromus tectorum</i>	cheatgrass	40
2-2	<i>Cryptantha fendleri</i>	Fendler's cryptantha	
2-2	<i>Descurainia pinnata</i>	western tansymustard	
2-2	<i>Ericameria nauseosa</i>	gray rabbitbrush	2
2-2	<i>Machaeranthera canescens</i>	hoary aster	
2-2	<i>Poa bulbosa</i>	bulbous bluegrass	
2-2	<i>Poa secunda</i>	Sandberg's bluegrass	
2-2	<i>Rumex venosus</i>	winged dock	
2-2	<i>Salsola tragus</i>	Russian thistle	20
2-2	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	
2-2	<i>Sporobolus cryptandrus</i>	sand dropseed	
2-2	<i>Tragopogon dubius</i>	Yellow salsify	
2-3	<i>Amsinckia species</i>		
2-3	<i>Astragalus caricinus</i>	buckwheat milkvetch	
2-3	<i>Bromus tectorum</i>	cheatgrass	25
2-3	<i>Descurainia sophia</i>	flixweed	
2-3	<i>Salsola tragus</i>	Russian thistle	25
2-3	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	
2-4	<i>Achnatherum hymenoides</i>	indian ricegrass	
2-4	<i>Bromus tectorum</i>	cheatgrass	15
2-4	<i>Descurainia sophia</i>	flixweed	
2-4	<i>Ericameria nauseosa</i>	gray rabbitbrush	
2-4	<i>Holosteum umbellatum</i>	jagged chickweed	
2-4	<i>Mentzelia albicaulis</i>	whitestem stickleaf	5
2-4	<i>Poa bulbosa</i>	bulbous bluegrass	
2-4	<i>Salsola tragus</i>	Russian thistle	40
2-4	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	
2-6	<i>Bromus tectorum</i>	cheatgrass	
2-6	<i>Descurainia sophia</i>	flixweed	
2-6	<i>Ericameria nauseosa</i>	gray rabbitbrush	
2-6	<i>Mentzelia albicaulis</i>	whitestem stickleaf	
2-6	<i>Poa bulbosa</i>	bulbous bluegrass	
2-6	<i>Poa secunda</i>	Sandberg's bluegrass	
2-6	<i>Salsola tragus</i>	Russian thistle	60
2-6	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	
2-6	<i>Tragopogon dubius</i>	Yellow salsify	
2-7	<i>Astragalus caricinus</i>	buckwheat milkvetch	
2-7	<i>Bromus tectorum</i>	cheatgrass	10
2-7	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	
2-7	<i>Ericameria nauseosa</i>	gray rabbitbrush	15
2-7	<i>Festuca microstachys</i>	small sixweeks	
2-7	<i>Machaeranthera canescens</i>	hoary aster	
2-7	<i>Poa secunda</i>	Sandberg's bluegrass	5
2-7	<i>Salsola tragus</i>	Russian thistle	
2-7	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	

Plant Species Continued			
May 27 and 28, 2015 200-West Maintenance Waste Sites EU			
Patch ID	Name	Common name	Abundance
2-8	<i>Agropyron cristatum</i>	crested wheatgrass	
2-8	<i>Bromus tectorum</i>	cheatgrass	
2-8	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	
2-8	<i>Ericameria nauseosa</i>	gray rabbitbrush	15
2-8	<i>Machaeranthera canescens</i>	hoary aster	
2-8	<i>Poa secunda</i>	Sandberg's bluegrass	20
2-8	<i>Salsola tragus</i>	Russian thistle	5
2-9	<i>Agropyron cristatum</i>	crested wheatgrass	
2-9	<i>Artemisia tridentata</i>	big sagebrush	
2-9	<i>Bromus tectorum</i>	cheatgrass	20
2-9	<i>Ericameria nauseosa</i>	gray rabbitbrush	5
2-9	<i>Machaeranthera canescens</i>	hoary aster	
2-9	<i>Poa bulbosa</i>	bulbous bluegrass	
2-9	<i>Poa secunda</i>	Sandberg's bluegrass	10
2-9	<i>Salix species</i>	Salix species	
2-9	<i>Salsola tragus</i>	Russian thistle	5
2-9	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	
2-10	<i>Agropyron cristatum</i>	crested wheatgrass	
2-10	<i>Bromus tectorum</i>	cheatgrass	5
2-10	<i>Ericameria nauseosa</i>	gray rabbitbrush	15
2-10	<i>Machaeranthera canescens</i>	hoary aster	
2-10	<i>Poa secunda</i>	Sandberg's bluegrass	25
2-10	<i>Salsola tragus</i>	Russian thistle	
2-10	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	
2-10	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	
2-10	<i>Sporobolus cryptandrus</i>	sand dropseed	
2-11	<i>Bromus tectorum</i>	cheatgrass	10
2-11	<i>Ericameria nauseosa</i>	gray rabbitbrush	20
2-11	<i>Poa secunda</i>	Sandberg's bluegrass	28
2-11	<i>Salsola tragus</i>	Russian thistle	
2-11	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	
3-1	<i>Achillea millefolium</i>	yarrow	
3-1	<i>Achnatherum hymenoides</i>	indian ricegrass	
3-1	<i>Agropyron cristatum</i>	crested wheatgrass	
3-1	<i>Ambrosia acanthicarpa</i>	bur ragweed	
3-1	<i>Amsinckia hycopsoides</i>	fiddleneck	
3-1	<i>Amsinckia species</i>		
3-1	<i>Artemisia tridentata</i>	big sagebrush	25
3-1	<i>Astragalus carnicinus</i>	buckwheat milkvetch	
3-1	<i>Astragalus sclerocarpus</i>	stalked-pod milkvetch	
3-1	<i>Balsamorhiza careyana</i>	Carey's balsamroot	
3-1	<i>Bromus tectorum</i>	cheatgrass	40
3-1	<i>Calochortus macrocarpus</i>	sagebrush mariposa lily	
3-1	<i>Chenopodium leptophyllum</i>	slimleaf goosefoot	
3-1	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	
3-1	<i>Crepis atriobarba</i>	slender hawkbeard	
3-1	<i>Cryptantha circumscissa</i>	matted cryptantha	
3-1	<i>Cryptantha fendleri</i>	Fendler's cryptantha	
3-1	<i>Descurainia pinnata</i>	western tansymustard	
3-1	<i>Festuca microstachys</i>	small sixweeks	

Plant Species Continued			
May 27 and 28, 2015 200-West Maintenance Waste Sites EU			
Patch ID	Name	Common name	Abundance
3-1	<i>Layia glandulosa</i>	white-daisy tidytops	
3-1	<i>Mentzelia albicaulis</i>	whitestem stickleaf	
3-1	<i>Orobanche species</i>		
3-1	<i>Poa secunda</i>	Sandberg's bluegrass	
3-1	<i>Pteryxia terebinthina var. terebinthina</i>	turpentine springparsley	
3-1	<i>Purshia tridentata</i>	bitterbrush	
3-1	<i>Rumex venosus</i>	winged dock	
3-1	<i>Salsola tragus</i>	Russian thistle	
3-1	<i>Sisymbrium altissimum</i>	Jim Hill's tumblemustard	
3-1	<i>Tragopogon dubius</i>	Yellow salsify	
3-2	<i>Achillea millefolium</i>	yarrow	
3-2	<i>Achnatherum hymenoides</i>	indian ricegrass	
3-2	<i>Agropyron cristatum</i>	crested wheatgrass	
3-2	<i>Ambrosia acanthicarpa</i>	bur ragweed	
3-2	<i>Amsinckia tessellata</i>	devil's lettuce	
3-2	<i>Artemisia tridentata</i>	big sagebrush	20
3-2	<i>Astragalus caricinus</i>	buckwheat milkvetch	
3-2	<i>Balsamorhiza careyana</i>	Carey's balsamroot	
3-2	<i>Bromus tectorum</i>	cheatgrass	30
3-2	<i>Calochortus macrocarpus</i>	sagebrush mariposa lily	
3-2	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	
3-2	<i>Comandra umbellata</i>	bastard toadflax	
3-2	<i>Cryptantha fendleri</i>	Fendler's cryptantha	
3-2	<i>Descurainia pinnata</i>	western tansymustard	
3-2	<i>Ericameria nauseosa</i>	gray rabbitbrush	
3-2	<i>Festuca microstachys</i>	small sixweeks	
3-2	<i>Hesperostipa comata</i>	needle-and-thread grass	
3-2	<i>Hesperostipa comata</i>	needle-and-thread grass	
3-2	<i>Machaeranthera canescens</i>	hoary aster	
3-2	<i>Poa secunda</i>	Sandberg's bluegrass	20
3-2	<i>Pteryxia terebinthina var. terebinthina</i>	turpentine springparsley	
3-2	<i>Rumex venosus</i>	winged dock	
3-2	<i>Salsola tragus</i>	Russian thistle	
3-2	<i>Sisymbrium altissimum</i>	Jim Hill's tumblemustard	
3-2	<i>Sporobolus cryptandrus</i>	sand dropseed	
3-2	<i>Tragopogon dubius</i>	Yellow salsify	
3-3	<i>Achillea millefolium</i>	yarrow	
3-3	<i>Achnatherum hymenoides</i>	indian ricegrass	
3-3	<i>Agropyron cristatum</i>	crested wheatgrass	
3-3	<i>Ambrosia acanthicarpa</i>	bur ragweed	
3-3	<i>Artemisia tridentata</i>	big sagebrush	20
3-3	<i>Astragalus caricinus</i>	buckwheat milkvetch	
3-3	<i>Astragalus sclerocarpus</i>	stalked-pod milkvetch	
3-3	<i>Balsamorhiza careyana</i>	Carey's balsamroot	
3-3	<i>Bromus tectorum</i>	cheatgrass	25
3-3	<i>Calochortus macrocarpus</i>	sagebrush mariposa lily	
3-3	<i>Chaenactis douglasii</i>	hoary falseyarrow	
3-3	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	

Plant Species Continued May 27 and 28, 2015 200-West Maintenance Waste Sites EU			
Patch ID	Name	Common name	Abundance
3-3	<i>Comandra umbellata</i>	bastard toadflax	
3-3	<i>Crepis atriobarba</i>	slender hawksbeard	
3-3	<i>Cryptantha circumscissa</i>	matted cryptantha	
3-3	<i>Descurainia pinnata</i>	western tansymustard	
3-3	<i>Gilia sinuata</i>	shy gilia	
3-3	<i>Hesperostipa comata</i>	needle-and-thread grass	
3-3	<i>Lactuca serriola</i>	prickly lettuce	
3-3	<i>Mentzelia albicaulis</i>	whitestem stickleaf	
3-3	<i>Penstemon acuminatus</i>	sand beardtongue	
3-3	<i>Phlox longifolia</i>	longleaf phlox	
3-3	<i>Poa secunda</i>	Sandberg's bluegrass	
3-3	<i>Pteryxia terebinthina var. terebinthina</i>	turpentine springparsley	
3-3	<i>Rumex venosus</i>	winged dock	
3-3	<i>Salsola tragus</i>	Russian thistle	
3-3	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	
3-3	<i>Sitanion hystrix</i>	bottlebrush grass	
3-3	<i>Stephanomeria paniculata</i>	stiff wirelettuce	
3-3	<i>Tragopogon dubius</i>	Yellow salsify	
3-3	<i>Vulpia microstachys</i>	small fescue	
3-3	<i>Vulpia octoflora</i>	sixweeks fescue	

Percent Canopy Cover of Herbaceous Species Measured in 0.5 m2 quadrats May 27, 2015, 200-West Maintenance Waste Sites																	
Survey Area	Species	Origin & Class	Q1	Q2	Q3	Q4	Q5	Q6	Q7*	Q8	Q9	Q10	Q11	Q12	sum	Mean Canopy Cover	Freq
2-1	Litter	Litter	40	50	50	30	40	35	50	45	45	35	30	20	470	39.17	1.00
2-1	Bare	Bare	6	10	20	60	36	30	25	8	24	25	20	40	304	25.33	1.00
2-1	Saka	IF	4	13	2	1	4	1	2	1	4	2	2	34	70	5.83	1.00
2-1	Brte	IG	50	60	30	18	45	40	40	35	15	35	22	16	406	33.83	1.00
2-1	Orhy	NG				10	25				35			24	94	7.83	0.33
2-1	Asca	NF				1									1	0.08	0.08
2-1	Chvi	NS							40						40	3.33	0.08
2-1	Posa	NG								2	15		10		27	2.25	0.25
2-1	Ruve	NF								1					1	0.08	0.08
2-1	Stco	NG									22	18	4		44	3.67	0.25

Notes: * 20 of litter is dead Chvi branches

Shrub Canopy Measured by Line-Intercept Methods on 50m Transect May 27, 2015, 200-West Maintenance Waste Sites						
Survey Area	Species	Transect Distance (total)	Start	Stop	Dif	Height (cm)
2-1	Chvi	50	34.85	35.73	0.88	0.92

Percent Canopy Cover of Herbaceous Species Measured in 0.5 m ² quadrats May 27, 2015, 200-West Maintenance Waste Sites																	
Survey Area	Species	Origin & Class	Q1	Q2	Q3	Q4	Q5	Q6	Q7*	Q8	Q9	Q10	Q11	Q12	sum	Mean Canopy Cover	Freq
3-1	Litter	Litter	30	45	60	30	20	30	18	40	50	22	75	5	425	35.42	1.00
3-1	Bare	Bare	18	25	8	40	5	30	60	8	35	32	8	95	364	30.33	1.00
3-1	Brte	IG	35	12	8	28	30	55	25	17	1	25		2	238	19.83	0.92
3-1	Vumi	NG	25	10	7	5	2	1	8	2		35			95	7.92	0.75
3-1	Depi	IG	1												1	0.08	0.08
3-1	Crust	Crust	1	28	15		80	15	3	30					172	14.33	0.58
3-1	Artr	NS		1	35	60		4		60	100		96		356	29.67	0.58
3-1	Pose	NG		16	14	2	1		2	18	3		5		61	5.08	0.67
3-1	Orhy	NG				4									4	0.33	0.08
3-1	Ruve	NF						2	4						6	0.50	0.17
3-1	Saka	IF							8	16	1	1			26	2.17	0.33
3-1	Crci	NF							1						1	0.08	0.08
3-1	Cama	NF								1					1	0.08	0.08

Shrub Canopy Measured by Line-Intercept Methods on 50m Transect May 27, 2015, 200-West Maintenance Waste Sites						
Survey Area	Species	Transect Distance (total)	Start	Stop	Dif	Height (cm)
3-1	Artr	50	3.15	4.85	1.70	133
3-1	Artr	50	8.4	9.65	1.25	170
3-1	Artr	50	11.05	11.4	0.35	83
3-1	Artr	50	13.35	15.15	1.80	150
3-1	Artr	50	17.85	18.4	0.55	160
3-1	Chna	50	22	22.2	0.20	55
3-1	Artr	50	33.65	35.7	2.05	138
3-1	Artr	50	37.9	38.5	0.60	105
3-1	Artr	50	39.8	41.25	1.45	165
3-1	Artr	50	47.72	49.7	1.98	137

Bird, Mammal and Herpetofauna Species May 27 and 28, 2015 200-West Maintenance Waste Sites EU			
Patch ID	Name	Common name	Comment
0-1	<i>Hirundo pyrrhonota</i>	cliff swallow	dozens nesting and foraging
0-1	<i>Passer domesticus</i>	house sparrow	1, probably nest nearby
0-1	<i>Columba livia</i>	rock dove	2 on conex, 2 on tank
0-1	<i>Hirundo rustica</i>	barn swallow	1 fly over
0-1	<i>Charadrius vociferus</i>	killdeer	2 in gravel between basins
0-1	<i>Tyrannus verticalis</i>	western kingbird	1 perched
0-1	<i>Sturnus vulgaris</i>	European starling	
0-1	<i>Sylvilagus nutalli</i>	mountain cottontail	laydown yard
0-2	<i>Sayornis saya</i>	Say's phoebe	1 perched on building
1-2	<i>Sturnella neglecta</i>	western meadowlark	1 perch shrub
2-1	<i>Hirundo pyrrhonota</i>	cliff swallow	foraging
2-1	<i>Pica pica</i>	black-billed magpie	
2-1	<i>Sturnella neglecta</i>	western meadowlark	flying over
2-1	<i>Eremophila alpestris</i>	horned lark	flying over
2-1	<i>Canis latrans</i>	coyote	tracks
2-1	<i>Sylvilagus nutalli</i>	mountain cottontail	tracks
2-2	<i>Zenaida macroura</i>	mourning dove	1 flew by
2-2	<i>Sturnus vulgaris</i>	European starling	
2-2		unidentified small mammal	holes
2-4		unidentified small mammal	
2-7	<i>Hirundo pyrrhonota</i>	cliff swallow	several flew over
2-9	<i>Eremophila alpestris</i>	horned lark	sing
2-9	<i>Sturnella neglecta</i>	western meadowlark	sing
2-9	<i>Charadrius vociferus</i>	killdeer	1 call
2-9	<i>Carpodacus mexicanus</i>	house finch	4 perched wire
2-9	<i>Sayornis saya</i>	Say's phoebe	1 perch fence
2-10	<i>Sturnella neglecta</i>	western meadowlark	sing nearby
2-10	<i>Eremophila alpestris</i>	horned lark	sing
2-10	<i>Sayornis saya</i>	Say's phoebe	foraging
3-1	<i>Sturnella neglecta</i>	western meadowlark	several singing, perched
3-1	<i>Eremophila alpestris</i>	horned lark	singing nearby, perched
3-1	<i>Hirundo pyrrhonota</i>	cliff swallow	several foraging
3-1	<i>Uta stansburiana</i>	side-blotched lizard	3
3-1	<i>Sylvilagus nutalli</i>	mountain cottontail	scat, tracks
3-1	<i>Canis latrans</i>	coyote	scat, tracks
3-1	<i>Thomomys talpoides</i>	northern pocket gopher	mounds
3-1		unidentified small mammal	holes
3-2	<i>Hirundo pyrrhonota</i>	cliff swallow	forage
3-2	<i>Sturnella neglecta</i>	western meadowlark	singing nearby, perched
3-2	<i>Uta stansburiana</i>	side-blotched lizard	3 observed
3-2	<i>Canis latrans</i>	coyote	
3-2		unidentified small mammal	holes
3-3	<i>Eremophila alpestris</i>	horned lark	singing
3-3	<i>Zenaida macroura</i>	mourning dove	5 flushed
3-3	<i>Sturnella neglecta</i>	western meadowlark	flushed, singing, call, perched
3-3	<i>Chondestes grammacus</i>	lark sparrow	sing, E edge
3-3	<i>Lanius ludovicianus</i>	loggerhead shrike	thought call heard in vicinity
3-3	<i>Uta stansburiana</i>	side-blotched lizard	tracks
3-3	<i>Canis latrans</i>	coyote	tracks
3-3		unidentified small mammal	tracks

Evaluation Unit: 200-E Burial Grounds
 ID: CP-LS-14
 Group: Legacy Source
 Operable Unit Cross-Walk: 200-SW-2
 Related EU: NA
 Sites & Facilities: Past practice radioactive waste burial grounds.
 Key Data Sources Docs: DOE-RL-96-32-01; Mission Support Alliance maps¹⁹
 Field Survey Date: 06/10/2015
 Datasheet prepared by: MAC, KDH, SAM 11/04/2015
 Datasheet reviewed by:

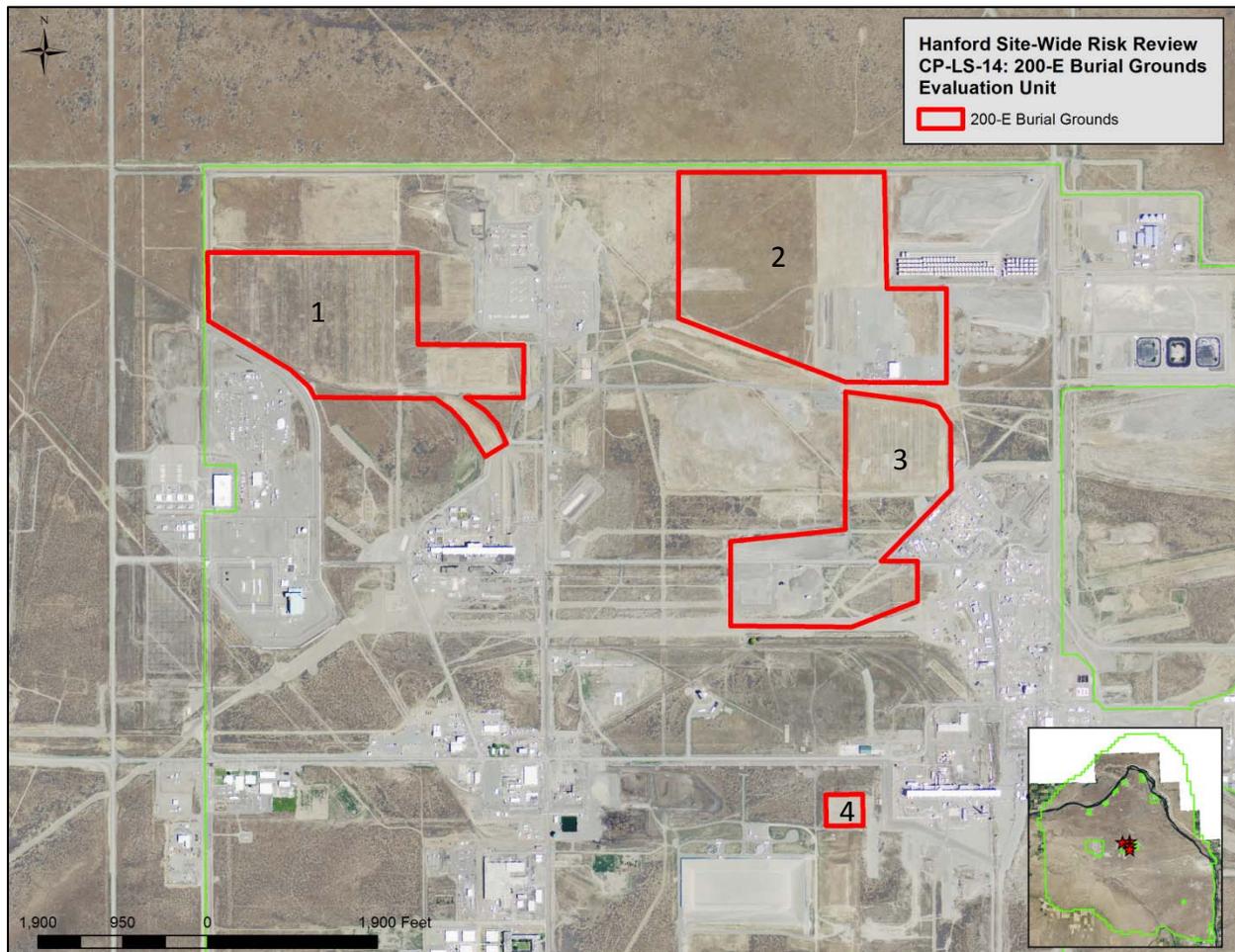


Figure J.35. CP-LS-14 (200-E Burial Grounds) Site Location Map (Numbers shown were assigned to individual burial grounds to facilitate data collection and discussion)

CP-LS-14: 200-E Burial Grounds

¹⁹MSA (Mission Support Alliance) maintains biological resource information for the Hanford Site for the Department of Energy.

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the current Endangered and Threatened Species (Federal and State) distribution data; priority habitats as defined by Washington Department of Fish and Wildlife; available current aerial imagery, locations of Hanford Site waste units and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data records.

The following steps were taken to assess the EU associated with 200-E Burial Grounds:

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. A pedestrian survey was conducted within the EU boundary by experienced shrub-steppe ecologists.
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2013 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.
6. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

The 200-E Burial Grounds EU consists of 4 separate parcels of land in the 200-E Area (Figure J.35). Each of these parcels was surveyed on June 10, 2015 and assigned a number to keep track of survey information for each parcel; the following data and discussions use these numbers (e.g., Burial Ground 1 or BG 1).

Most of the surfaces of the three of the four burial grounds (BG 1, BG 2 and BG 3) have been revegetated with crested wheatgrass (*Agropyron cristatum*) and are sprayed with a broad-leaf herbicide to prevent the growth of deep-rooted forbs and shrubs. Native grasses such as sand dropseed (*Sporobolus cryptandrus*) and Sandberg's bluegrass (*Poa secunda*) are gradually moving into these areas since they are not impacted by the herbicide; in places they form a significant component of the plant community. Areas dominated by introduced crested wheatgrass are classified as resource level 1 and constitute approximately 41% of the EU. Burial Ground 4 is sprayed with herbicides to prevent all vegetation growth and is classified as a level 0 resource.

Areas around or between sections of each burial ground parcel are less disturbed and patches of successional and climax plant communities occur. Successional vegetation includes native grasses such as Sandberg's bluegrass (20%-25% cover, cheatgrass (5 -25%), gray rabbitbrush (*Ericameria nauseosa*) and scattered big sagebrush (*Artemisia tridentata*) (Table J.33). Small patches of climax communities containing big sagebrush (40% cover) and other climax shrubs along with an understory dominated by cheatgrass and Sandberg's bluegrass occur in the center and south portions of Burial Ground 3 (Table J.33).

Table J.33. Percent Canopy Cover and Surface Cover Estimated at the 200-E Burial Grounds Evaluation Unit

	BG 1			BG 2	BG 3		BG 4
Vegetation/Surface Cover	Survey Area 2-1 (%)	Survey Area 2-2 (%)	Survey Area 2-3 (%)	Survey Area 2-1 (%)	Survey Area 2-1 (%)	Survey Area 3-1 (%)	Survey Area 0-1 (%)
Bare Ground	-	-	-	-	-	-	100
Introduced forb	25	20	20	20	30	10	-
Introduced grass	15	15	15	40	20	25	-
Native forb	-	-	-	-	-	-	-
Native grass	20	25	20	22	10	15	-
Successional shrub	15	25	3		5		-
Climax shrub	5	5	1	-	-	40	-

Note: a dash (-) indicates no percent cover data were collected

A Swainson's hawk (*Buteo swainsoni*) was observed flying over Burial Ground 1. This species is a Washington state monitor species. Small circular patches of resource level 3 in Burial Grounds 1 and 3 are previously observed locations of Piper's daisy (*Erigeron piperianus*), a state sensitive species. Piper's daisy was not observed in the June 2015 surveys. Field data records at the end of this section provide lists of plant and animal species observed during the June surveys.

Landscape Evaluation and Resource Classification:

Much of the land in the 200-E Burial Grounds EU has been disturbed to some extent; consequently more than 96% (1443 acres) of the EU is characterized as resource level 2 or below (Figure J.36, Table J.34). Burial grounds are mostly revegetated and sprayed to prevent growth of deep-rooted forbs and shrubs. On the outskirts or between sections of the burial grounds, patches of habitat classified as resource level 3 remain. No habitat classified as resource levels 4 or 5 occurs within the EU.

The amount and proximity of biological resources surrounding the 200-E Burial Grounds EU were examined within the adjacent landscape buffer area. The buffer areas were created by adding a strip 1 times the maximum width of each burial ground parcel to its EU boundary. The buffer areas for the 4 burial ground parcels overlap and were merged into one buffer area that encompasses 1970.1 acres (Table J.34). The combined EU and adjacent buffer area encloses 2274.3 acres, of which approximately 63% is classified as resource level 2 or below.

The combined buffer area extends beyond the 200-E Area fence to the north and west, where resource level 3 and 4 habitats occur. These habitats outside the 200-E Area are contiguous with similar areas across the Hanford Site, but the level 3 resources within the 200-E Area are fragmented and are not contiguous with habitats beyond the fence (Figure J.36).

Assumptions and Uncertainty:

Although all observations for species of concern and current conditions of biological resources were noted during surveys and evaluations conducted in 2015, the presence or absence of species cannot be assumed or predicted for future years. Field reconnaissance and surveys of evaluation units at the time of remediation will need to be conducted to verify resources and evaluation ecological conditions at that time.

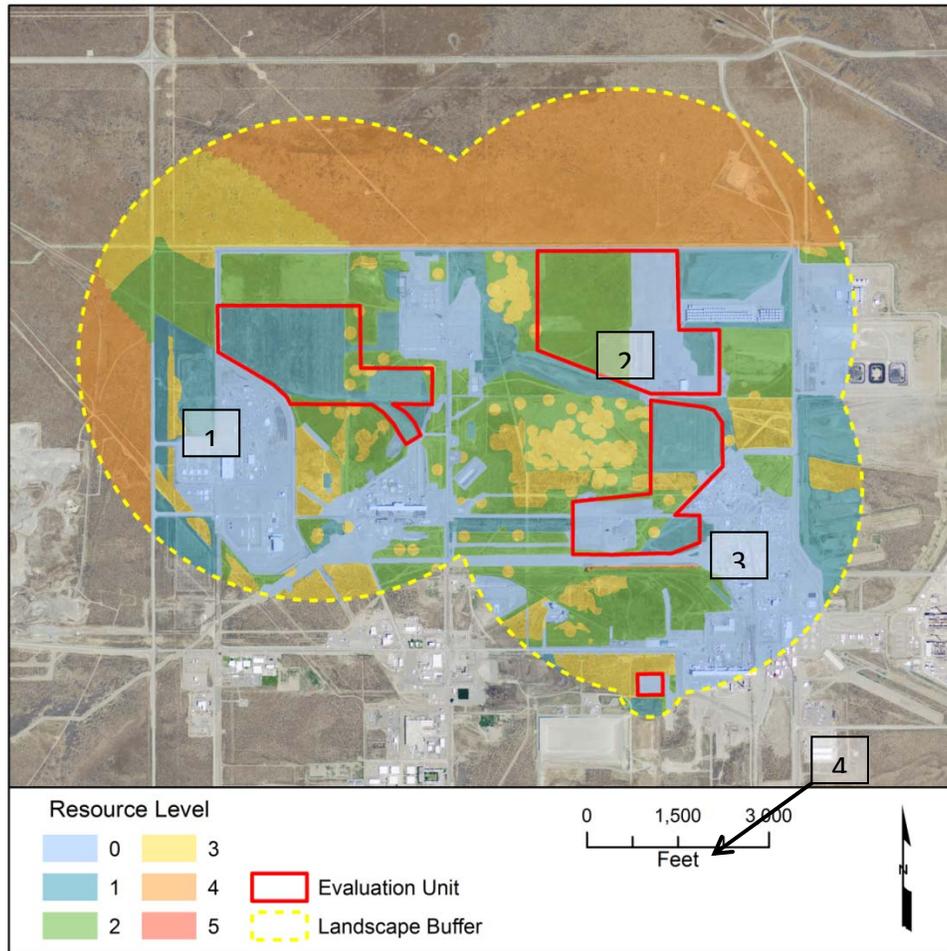


Figure J.36. Biological Resource Level Classifications Based on the June 6, 2015 Survey at the 200-E Burial Grounds Evaluation Unit (red solid line) and Adjacent Landscape Buffer Area (yellow dashed line). Individual Units are Numbered for Convenience

Table J.34. Area and Proportion of Each Biological Resource Level Within the 200-E Burial Grounds Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources.

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
0	81.2	537.1	618.3	27.19%	36.99%	9.81%
1	124.4	224.0	348.4	15.32%	9.85%	-5.47%
2	87.8	388.8	476.6	20.96%	17.10%	-3.86%
3	10.8	303.3	314.1	13.81%	13.34%	-0.47%
4	0	516.9	516.9	22.73%	22.73%	0.00%
5	0	0	0	0.00%	0.00%	0.00%
Total	304.2	1970.1	2274.3	100.00%	100.00%	

¹ Resource levels for both the evaluation unit and adjacent landscape boundary were reviewed in the field and via imagery during May-August 2015 and revised to reflect current habitats conditions.

² Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.

Summary of Ecological Review:

- The 4 parcels of land comprising the 200-E Burial Grounds EU are not adjacent to one another, but all occur within the 200-E Area and 3 of the 4 have roughly similar biological resources. More than 96% (293 acres) of the EU are characterized as resource level 2 or below.
- Three of the 4 burial ground parcels are vegetated, the 4th is maintained to remove vegetation.
- More than 63% (1443 acres) of the combined EU and adjacent landscape area are characterized as resource level 2 or below.
- Small patches of level 3 habitat (4%) of the EU are fragmented and not contiguous with level 3 and 4 habitats in the adjacent landscape buffer. Loss of higher level habitat within the EU is not expected to reduce connectivity with similar habitat outside the 200-E Area.
- In the past, Piper's daisy, a state sensitive species, has been previously observed in relatively dense clusters in Burial Grounds 1 and 3, and although none were noted in 2015, it is considered highly likely to occur in the area. Loss of individual Piper's daisies is not expected to affect population viability.

References:

- DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 0.
- U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act. <http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>
- U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington. http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902
- Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. <http://wdfw.wa.gov/conservation/phs/list/>
- Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington. <http://wdfw.wa.gov/conservation/endangered/>
- Washington Noxious Weed Control Board. 2014. Noxious Weed List. <http://www.nwcb.wa.gov/>
- Washington State Department of Natural Resources. 2014. Washington Natural Heritage Program Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

Definitions and Acronyms:

Adjacent Landscape Buffer – a circular area adjacent to and outside the EU boundary with the center of the circle at the centroid of the EU, and with a radius that is 1 times the maximum dimension (width or length—whichever is greatest). This circular buffer area is used to evaluate indirect effects and assess the remediation in relation to the landscape features and resources adjacent to the EU. This circular area is generally at least 3 times the area of the EU.

Biological Resource Levels (from DOE-RL-96-32-01) –

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats.
- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks.
- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub-steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.
- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.

- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.
- Level 0 resources consist of non-native plants and animals (unless otherwise listed at a higher level), non-vegetated areas, and industrial areas.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

MBTA – Migratory Bird Treaty Act; referring to species listed and protected under the federal Act.

PNNL ECAP (Ecological Compliance and Assessment Project) Database – PNNL performed ecological reviews for individual projects and annually surveyed selected areas and buildings on the Hanford Site for DOE-RL under the DOE's Public Safety and Resource Protection Program until 2011. The data collected during those surveys is archived in the ECAP database, and is used to supplement ecological evaluations as available.

Priority Habitats – Priority habitats are habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type (e.g., shrub-steppe) or dominant plant species (e.g., juniper savannah), a described successional stage (e.g., old-growth forest), or a specific habitat feature (e.g., cliffs).

Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

Field Data Records

Plant Species Identified During Visual Surveys June 10 2015, 200-East Burial Grounds EU - Burial Ground 1			
Patch ID	Name	Common name	Abundance
1-1	<i>Agropyron cristatum</i>	crested wheatgrass	20
1-1	<i>Bromus tectorum</i>	cheatgrass	10
1-1	<i>Ericameria nauseosa</i>	gray rabbitbrush	
1-1	<i>Poa secunda</i>	Sandberg's bluegrass	10
1-1	<i>Salsola tragus</i>	Russian thistle	
1-1	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	
1-1	<i>Sporobolus cryptandrus</i>	sand dropseed	
2-1	<i>Amsinckia species</i>		
2-1	<i>Artemisia tridentata</i>	big sagebrush	5
2-1	<i>Astragalus caricinus</i>	buckwheat milkvetch	
2-1	<i>Bromus tectorum</i>	cheatgrass	15
2-1	<i>Ericameria nauseosa</i>	gray rabbitbrush	15
2-1	<i>Erigeron filifolius</i>	threadleaf fleabane	
2-1	<i>Machaeranthera canescens</i>	hoary aster	
2-1	<i>Poa secunda</i>	Sandberg's bluegrass	20
2-1	<i>Salsola tragus</i>	Russian thistle	25
2-1	<i>Sphaeralcea munroana</i>	Munro's globemallow	
2-1	<i>Sporobolus cryptandrus</i>	sand dropseed	
2-2	<i>Achillea millefolium</i>	yarrow	
2-2	<i>Agropyron cristatum</i>	crested wheatgrass	
2-2	<i>Artemisia tridentata</i>	big sagebrush	5
2-2	<i>Bromus tectorum</i>	cheatgrass	15
2-2	<i>Ericameria nauseosa</i>	gray rabbitbrush	25
2-2	<i>Poa secunda</i>	Sandberg's bluegrass	25
2-2	<i>Salsola tragus</i>	Russian thistle	20
2-2	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	
2-2	<i>Sporobolus cryptandrus</i>	sand dropseed	
2-3	<i>Amsinckia species</i>		
2-3	<i>Artemisia tridentata</i>	big sagebrush	1
2-3	<i>Balsamorhiza careyana</i>	Carey's balsamroot	
2-3	<i>Bromus tectorum</i>	cheatgrass	15
2-3	<i>Ericameria nauseosa</i>	gray rabbitbrush	3
2-3	<i>Erigeron pumilis</i>	shaggy fleabane	
2-3	<i>Lomatium macrocarpum</i>	bigseeded desertparsley	
2-3	<i>Machaeranthera canescens</i>	hoary aster	
2-3	<i>Mentzelia albicaulis</i>	whitestem stickleaf	
2-3	<i>Phlox longifolia</i>	longleaf phlox	
2-3	<i>Poa bulbosa</i>	bulbous bluegrass	
2-3	<i>Poa secunda</i>	Sandberg's bluegrass	20
2-3	<i>Salsola tragus</i>	Russian thistle	20
2-3	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	
2-3	<i>Sporobolus cryptandrus</i>	sand dropseed	

Plant Species Identified During Visual Surveys June 10 2015, 200-East Burial Grounds EU - Burial Ground 2			
Patch ID	Name	Common name	Abundance
0-1	<i>Bromus tectorum</i>	cheatgrass	
0-1	<i>Ericameria nauseosa</i>	gray rabbitbrush	
0-1	<i>Salsola tragus</i>	Russian thistle	
1-1	<i>Agropyron cristatum</i>	crested wheatgrass	35
1-1	<i>Bromus tectorum</i>	cheatgrass	
1-1	<i>Poa secunda</i>	Sandberg's bluegrass	25
1-1	<i>Salsola tragus</i>	Russian thistle	
2-1	<i>Agropyron cristatum</i>	crested wheatgrass	
2-1	<i>Bromus tectorum</i>	cheatgrass	40
2-1	<i>Poa secunda</i>	Sandberg's bluegrass	20
2-1	<i>Salsola tragus</i>	Russian thistle	20
2-1	<i>Sisymbrium altissimum</i>	Jim Hill's tumbled mustard	
2-1	<i>Sporobolus cryptandrus</i>	sand dropseed	2
2-1	<i>Tragopogon dubius</i>	Yellow salsify	

Plant Species Identified During Visual Surveys			
June 10 2015, 200-East Burial Grounds EU - Burial Ground 3			
Patch ID	Name	Common name	Abundance
1-1	<i>Agropyron cristatum</i>	crested wheatgrass	15
1-1	<i>Bromus tectorum</i>	cheatgrass	15
1-1	<i>Poa secunda</i>	Sandberg's bluegrass	
1-1	<i>Salsola tragus</i>	Russian thistle	
1-1	<i>Sporobolus cryptandrus</i>	sand dropseed	
1-2	<i>Achillea millefolium</i>	yarrow	
1-2	<i>Achnatherum hymenoides</i>	indian ricegrass	
1-2	<i>Agropyron cristatum</i>	crested wheatgrass	20
1-2	<i>Amsinckia species</i>		
1-2	<i>Asparagus officinalis</i>	asparagus	
1-2	<i>Astragalus caricinus</i>	buckwheat milkvetch	
1-2	<i>Bromus tectorum</i>	cheatgrass	10
1-2	<i>Chondrilla juncea</i>	Rush skeletonweed	
1-2	<i>Ericameria nauseosa</i>	gray rabbitbrush	
1-2	<i>Poa bulbosa</i>	bulbous bluegrass	
1-2	<i>Poa secunda</i>	Sandberg's bluegrass	
1-2	<i>Salsola tragus</i>	Russian thistle	
1-2	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	
2-1	<i>Achnatherum hymenoides</i>	indian ricegrass	
2-1	<i>Asparagus officinalis</i>	asparagus	
2-1	<i>Bromus tectorum</i>	cheatgrass	20
2-1	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	
2-1	<i>Ericameria nauseosa</i>	gray rabbitbrush	5
2-1	<i>Hesperostipa comata</i>	needle-and-thread grass	
2-1	<i>Machaeranthera canescens</i>	hoary aster	
2-1	<i>Poa secunda</i>	Sandberg's bluegrass	10
2-1	<i>Salsola tragus</i>	Russian thistle	30
2-1	<i>Sporobolus cryptandrus</i>	sand dropseed	
2-1	<i>Stephanomeria paniculata</i>	stiff wirelettuce	
2-1	<i>Tragopogon dubius</i>	Yellow salsify	
3-1	<i>Achnatherum hymenoides</i>	indian ricegrass	
3-1	<i>Agropyron cristatum</i>	crested wheatgrass	
3-1	<i>Ambrosia acanthicarpa</i>	bur ragweed	
3-1	<i>Amsinckia species</i>		
3-1	<i>Artemisia tridentata</i>	big sagebrush	40
3-1	<i>Balsamorhiza careyana</i>	Carey's balsamroot	
3-1	<i>Bromus tectorum</i>	cheatgrass	25
3-1	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	
3-1	<i>Cryptantha fendleri</i>	Fendler's cryptantha	
3-1	<i>Grayia spinosa</i>	spiny hopsage	
3-1	<i>Machaeranthera canescens</i>	hoary aster	
3-1	<i>Poa secunda</i>	Sandberg's bluegrass	15
3-1	<i>Pteryxia terebinthina var. terebinthina</i>	turpentine springparsley	
3-1	<i>Salsola tragus</i>	Russian thistle	10
3-1	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	

Bird, Mammal and Herpetofauna Species June 10 2015, 200-East Burial Grounds EU			
Patch ID	Name	Common name	Comment
BG 1, patch 1-1	<i>Eremophila alpestris</i>	horned lark	
BG 1, patch 2-3	<i>Buteo swainsoni</i>	Swainson's hawk	soaring overhead
BG 2, patch 0-1	<i>Eremophila alpestris</i>	horned lark	on ground
BG 3, patch 1-1	<i>Eremophila alpestris</i>	horned lark	
BG 3, patch 1-2	<i>Chordeiles minor</i>	common nighthawk	
BG 3, patch 1-2		unidentified lizard	tracks

Evaluation Unit: 200-E Miscellaneous Waste Sites
 ID: CP-LS-15
 Group: Legacy Source
 Operable Unit Cross-Walk: 200-OA-1, 200-EA-1
 Related EU: NA
 Sites & Facilities: Waste sites, buildings, and structures associated with maintenance operations and coal power plant in the southern portion of 200-E.
 Key Data Sources Docs: DOE-RL-96-32-01; Mission Support Alliance maps²⁰
 Field Survey Dates: 06/02/2015, 06/05/2015, and 06/08/2015
 Datasheet prepared by: MAC, KDH, SAM 11/06/2015
 Datasheet reviewed by:

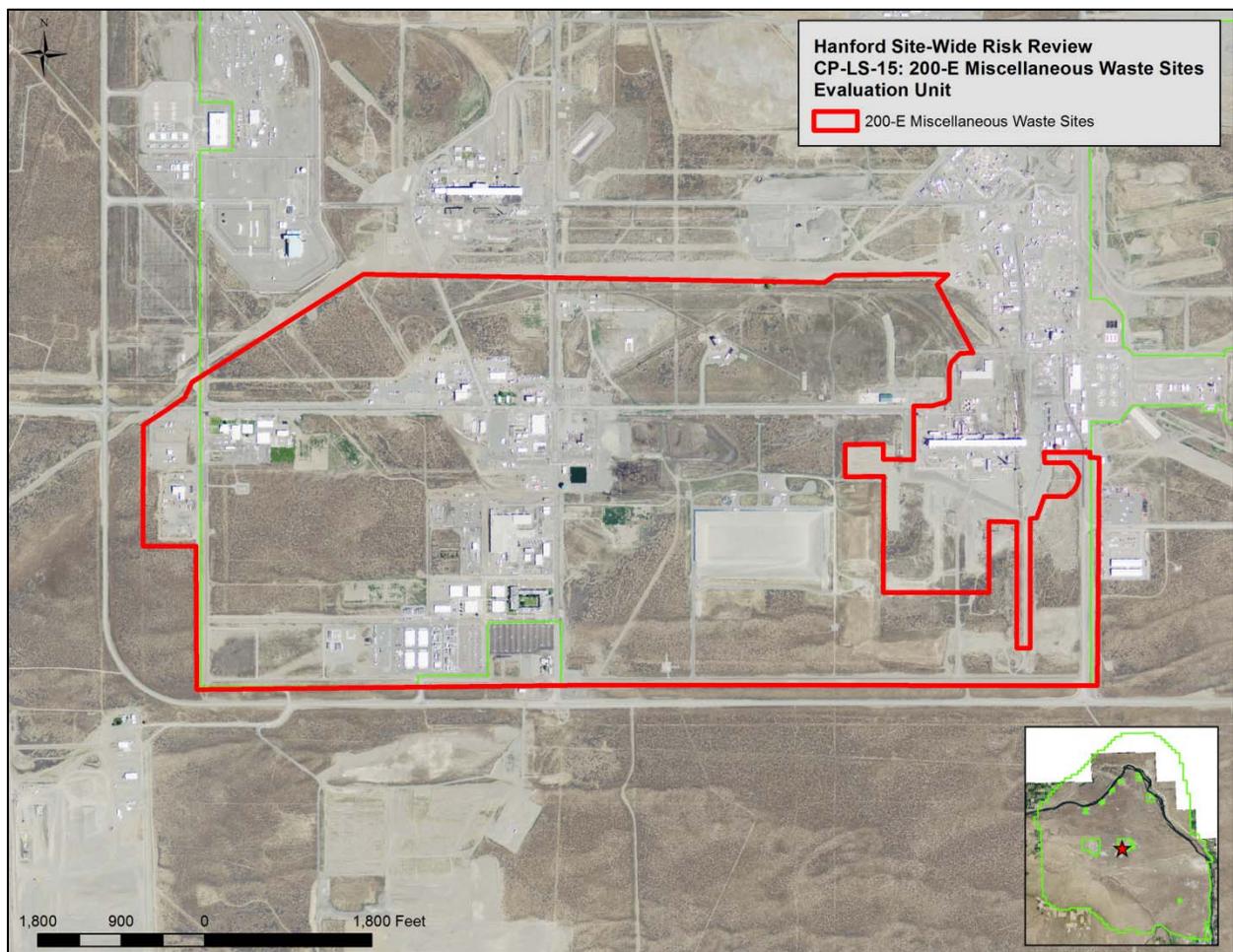


Figure J.37. CP-LS-15 (200-E Miscellaneous Waste Sites) Site Location Map

²⁰ MSA (Mission Support Alliance) maintains biological resource information for the Hanford Site for the Department of Energy.

CP-LS-15: 200-E Miscellaneous Waste Sites

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the current Endangered and Threatened Species (Federal and State) distribution data; priority habitats as defined by Washington Department of Fish and Wildlife; available current aerial imagery, locations of Hanford Site waste units and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data records.

The following steps were taken to assess the EU associated with 200-E Miscellaneous Waste Sites:

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. Pedestrian surveys and vegetation measurement along transects were conducted within the EU boundary by experienced shrub-steppe ecologists.
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2013 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.

6. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

The 200-E Miscellaneous Waste Sites EU encompasses almost all of the south half of the 200-East Area, including a large amount of habitat that has not been disturbed by Hanford activities. Most areas of disturbance (resource level 0) are where administrative buildings or other infrastructure facilities (e.g., gas station, first aid station, vehicle maintenance shops, and the water supply and regional septic system facilities) are located.

Pedestrian surveys were conducted throughout much of the EU and transect data were collected at areas thought to be representative of the level 3 resources in early June. Data from the pedestrian surveys and transect measurements are provided in Table J.35. In some cases, observed percent cover/abundance data for level 2 and above resources were supplemented through review of ECAP data from 2009 and 2010.

Areas classified as resource level 0 are occupied by buildings, parking lots, roads or waste sites kept free of vegetation through the regular use of herbicides. Areas classified as resource level 1 include septic or tile fields, stockpiles of partially revegetated sediment adjacent to the IDF facility, and areas around the former coal-fired steam plant. Level 1 habitats typically are dominated by Russian thistle (*Salsola tragus*), with varying amounts of cheatgrass (*Bromus tectorum*) and native but weedy forbs. Field data records at the end of this section provide a full list of plant species observed in many areas.

Table J.35. Percent Canopy Cover and Surface Cover Estimated or Measured at the 200-E Miscellaneous Waste Sites Evaluation Unit

	Survey Areas (% cover)									
Vegetation/Surface Cover	2-1	2-2b	2-3	2-4	3-1	3-2	3-3	3-4	3-5	3-6
Bare Ground	-	-	-	-	10.70	-	-	-	-	-
Introduced forb	40	-	-	10	10.75	-	-	-	-	5
Introduced grass	40	30	10	10	24.58	35	25	40	-	15
Native forb	-	-	-	-	18.11	-	-	-	-	-
Native grass	5	5	15	50	2.00	-	-	10	-	5
Successional shrub	15	5	25	35	0	-	-	-	-	-
Climax shrub	0	-	1	0	27.00	20	15	30	10	30

Note: a dash (-) indicates no percent cover data were collected

	Survey Areas (% cover)									
Vegetation/Surface Cover	3-7	3-8 North	3-8 South	3-9	3-9a North	3-9a South	3-9b	3-11	3-12	3-13
Bare Ground	11	-	-	29.67	-	-	-	-	-	-
Introduced forb	-	-	-	7.96	-	-	-	5	5	10
Introduced grass	15	30	-	21.67	20	20	30	25	25	5
Native forb	-	-	-	3.93	-	-	-	-	-	-

Native grass	5	-	30	3.00	15	15	-	-	-	15
Successional shrub	-	15	10	0	10	-	-	-	-	-
Climax shrub	20	20	-	42.33	10	35	20	35	35	35

Note: a dash (-) indicates no percent cover data were collected

Habitats classified as resource level 2 are dominated by gray rabbitbrush (*Ericameria nauseosa*) with 5 to 35% cover, and an understory of cheatgrass and Sandberg's bluegrass (*Poa secunda*) (Table J.35). One patch in the north central part of the EU with greater cover of Sandberg's bluegrass (50%) and gray rabbitbrush (35%) appears to be a stable community with no climax shrubs moving in.

The highest quality habitat occurs around the west and south parts of the EU near the 200-East Area fence. Many of these areas have never been disturbed and still contain mature shrub-steppe with big sagebrush (*Artemisia tridentata*) cover of 10 to 42% (Table J.35). The understory in the shrub-steppe communities is co-dominated by cheatgrass and Sandberg's bluegrass. Patch 3-8 South is a climax community on open sand where the dominant species are native grasses like needle-and-thread grass (*Hesperostipa comata*) with a sparse understory dominated by native forbs and scattered gray rabbitbrush around the edges (Table J.35).

A variety of animal species were observed in or near the resource level 3 habitats during the June 2015 surveys, including the following state candidate species – black-tailed jackrabbit (*Lepus californicus*), loggerhead shrike (*Lanius ludovicianus*), and sage sparrow (*Amphispiza belli*). A few small circular patches of level 3 resources shown in Figure J.38 are locations for previously noted occurrences of Piper's daisy (*Erigeron piperianus*), a state sensitive plant species.

Landscape Evaluation and Resource Classification:

The 200-E Miscellaneous Waste Sites EU covers nearly all of the south half of the 200-East Area (Figure J.38) and includes some of the highest quality habitat in the area. Thirty-seven percent of the EU is classified as resource level 3, which occurs in large patches along the west and south sides of the EU. Approximately 63% of the EU is classified as resource level 2 or below (Table J.36).

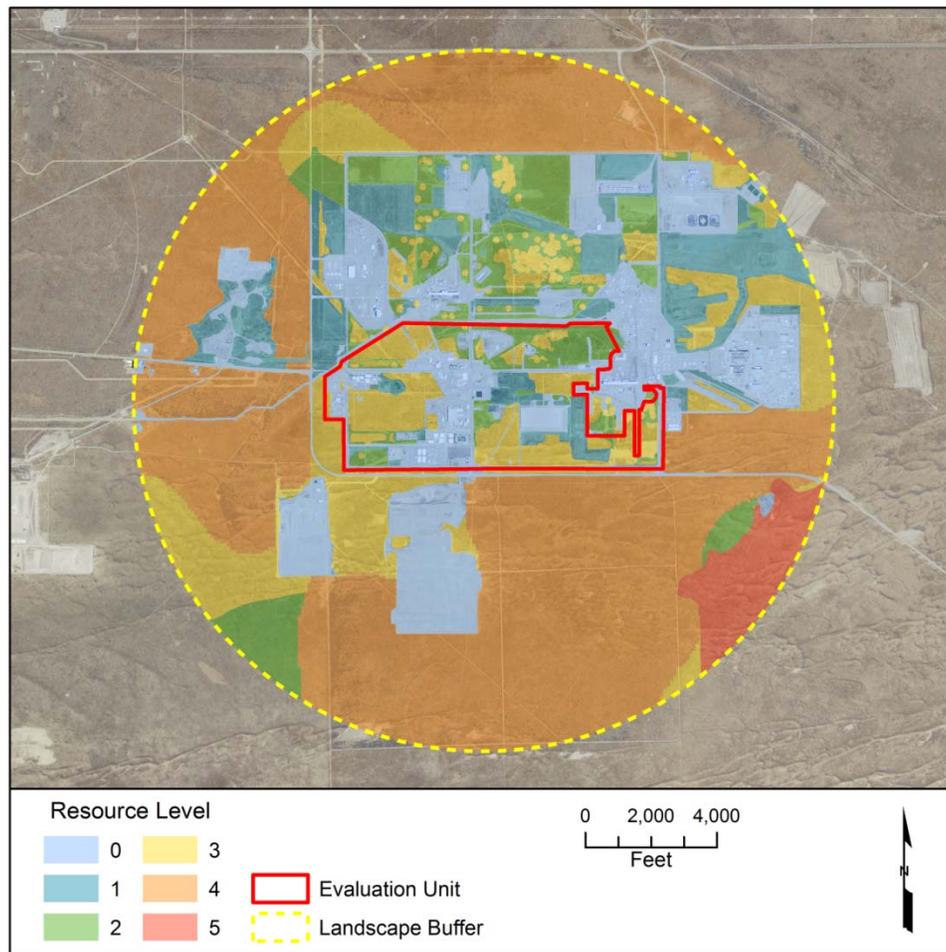


Figure J.38. Biological Resource Level Classifications Based on the June 2, June 5 and June 8, 2015 Surveys at the 200-E Miscellaneous Waste Sites Evaluation Unit (red solid line) and Adjacent Landscape Buffer Area (yellow dashed line).

The amount and proximity of biological resources surrounding the 200-E Miscellaneous Waste Sites EU were examined within the adjacent landscape buffer area, which extends 10,663 ft (3250 m) from the geometric center of the EU (Figure J.38). The adjacent landscape buffer incorporates all EUs within the 200-East Area except for TEDF and parts of the B Pond and BC Control Zone EUs. Species lists and landscape resources are described for each of these EUs in other sections of this report.

Habitat classified as resource level 2 and below accounts for 38% (1443 acres) of the combined EU and buffer area. Resource level 3 habitat accounts for roughly 15% of the combined area, and level 4 and level 5 resources account for over 46% of the combined area (Table J.36). The calculations of habitat loss provided in Table J.36 are based on changes in resource level due to cleanup actions in the 200-East Miscellaneous Waste Sites EU only.

Table J.36. Area and Proportion of Each Biological Resource Level Within the 200-E Miscellaneous Waste Sites Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources.

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
0	314.6	1377.1	1691.8	20.63%	27.15%	6.52%
1	83.6	645.1	728.7	8.89%	7.87%	-1.02%
2	137.7	575.0	712.6	8.69%	7.01%	-1.68%
3	311.6	950.8	1262.3	15.39%	11.59%	-3.80%
4	1.8	3559.0	3560.9	43.43%	43.40%	-0.02%
5	0	243.8	243.8	2.97%	2.97%	0.00%
Total	849.3	7350.8	8200.1	100.00%	100.00%	

1 Resource levels for both the evaluation unit and adjacent landscape boundary were reviewed in the field and via imagery during May-August 2015 and revised to reflect current habitats conditions.

2 Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.

Assumptions and Uncertainty:

Although all observations for species of concern and current conditions of biological resources were noted during surveys and evaluations conducted in 2015, the presence or absence of species cannot be assumed or predicted for future years. Field reconnaissance and surveys of evaluation units at the time of remediation will need to be conducted to verify resources and evaluate ecological conditions at that time.

Summary of Ecological Review:

- 63% of the EU is classified as resource level 2 or below and loss of this habitat would not be expected to significantly impact sensitive wildlife populations
- 37% of the EU is classified as resource level 3. Most of these patches lie along the west and south sides of the EU and is considered contiguous with high-quality resources outside the EU although separated by a road around the exterior of the 200-East Area. If all habitat within the EU is reduced to level 0, it would result in a loss of over 313 acres of high quality habitat (levels 3 and 4). This reduction of available habitat for state-listed sagebrush obligate species represents a significant impact.
- Several state candidate species were observed in resource level 3 patches within the EU, including black-tailed jackrabbits, loggerhead shrikes and sage sparrows.
- In the past, Piper's daisy, a state sensitive species, has been observed at numerous locations within the EU, and although none were observed in 2015, it is considered likely to occur in the area. Loss of individual Piper's daisies is not expected to affect population viability.

References:

- DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 0.
- U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act. <http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>
- U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington. http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902
- Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. <http://wdfw.wa.gov/conservation/phs/list/>
- Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington. <http://wdfw.wa.gov/conservation/endangered/>
- Washington Noxious Weed Control Board. 2014. Noxious Weed List. <http://www.nwcb.wa.gov/>
- Washington State Department of Natural Resources. 2014. Washington Natural Heritage Program Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

Definitions and Acronyms:

Adjacent Landscape Buffer – a circular area adjacent to and outside the EU boundary with the center of the circle at the centroid of the EU, and with a radius that is 1 times the maximum dimension (width or length—whichever is greatest). This circular buffer area is used to evaluate indirect effects and assess the remediation in relation to the landscape features and resources adjacent to the EU. This circular area is generally at least 3 times the area of the EU.

Biological Resource Levels (from DOE-RL-96-32-01) –

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats.
- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks.
- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub-steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.

- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.
- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.
- Level 0 resources consist of non-native plants and animals (unless otherwise listed at a higher level), non-vegetated areas, and industrial areas.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

MBTA – Migratory Bird Treaty Act; referring to species listed and protected under the federal Act.

PNNL ECAP (Ecological Compliance and Assessment Project) Database – PNNL performed ecological reviews for individual projects and annually surveyed selected areas and buildings on the Hanford Site for DOE-RL under the DOE's Public Safety and Resource Protection Program until 2011. The data collected during those surveys is archived in the ECAP database, and is used to supplement ecological evaluations as available.

Priority Habitats – Priority habitats are habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type (e.g., shrub-steppe) or dominant plant species (e.g., juniper savannah), a described successional stage (e.g., old-growth forest), or a specific habitat feature (e.g., cliffs).

Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

Field Data Records

Plant Species Identified During Visual Surveys June 2 and June 8 2015, 200-East Maintenance Waste Sites EU			
Patch ID	Name	Common name	Abundance
1-1	<i>Amsinckia species</i>		
1-1	<i>Artemisia tridentata</i>	big sagebrush	1
1-1	<i>Bromus tectorum</i>	cheatgrass	
1-1	<i>Descurainia sophia</i>	flixweed	
1-1	<i>Poa secunda</i>	Sandberg's bluegrass	1
1-1	<i>Salsola tragus</i>	Russian thistle	50
1-1	<i>Sisymbrium altissimum</i>	Jim Hill's tumblemustard	
1-1	<i>Stephanomeria paniculata</i>	stiff wirelettuce	
1-2	<i>Agropyron cristatum</i>	crested wheatgrass	10
1-2	<i>Ambrosia acanthicarpa</i>	bur ragweed	
1-2	<i>Amsinckia species</i>		
1-2	<i>Artemisia tridentata</i>	big sagebrush	
1-2	<i>Bromus tectorum</i>	cheatgrass	25
1-2	<i>Chaenactis douglasii</i>	hoary falseyarrow	
1-2	<i>Cryptantha circumscissa</i>	matted cryptantha	
1-2	<i>Descurainia sophia</i>	flixweed	
1-2	<i>Erigeron pumilis</i>	shaggy fleabane	
1-2	<i>Mentzelia albicaulis</i>	whitestem stickleaf	
1-2	<i>Poa secunda</i>	Sandberg's bluegrass	5
1-2	<i>Pteryxia terebinthina var. terebinthina</i>	turpentine springparsley	
1-2	<i>Salsola tragus</i>	Russian thistle	5
1-2	<i>Sisymbrium altissimum</i>	Jim Hill's tumblemustard	
1-2	<i>Stephanomeria paniculata</i>	stiff wirelettuce	
1-2	<i>Tragopogon dubius</i>	Yellow salsify	
1-2	<i>unknown Chenopod</i>		
1-3	<i>Agropyron cristatum</i>	crested wheatgrass	10
1-3	<i>Bromus tectorum</i>	cheatgrass	30
1-3	<i>Descurainia pinnata</i>	western tansymustard	
1-3	<i>Poa secunda</i>	Sandberg's bluegrass	
1-3	<i>Salsola tragus</i>	Russian thistle	
1-3	<i>Sisymbrium altissimum</i>	Jim Hill's tumblemustard	
1-3	<i>Stephanomeria paniculata</i>	stiff wirelettuce	
1-3	<i>Tragopogon dubius</i>	Yellow salsify	
2-1	<i>Achillea millefolium</i>	yarrow	
2-1	<i>Achnatherum hymenoides</i>	indian ricegrass	
2-1	<i>Agropyron dasytachyum</i>	thickspike wheatgrass	
2-1	<i>Ambrosia acanthicarpa</i>	bur ragweed	
2-1	<i>Artemisia tridentata</i>	big sagebrush	<1
2-1	<i>Bromus tectorum</i>	cheatgrass	40
2-1	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	
2-1	<i>Ericameria nauseosa</i>	gray rabbitbrush	15
2-1	<i>Hesperostipa comata</i>	needle-and-thread grass	
2-1	<i>Machaeranthera canescens</i>	hoary aster	

Plant Species Continued			
June 2 and June 8 2015, 200-East Maintenance Waste Sites EU			
Patch ID	Name	Common name	Abundance
2-1	<i>Poa secunda</i>	Sandberg's bluegrass	5
2-1	<i>Salsola tragus</i>	Russian thistle	40
2-1	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	
2-1	<i>Sporobolus cryptandrus</i>	sand dropseed	
2-1	<i>Ulmus pumila</i>	Siberian elm	
2-3	<i>Achillea millefolium</i>	yarrow	
2-3	<i>Achnatherum hymenoides</i>	indian ricegrass	
2-3	<i>Ambrosia acanthicarpa</i>	bur ragweed	
2-3	<i>Amsinckia species</i>		
2-3	<i>Artemisia tridentata</i>	big sagebrush	1
2-3	<i>Bromus tectorum</i>	cheatgrass	10
2-3	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	
2-3	<i>Ericameria nauseosa</i>	gray rabbitbrush	25
2-3	<i>Hesperostipa comata</i>	needle-and-thread grass	
2-3	<i>Lactuca serriola</i>	prickly lettuce	
2-3	<i>Machaeranthera canescens</i>	hoary aster	
2-3	<i>Poa secunda</i>	Sandberg's bluegrass	15
2-3	<i>Psoralea lanceolata</i>	dune scurfpea	
2-3	<i>Salsola tragus</i>	Russian thistle	
2-3	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	
2-3	<i>Sporobolus cryptandrus</i>	sand dropseed	
2-3	<i>Tragopogon dubius</i>	Yellow salsify	
2-4	<i>Achillea millefolium</i>	yarrow	
2-4	<i>Agropyron cristatum</i>	crested wheatgrass	
2-4	<i>Artemisia tridentata</i>	big sagebrush	<1
2-4	<i>Bromus tectorum</i>	cheatgrass	10
2-4	<i>Ericameria nauseosa</i>	gray rabbitbrush	35
2-4	<i>Poa secunda</i>	Sandberg's bluegrass	50
2-4	<i>Salsola tragus</i>	Russian thistle	10
2-4	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	
2-5	<i>Artemisia tridentata</i>	big sagebrush	12
2-5	<i>Bromus tectorum</i>	cheatgrass	8
2-5	<i>Ericameria nauseosa</i>	gray rabbitbrush	23
2-5	<i>Machaeranthera canescens</i>	hoary aster	
2-5	<i>Poa secunda</i>	Sandberg's bluegrass	15
2-5	<i>Salsola tragus</i>	Russian thistle	
2-2a	<i>Agropyron cristatum</i>	crested wheatgrass	
2-2a	<i>Amsinckia species</i>		
2-2a	<i>Artemisia tridentata</i>	big sagebrush	
2-2a	<i>Bromus tectorum</i>	cheatgrass	60
2-2a	<i>Descurainia sophia</i>	flixweed	
2-2a	<i>Ericameria nauseosa</i>	gray rabbitbrush	15
2-2a	<i>Machaeranthera canescens</i>	hoary aster	
2-2a	<i>Mentzelia albicaulis</i>	whitestem stickleaf	
2-2a	<i>Poa bulbosa</i>	bulbous bluegrass	
2-2a	<i>Poa secunda</i>	Sandberg's bluegrass	
2-2a	<i>Pteroxia terebinthina var. terebinthina</i>	turpentine springparsley	
2-2a	<i>Salsola tragus</i>	Russian thistle	45
2-2a	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	
2-2a	<i>Tragopogon dubius</i>	Yellow salsify	

Plant Species Continued			
June 2 and June 8 2015, 200-East Maintenance Waste Sites EU			
Patch ID	Name	Common name	Abundance
2-2b	<i>Achnatherum hymenoides</i>	indian ricegrass	
2-2b	<i>Agropyron cristatum</i>	crested wheatgrass	
2-2b	<i>Bromus tectorum</i>	cheatgrass	30
2-2b	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	
2-2b	<i>Ericameria nauseosa</i>	gray rabbitbrush	5
2-2b	<i>Machaeranthera canescens</i>	hoary aster	
2-2b	<i>Poa secunda</i>	Sandberg's bluegrass	5
2-2b	<i>Salsola tragus</i>	Russian thistle	
2-2b	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	
3-2	<i>Achillea millefolium</i>	yarrow	
3-2	<i>Agropyron cristatum</i>	crested wheatgrass	
3-2	<i>Ambrosia acanthicarpa</i>	bur ragweed	
3-2	<i>Amsinckia species</i>		
3-2	<i>Artemisia tridentata</i>	big sagebrush	20
3-2	<i>Balsamorhiza careyana</i>	Carey's balsamroot	
3-2	<i>Bromus tectorum</i>	cheatgrass	35
3-2	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	
3-2	<i>Descurainia sophia</i>	flixweed	
3-2	<i>Grayia spinosa</i>	spiny hopsage	
3-2	<i>Phlox longifolia</i>	longleaf phlox	
3-2	<i>Poa secunda</i>	Sandberg's bluegrass	
3-2	<i>Pteryxia terebinthina var. terebinthina</i>	turpentine springparsley	
3-2	<i>Salsola tragus</i>	Russian thistle	
3-2	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	
3-2	<i>Stephanomeria paniculata</i>	stiff wirelettuce	
3-3	<i>Achillea millefolium</i>	yarrow	
3-3	<i>Ambrosia acanthicarpa</i>	bur ragweed	
3-3	<i>Amsinckia lycopsoides</i>	fiddleneck	
3-3	<i>Artemisia tridentata</i>	big sagebrush	15
3-3	<i>Balsamorhiza careyana</i>	Carey's balsamroot	
3-3	<i>Bromus tectorum</i>	cheatgrass	25
3-3	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	
3-3	<i>Comandra umbellata</i>	bastard toadflax	
3-3	<i>Cryptantha circumscissa</i>	matted cryptantha	
3-3	<i>Descurainia pinnata</i>	western tansymustard	
3-3	<i>Descurainia sophia</i>	flixweed	
3-3	<i>Machaeranthera canescens</i>	hoary aster	
3-3	<i>Microsteris gracilis</i>	slender phlox	
3-3	<i>Orobancha species</i>		
3-3	<i>Poa secunda</i>	Sandberg's bluegrass	
3-3	<i>Pteryxia terebinthina var. terebinthina</i>	turpentine springparsley	
3-3	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	
3-3	<i>Tragopogon dubius</i>	Yellow salsify	
3-3	<i>Vulpia microstachys</i>	small fescue	
3-3	<i>Vulpia octoflora</i>	sixweeks fescue	
3-4	<i>Achillea millefolium</i>	yarrow	
3-4	<i>Achnatherum hymenoides</i>	indian ricegrass	
3-4	<i>Artemisia tridentata</i>	big sagebrush	30

Plant Species Continued			
June 2 and June 8 2015, 200-East Maintenance Waste Sites EU			
Patch ID	Name	Common name	Abundance
3-4	<i>Bromus tectorum</i>	cheatgrass	40
3-4	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	
3-4	<i>Ericameria nauseosa</i>	gray rabbitbrush	
3-4	<i>Poa secunda</i>	Sandberg's bluegrass	10
3-5	<i>Achillea millefolium</i>	yarrow	
3-5	<i>Agropyron cristatum</i>	crested wheatgrass	
3-5	<i>Ambrosia acanthicarpa</i>	bur ragweed	
3-5	<i>Artemisia tridentata</i>	big sagebrush	10
3-5	<i>Asclepias speciosa</i>	showy milkweed	
3-5	<i>Bromus tectorum</i>	cheatgrass	
3-5	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	
3-5	<i>Cryptantha circumscissa</i>	matted cryptantha	
3-5	<i>Descurainia pinnata</i>	western tansymustard	
3-5	<i>Descurainia sophia</i>	flixweed	
3-5	<i>Erigeron poliospermus</i>	cushion fleabane	
3-5	<i>Juniperus communis</i>	common juniper	5
3-5	<i>Lactuca serriola</i>	prickly lettuce	
3-5	<i>Machaeranthera canescens</i>	hoary aster	
3-5	<i>Poa secunda</i>	Sandberg's bluegrass	
3-5	<i>Salsola tragus</i>	Russian thistle	
3-5	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	
3-6	<i>Achillea millefolium</i>	yarrow	
3-6	<i>Ambrosia acanthicarpa</i>	bur ragweed	
3-6	<i>Amsinckia lycopsoides</i>	fiddleneck	
3-6	<i>Artemisia tridentata</i>	big sagebrush	30
3-6	<i>Astragalus caricinus</i>	buckwheat milkvetch	
3-6	<i>Balsamorhiza careyana</i>	Carey's balsamroot	
3-6	<i>Bromus tectorum</i>	cheatgrass	15
3-6	<i>Crepis aribarba</i>	slender hawkbeard	
3-6	<i>Cryptantha circumscissa</i>	matted cryptantha	
3-6	<i>Descurainia pinnata</i>	western tansymustard	
3-6	<i>Descurainia sophia</i>	flixweed	
3-6	<i>Gilia sinuata</i>	shy gilia	
3-6	<i>Ipomopsis minutiflora</i>	littleflower ipomopsis	
3-6	<i>Machaeranthera canescens</i>	hoary aster	
3-6	<i>Nama densum</i>	purplemat	
3-6	<i>Orobanche species</i>		
3-6	<i>Phlox longifolia</i>	longleaf phlox	
3-6	<i>Poa secunda</i>	Sandberg's bluegrass	5
3-6	<i>Pteryxia terebinthina var. terebinthina</i>	turpentine springparsley	
3-6	<i>Salsola tragus</i>	Russian thistle	5
3-6	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	
3-6	<i>Solanum triflorum</i>	cutleaf nightshade	
3-6	<i>Tiquilia nuttallii</i>	desert mat	
3-6	<i>Vulpia microstachys</i>	small sixweeks	
3-6	<i>Vulpia octoflora</i>	slender sixweeks	
3-7	<i>Artemisia tridentata</i>	big sagebrush	20
3-7	<i>Astragalus caricinus</i>	buckwheat milkvetch	

Plant Species Continued			
June 2 and June 8 2015, 200-East Maintenance Waste Sites EU			
Patch ID	Name	Common name	Abundance
3-7	<i>Bromus tectorum</i>	cheatgrass	15
3-7	<i>Chaenactis douglasii</i>	hoary falseyarrow	
3-7	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	
3-7	<i>Cryptantha circumscissa</i>	matted cryptantha	
3-7	<i>Descurainia pinnata</i>	western tansymustard	
3-7	<i>Grayia spinosa</i>	spiny hopsage	
3-7	<i>Machaeranthera canescens</i>	hoary aster	
3-7	<i>Poa secunda</i>	Sandberg's bluegrass	5
3-7	<i>Salsola tragus</i>	Russian thistle	
3-8 North Half	<i>Achnatherum hymenoides</i>	indian ricegrass	
3-8 North Half	<i>Artemisia tridentata</i>	big sagebrush	20
3-8 North Half	<i>Astragalus caricinus</i>	buckwheat milkvetch	
3-8 North Half	<i>Balsamorhiza careyana</i>	Carey's balsamroot	
3-8 North Half	<i>Bromus tectorum</i>	cheatgrass	30
3-8 North Half	<i>Descurainia sophia</i>	flixweed	
3-8 North Half	<i>Ericameria nauseosa</i>	gray rabbitbrush	15
3-8 North Half	<i>Erigeron piperianus</i>	Piper's daisy	
3-8 North Half	<i>Hesperostipa comata</i>	needle-and-thread grass	
3-8 North Half	<i>Ipomopsis miniutiflora</i>	littleflower ipomopsis	
3-8 North Half	<i>Phlox longifolia</i>	longleaf phlox	
3-8 North Half	<i>Poa secunda</i>	Sandberg's bluegrass	
3-8 North Half	<i>Pteryxia terebinthina var. terebinthina</i>	turpentine springparsley	
3-8 North Half	<i>Salsola tragus</i>	Russian thistle	
3-8 South Half	<i>Achillea millefolium</i>	yarrow	
3-8 South Half	<i>Achnatherum hymenoides</i>	indian ricegrass	5
3-8 South Half	<i>Ambrosia acanthicarpa</i>	bur ragweed	
3-8 South Half	<i>Artemisia tridentata</i>	big sagebrush	
3-8 South Half	<i>Astragalus caricinus</i>	buckwheat milkvetch	
3-8 South Half	<i>Bromus tectorum</i>	cheatgrass	
3-8 South Half	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	
3-8 South Half	<i>Cryptantha circumscissa</i>	matted cryptantha	
3-8 South Half	<i>Ericameria nauseosa</i>	gray rabbitbrush	10
3-8 South Half	<i>Erigeron linearis</i>	desert yellowdaisy	
3-8 South Half	<i>Hesperostipa comata</i>	needle-and-thread grass	25
3-8 South Half	<i>Ipomopsis miniutiflora</i>	littleflower ipomopsis	
3-8 South Half	<i>Machaeranthera canescens</i>	hoary aster	
3-8 South Half	<i>Poa secunda</i>	Sandberg's bluegrass	
3-8 South Half	<i>Pteryxia terebinthina var. terebinthina</i>	turpentine springparsley	
3-8 South Half	<i>Purshia tridentata</i>	bitterbrush	
3-8 South Half	<i>Salsola tragus</i>	Russian thistle	
3-8 South Half	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	
3-8 South Half	<i>Tragopogon dubius</i>	Yellow salsify	
3-8 South Half	<i>Vulpia octoflora</i>	sixweeks fescue	
3-9a North	<i>Achnatherum hymenoides</i>	indian ricegrass	
3-9a North	<i>Artemisia tridentata</i>	big sagebrush	10
3-9a North	<i>Astragalus caricinus</i>	buckwheat milkvetch	
3-9a North	<i>Bromus tectorum</i>	cheatgrass	20
3-9a North	<i>Ericameria nauseosa</i>	gray rabbitbrush	10

Plant Species Continued			
June 2 and June 8 2015, 200-East Maintenance Waste Sites EU			
Patch ID	Name	Common name	Abundance
3-9a North	<i>Eriogonum vimineum</i>	broom buckwheat	
3-9a North	<i>Poa secunda</i>	Sandberg's bluegrass	15
3-9a North	<i>Pteryxia terebinthina</i> var. <i>terebinthina</i>	turpentine springparsley	
3-9a North	<i>Salsola tragus</i>	Russian thistle	
3-9a South	<i>Achillea millefolium</i>	yarrow	
3-9a South	<i>Achnatherum hymenoides</i>	indian ricegrass	
3-9a South	<i>Ambrosia acanthicarpa</i>	bur ragweed	
3-9a South	<i>Artemisia tridentata</i>	big sagebrush	35
3-9a South	<i>Balsamorhiza careyana</i>	Carey's balsamroot	
3-9a South	<i>Bromus tectorum</i>	cheatgrass	20
3-9a South	<i>Chaenactis douglasii</i>	hoary falseyarrow	
3-9a South	<i>Chondrilla juncea</i>	Rush skeletonweed	
3-9a South	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	
3-9a South	<i>Conyza canadensis</i>	horseweed	
3-9a South	<i>Crepis atriobarba</i>	slender hawkbeard	
3-9a South	<i>Cryptantha circumscissa</i>	matted cryptantha	
3-9a South	<i>Ericameria nauseosa</i>	gray rabbitbrush	
3-9a South	<i>Hesperostipa comata</i>	needle-and-thread grass	
3-9a South	<i>Ipomopsis miniutiflora</i>	littleflower ipomopsis	
3-9a South	<i>Machaeranthera canescens</i>	hoary aster	
3-9a South	<i>Phacelia bastata</i>	whiteleaf scorpionweed	
3-9a South	<i>Phlox longifolia</i>	longleaf phlox	
3-9a South	<i>Poa secunda</i>	Sandberg's bluegrass	15
3-9a South	<i>Pteryxia terebinthina</i> var. <i>terebinthina</i>	turpentine springparsley	
3-9a South	<i>Salsola tragus</i>	Russian thistle	
3-9a South	<i>Sisymbrium altissimum</i>	Jim Hill's tumbled mustard	
3-9b	<i>Achnatherum hymenoides</i>	indian ricegrass	
3-9b	<i>Ambrosia acanthicarpa</i>	bur ragweed	
3-9b	<i>Amsinckia species</i>		
3-9b	<i>Artemisia tridentata</i>	big sagebrush	20
3-9b	<i>Balsamorhiza careyana</i>	Carey's balsamroot	
3-9b	<i>Bromus tectorum</i>	cheatgrass	30
3-9b	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	
3-9b	<i>Comandra umbellata</i>	bastard toadflax	
3-9b	<i>Crepis atriobarba</i>	slender hawkbeard	
3-9b	<i>Cryptantha circumscissa</i>	matted cryptantha	
3-9b	<i>Cryptantha fendleri</i>	Fendler's cryptantha	
3-9b	<i>Descurainia sophia</i>	flixweed	
3-9b	<i>Eriogonum vimineum</i>	broom buckwheat	
3-9b	<i>Machaeranthera canescens</i>	hoary aster	
3-9b	<i>Microsteris gracilis</i>	pink microsteris	
3-9b	<i>Phlox longifolia</i>	longleaf phlox	
3-9b	<i>Pteryxia terebinthina</i> var. <i>terebinthina</i>	turpentine springparsley	
3-9b	<i>Purshia tridentata</i>	bitterbrush	
3-9b	<i>Salsola tragus</i>	Russian thistle	
3-11	<i>Artemisia tridentata</i>	big sagebrush	35
3-11	<i>Balsamorhiza careyana</i>	Carey's balsamroot	
3-11	<i>Bromus tectorum</i>	cheatgrass	25

Plant Species Continued			
June 2 and June 8 2015, 200-East Maintenance Waste Sites EU			
Patch ID	Name	Common name	Abundance
3-11	<i>Cryptantha circumscissa</i>	matted cryptantha	
3-11	<i>Descurainia sophia</i>	flixweed	
3-11	<i>Festuca microstachys</i>	small sixweeks	
3-11	<i>Hesperostipa comata</i>	needle-and-thread grass	
3-11	<i>Machaeranthera canescens</i>	hoary aster	
3-11	<i>Poa secunda</i>	Sandberg's bluegrass	
3-11	<i>Pteryxia terebinthina</i> var. <i>terebinthina</i>	turpentine springparsley	
3-11	<i>Salsola tragus</i>	Russian thistle	5
3-11	<i>Sisymbrium altissimum</i>	Jim Hill's tumblemustard	
3-11	<i>Tragopogon dubius</i>	Yellow salsify	
3-12	<i>Artemisia tridentata</i>	big sagebrush	35
3-12	<i>Balsamorhiza careyana</i>	Carey's balsamroot	
3-12	<i>Bromus tectorum</i>	cheatgrass	25
3-12	<i>Cryptantha circumscissa</i>	matted cryptantha	
3-12	<i>Descurainia sophia</i>	flixweed	
3-12	<i>Hesperostipa comata</i>	needle-and-thread grass	
3-12	<i>Machaeranthera canescens</i>	hoary aster	
3-12	<i>Poa secunda</i>	Sandberg's bluegrass	
3-12	<i>Pteryxia terebinthina</i> var. <i>terebinthina</i>	turpentine springparsley	
3-12	<i>Salsola tragus</i>	Russian thistle	5
3-12	<i>Sisymbrium altissimum</i>	Jim Hill's tumblemustard	
3-12	<i>Tragopogon dubius</i>	Yellow salsify	
3-13	<i>Amsinckia species</i>		
3-13	<i>Artemisia tridentata</i>	big sagebrush	35
3-13	<i>Bromus tectorum</i>	cheatgrass	5
3-13	<i>Cryptantha circumscissa</i>	matted cryptantha	
3-13	<i>Descurainia sophia</i>	flixweed	
3-13	<i>Ericameria nauseosa</i>	gray rabbitbrush	
3-13	<i>Festuca microstachys</i>	small sixweeks	
3-13	<i>Festuca octoflora</i>	slender sixweeks	
3-13	<i>Hesperostipa comata</i>	needle-and-thread grass	
3-13	<i>Machaeranthera canescens</i>	hoary aster	
3-13	<i>Poa secunda</i>	Sandberg's bluegrass	15
3-13	<i>Salsola tragus</i>	Russian thistle	10
3-13	<i>Sisymbrium altissimum</i>	Jim Hill's tumblemustard	
3-13	<i>Sisymbrium altissimum</i>	Jim Hill's tumblemustard	
3-13	<i>Sporobolus cryptandrus</i>	sand dropseed	
3-13	<i>Stephanomeria paniculata</i>	stiff wirelettuce	
3-13	<i>Vulpia microstachys</i>	small fescue	

Percent Canopy Cover of Herbaceous Species Measured in 0.5 m2 quadrats June 2 2015, 200-E Maintenance Waste Sites EU																	
Survey Area	Species	Origin & Class	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Sum	Mean Canopy Cover	Freq
3-1	Crust	Crust	4	30	15	5	75	70	8	6	25	70	20	10	338	28.17	1.00
3-1	Bare	Bare	60	4	6	2	5	6	4	8	2	10			107	10.70	0.83
3-1	Artr	NS	35		12	35		34	45		9	28	18		216	27.00	0.67
3-1	Phgr	NF	12	1		6	3	1	3		1		60	4	91	10.11	0.75
3-1	Brte	IG	3	14	16	3	12	15	15	57	55	15	30	60	295	24.58	1.00
3-1	Litter	Litter	16	50	55	90	15	10	35	30	30	12	50	22	415	34.58	1.00
3-1	Saka	IF		18	1				2					2	23	5.75	0.33
3-1	Trdu	IF		1											1	1.00	0.08
3-1	Vuoc	NG		1				1							2	1.00	0.17
3-1	Pomi	NF			10	6									16	8.00	0.17
3-1	Vumi	NG						1							1	1.00	0.08
3-1	Deso	IF									2			6	8	4.00	0.17

Shrub Canopy Measured by Line-Intercept Methods on 50m Transect June 2 2015, 200-E Maintenance Waste Sites EU						
Survey Area	Species	Transect distance (total meters)	Start	Stop	Dif	Height (cm)
3-1	Artr	50	2	2.6	0.6	82
3-1	Artr	50	3.5	3.68	0.18	80
3-1	Artr	50	13.8	16.28	2.48	130
3-1	Artr	50	18.65	18.95	0.3	38
3-1	Artr	50	21.59	21.66	0.07	20
3-1	Artr	50	22.05	22.3	0.25	29
3-1	Artr	50	22.3	22.4	0.1	30
3-1	Artr	50	23.18	23.3	0.12	25
3-1	Artr	50	31.8	31.85	0.05	21
3-1	Artr	50	34.18	34.27	0.09	42
3-1	Artr	50	38.52	39.3	0.78	105
3-1	Artr	50	40.4	40.61	0.21	33
3-1	Artr	50	41.65	41.7	0.05	26
3-1	Artr	50	42.65	42.77	0.12	19
3-1	Artr	50	43.24	43.46	0.22	55
3-1	Artr	50	45.36	45.67	0.31	29
3-1	Artr	50	45.95	46.3	0.35	48

Percent Canopy Cover of Herbaceous Species Measured in 0.5 m2 quadrats June 5 2015, 200-E Maintenance Waste Sites EU																	
Survey Area	Species	Origin & Class	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Sum	Mean Canopy Cover	Freq
3-9	Bare	Bare	82	25	27	2	1	52	65	40	8	45	3	6	356	29.67	1.00
3-9	Crust	Crust	1	6	20	5	30		1		12	2	28	10	115	11.50	0.83
3-9	Litter	Litter	10	35	30	70	65	32	20	45	55	40	45	65	512	42.67	1.00
3-9	Crci	NF	2					3	2						7	2.33	0.25
3-9	Brte	IG	4	35	20	45	15	12	10	12	25	30	30	22	260	21.67	1.00
3-9	Saka	IF	1		2	2		5	2	38	1		2		53	6.63	0.67
3-9	Migr	NF			1	1	3				1		2		8	1.60	0.42
3-9	Artr	NS					38			65		24			127	42.33	0.25
3-9	Vuoc	NG						1							1	1.00	0.08
3-9	Deso	IF								2			1	1	4	1.33	0.25
3-9	Pose	NG									1		3		4	2.00	0.17

Shrub Canopy Measured by Line-Intercept Methods on 50m Transect June 5 2015, 200-E Maintenance Waste Sites EU						
Survey Area	Species	Transect distance (total meters)	Start	Stop	Dif	Height (cm)
3-9	Artr	50	8.65	9.03	0.38	85
3-9	Artr	50	11.38	12.36	0.98	92
3-9	Artr	50	19.77	20.37	0.6	70
3-9	Artr	50	22.8	24.7	1.9	182
3-9	Artr	50	35.12	35.65	0.53	112
3-9	Artr	50	37.23	38.77	1.54	144
3-9	Artr	50	39.23	40.03	0.8	98
3-9	Artr	50	42.15	43.33	1.18	15.2
3-9	Artr	50	46.02	46.55	0.53	94

Bird, Mammal and Herpetofauna Species June 2 and June 8 2015, 200-East Maintenance Waste Sites EU			
Patch ID	Name	Common name	Comment
0-1	<i>Tyrannus verticalis</i>	western kingbird	flying around
0-1	<i>Sturnus vulgaris</i>	European starling	fly over
0-1	<i>Canis latrans</i>	coyote	scat
0-1	<i>Sylvilagus nutalli</i>	mountain cottontail	scat
0-1		unidentified small mammal	holes
0-2	<i>Canis latrans</i>	coyote	mosying over to water stantion
1-1	<i>Canis latrans</i>	coyote	tracks
1-2		unidentified lizard	
1-2		unidentified small mammal	holes
1-2	<i>Canis latrans</i>	coyote	tracks, dig
1-2	<i>Lepus californicus</i>	black-tailed jackrabbit	scat, tracks
2-1	<i>Sayornis saya</i>	Say's phoebe	perched on Erna
2-1	<i>Sturnella neglecta</i>	western meadowlark	singing
2-2	<i>Eremophila alpestris</i>	horned lark	fly by
2-3	<i>Zenaida macroura</i>	mourning dove	2 perched on wire
2-3	<i>Canis latrans</i>	coyote	tracks
2-5	<i>Hirundo pyrrhonota</i>	cliff swallow	foraging
3-1	<i>Callipepla californica</i>	California quail	calls in distance
3-1	<i>Sayornis saya</i>	Say's phoebe	fly over
3-1	<i>Hirundo pyrrhonota</i>	cliff swallow	4 foraging
3-1	<i>Sturnella neglecta</i>	western meadowlark	singing
3-1	<i>Turdus migratorius</i>	American robin	1
3-1	<i>Chondestes grammacus</i>	lark sparrow	1 or 2 perched on shrub, singing
3-1	<i>Eremophila alpestris</i>	horned lark	singing
3-1	<i>Carpodacus mexicanus</i>	house finch	on fence
3-1		unidentified small mammal	tracks, holes
3-1	<i>Thomomys talpoides</i>	northern pocket gopher	mounds
3-1	<i>Lepus californicus</i>	black-tailed jackrabbit	trail, scat
3-1	<i>Uta stansburiana</i>	side-blotched lizard	several
3-1	<i>Canis latrans</i>	coyote	tracks
3-1	<i>Sylvilagus nutalli</i>	mountain cottontail	scat
3-2	<i>Pica pica</i>	black-billed magpie	1 fly by
3-2	<i>Canis latrans</i>	coyote	tracks
3-3	<i>Callipepla californica</i>	California quail	several calling
3-3	<i>Carpodacus mexicanus</i>	house finch	resting in nearby level 0 habitat
3-3	<i>Sturnella neglecta</i>	western meadowlark	singing S
3-3	<i>Tyrannus verticalis</i>	western kingbird	flew to sagebrush
3-3	<i>Sylvilagus nutalli</i>	mountain cottontail	scat
3-3	<i>Canis latrans</i>	coyote	scat
3-3	<i>Uta stansburiana</i>	side-blotched lizard	tracks
3-3	<i>Thomomys talpoides</i>	northern pocket gopher	mounds
3-5	<i>Sturnus vulgaris</i>	European starling	flyover
3-5	<i>Tyrannus verticalis</i>	western kingbird	flyover

Bird, Mammal and Herpetofauna Species - Continued			
June 2 and June 8 2015, 200-East Maintenance Waste Sites EU			
Patch ID	Name	Common name	Comment
3-5	<i>Sylvilagus nutalli</i>	mountain cottontail	scat
3-5		unidentified small mammal	holes
3-5	<i>Canis latrans</i>	coyote	scat
3-5	<i>Lepus californicus</i>	black-tailed jackrabbit	scat
3-5	<i>Uta stansburiana</i>	side-blotched lizard	tracks, speckled male
3-6	<i>Sturnus vulgaris</i>	European starling	several flying over
3-6	<i>Sylvilagus nutalli</i>	mountain cottontail	scat
3-6		unidentified small mammal	holes
3-6	<i>Canis latrans</i>	coyote	scat, tracks, digs
3-6	<i>Uta stansburiana</i>	side-blotched lizard	3, tracks, holes
3-7	<i>Sturnella neglecta</i>	western meadowlark	singing
3-7		unidentified small mammal	holes
3-7		unidentified lizard	1
3-7	<i>Lepus californicus</i>	black-tailed jackrabbit	scat
3-7	<i>Sylvilagus nutalli</i>	mountain cottontail	scat
3-8	<i>Pica pica</i>	black-billed magpie	
3-8	<i>Sturnella neglecta</i>	western meadowlark	on powerline
3-8	<i>Chordeiles minor</i>	common nighthawk	flew over
3-8	<i>Eremophila alpestris</i>	horned lark	singing
3-8		unidentified small mammal	holes
3-8	<i>Uta stansburiana</i>	side-blotched lizard	tracks
3-8	<i>Sylvilagus nutalli</i>	mountain cottontail	scat, tracks
3-8	<i>Canis latrans</i>	coyote	dig, tracks
3-8	<i>Lepus californicus</i>	black-tailed jackrabbit	scat, tracks
3-9	<i>Hirundo pyrrhonota</i>	cliff swallow	
3-9	<i>Tyrannus verticalis</i>	western kingbird	
3-9	<i>Amphispiza belli</i>	sage sparrow	sing dead shrub
3-9	<i>Eremophila alpestris</i>	horned lark	singing
3-9	<i>Sturnella neglecta</i>	western meadowlark	in bushes
3-9	<i>Lanius ludovicianus</i>	loggerhead shrike	maybe heard
3-9	<i>Sturnus vulgaris</i>	European starling	2 flying over
3-9	<i>Corvus corax</i>	common raven	2 foraging
3-9	<i>Turdus migratorius</i>	American robin	6 flying around
3-9	<i>Uta stansburiana</i>	side-blotched lizard	running away
3-9		unidentified small mammal	tracks
3-9	<i>Canis latrans</i>	coyote	scat, tracks
3-9	<i>Sylvilagus nutalli</i>	mountain cottontail	scat, track
3-9	<i>Lepus californicus</i>	black-tailed jackrabbit	active trails
3-9	<i>Thomomys talpoides</i>	northern pocket gopher	old mounds
3-11	<i>Chondestes grammacus</i>	lark sparrow	2 on power pole
3-11	<i>Sturnella neglecta</i>	western meadowlark	sing in vicinity
3-11	<i>Zenaida macroura</i>	mourning dove	S end, 1 perch wire, 2 flushed
3-11	<i>Eremophila alpestris</i>	horned lark	in vicinity

Bird, Mammal and Herpetofauna Species - Continued			
June 2 and June 8 2015, 200-East Maintenance Waste Sites EU			
Patch ID	Name	Common name	Comment
3-11	<i>Chordeiles minor</i>	common nighthawk	in distance
3-11		unidentified lizard	tracks
3-11	<i>Canis latrans</i>	coyote	scat, tracks common, digs, maybe den
3-11		unidentified small mammal	tracks
3-11	<i>Lepus californicus</i>	black-tailed jackrabbit	scat
3-11	<i>Sylvilagus nutalli</i>	mountain cottontail	scat
3-11	<i>Thomomys talpoides</i>	northern pocket gopher	mounds
3-13		unidentified lizard	tracks

Evaluation Unit: Grout Vaults
 ID: CP-LS-16
 Group: Legacy Source
 Operable Unit Cross-Walk: NA
 Related EU: NA
 Sites & Facilities: Grout vaults located west of WTP.
 Key Data Sources Docs: DOE-RL-96-32-01; Mission Support Alliance maps²¹
 Field Survey Date: 06/16/2015
 Datasheet prepared by: MAC, KDH, KDH 10/26/2015
 Datasheet reviewed by:

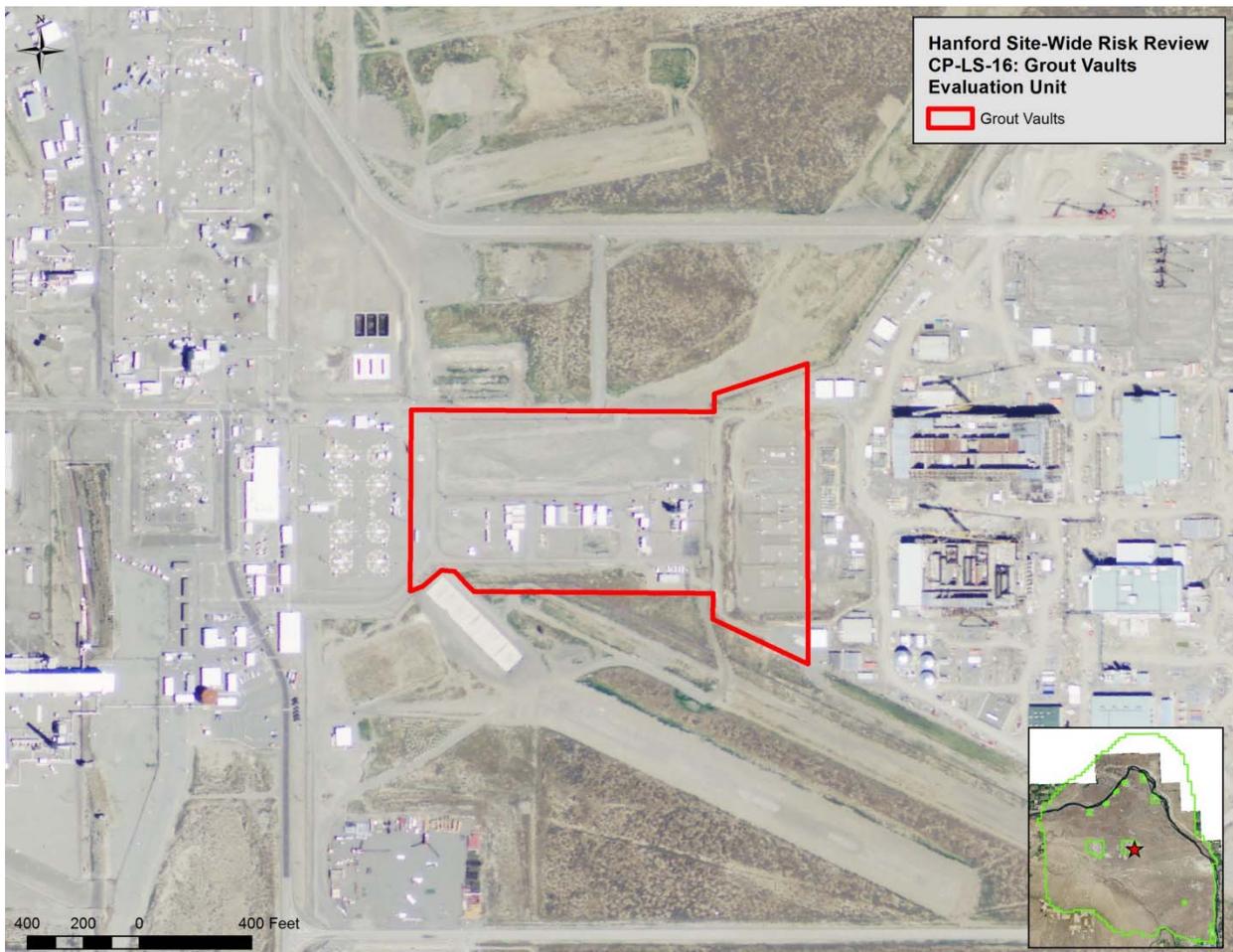


Figure J.39. CP-LS-16 (Grout Vaults) Site Location Map

CP-LS-16: Grout Vaults

²¹ MSA (Mission Support Alliance) maintains biological resource information for the Hanford Site for the Department of Energy

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the current Endangered and Threatened Species (Federal and State) distribution data; priority habitats as defined by Washington Department of Fish and Wildlife; available current aerial imagery, locations of Hanford Site waste units and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary.

The following steps were taken to assess the EU associated with the Grout Vaults:

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. A pedestrian survey was conducted around the EU perimeter by experienced shrub-steppe ecologists.
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2013 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.
6. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

Approximately 90% of the landscape encompassed by the Grout Vaults EU is bare ground and buildings associated with the facility; the remaining 10% occurs in 2 patches of disturbed habitat, one on the north and one on the south side of the EU. These two patches are dominated by Russian thistle (*Salsola tragus*) and cheatgrass (*Bromus tectorum*) (Table J.37). No birds or other animals were observed within the EU during the June 16, 2015 survey.

Table J.37. Percent Canopy Cover and Surface Cover Estimated at the Grout Vaults Evaluation Unit

Vegetation/Surface Cover	Survey Area (%)
Bare	90
Introduced grass	2
Introduced forb	8
Native forb	-
Native grass	-
Successional shrub	-
Climax shrub	-

Note: a dash (-) indicates no percent cover data was collected

Landscape Evaluation and Resource Classification:

All of the resources within the Grout Vaults EU are classified as level 1 or lower (Table J.38).

The amount and proximity of biological resources surrounding the Grout Vaults EU were examined within the adjacent landscape buffer area, which extends 1683 ft (513 m) from the geometric center of the EU. Resource level 0 areas cover almost 54% of the buffer area (Table J.38) and include the future vitrification plant under construction on the east, and various waste sites and buildings within the 200-East Area on the west (Figure J.40). On the north and south sides of the buffer area are disturbed areas of level 1 resources dominated by Russian thistle surrounding isolated remnant patches of level 3 resources containing mature sagebrush (*Artemisia tridentata*) with an understory comprised of various introduced and native grasses and forbs.

Assumptions and Uncertainty:

Although all observations for species of concern and current conditions of biological resources were noted during surveys and evaluations conducted in 2015, the presence or absence of species cannot be assumed or predicted for future years. Field reconnaissance and surveys of evaluation units at the time of remediation will need to be conducted to verify resources and evaluate ecological conditions at that time.

Summary of Ecological Review:

- 100% of the EU is classified as level 1 or lower biological resources. Loss of the level 1 habitat within the EU during remediation activities is not expected to impact connectivity with surrounding habitats.

- Over 81% of the combined EU and adjacent landscape buffer area is classified at level 2 or lower.
- Patches of level 3 resources in the adjacent buffer area are mostly shrub-steppe remnants that are isolated from similar habitat outside the 200-East Area.

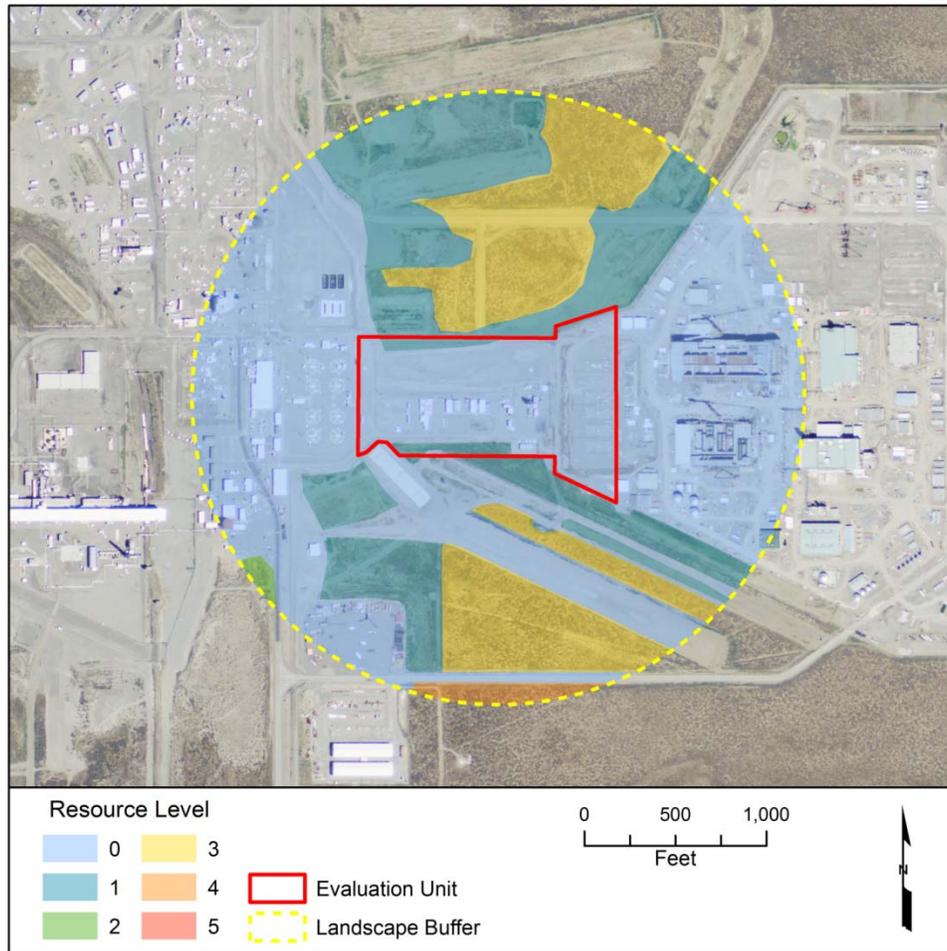


Figure J.40. Biological Resource Level Classifications Based on the June 16, 2015 Survey at the Grout Vaults Evaluation Unit (red solid line) and Adjacent Landscape Buffer Area (yellow dashed line).

Table J.38. Area and Proportion of Each Biological Resource Level Within the Grout Vaults Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources.

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
0	21.1	96.8	118.0	57.75%	58.77%	1.01%
1	2.1	45.1	47.2	23.12%	22.10%	-1.01%
2	0	0.7	0.7	0.32%	0.32%	0.00%
3	0	36.2	36.2	17.71%	17.71%	0.00%
4	0	2.2	2.2	1.10%	1.10%	0.00%
5	0	0	0	0.00%	0.00%	0.00%
Total	23.2	181.0	204.2	100.00%	100.00%	

1 Resource levels for both the evaluation unit and adjacent landscape boundary were reviewed in the field and via imagery during May-August 2015 and revised to reflect current habitats conditions.

2 Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.

References:

- DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 0.
- U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act. <http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>
- U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington. http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902
- Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. <http://wdfw.wa.gov/conservation/phs/list/>
- Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington. <http://wdfw.wa.gov/conservation/endangered/>
- Washington Noxious Weed Control Board. 2014. Noxious Weed List. <http://www.nwcb.wa.gov/>
- Washington State Department of Natural Resources. 2014. Washington Natural Heritage Program Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

Definitions and Acronyms:

Adjacent Landscape Buffer – a circular area adjacent to and outside the EU boundary with the center of the circle at the centroid of the EU, and with a radius that is 1 times the maximum dimension (width or length—whichever is greatest). This circular buffer area is used to evaluate indirect effects and assess the remediation in relation to the landscape features and resources adjacent to the EU. This circular area is generally at least 3 times the area of the EU.

Biological Resource Levels (from DOE-RL-96-32-01) –

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats.
- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks.
- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub-steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.
- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.
- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.
- Level 0 resources consist of non-native plants and animals (unless otherwise listed at a higher level), non-vegetated areas, and industrial areas.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

MBTA – Migratory Bird Treaty Act; referring to species listed and protected under the federal Act.

PNNL ECAP (Ecological Compliance and Assessment Project) Database – PNNL performed ecological reviews for individual projects and annually surveyed selected areas and buildings on the Hanford Site for DOE-RL under the DOE's Public Safety and Resource Protection Program until 2011. The data collected during those surveys is archived in the ECAP database, and is used to supplement ecological evaluations as available.

Priority Habitats – Priority habitats are habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type (e.g., shrub-steppe) or dominant plant species (e.g., juniper savannah), a described successional stage (e.g., old-growth forest), or a specific habitat feature (e.g., cliffs).

Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

Field Data Records

Plant Species Identified During Visual Surveys June 16 2015, Grout Vaults EU			
Patch ID	Name	Common name	Abundance
1	<i>Salsola tragus</i>	Russian thistle	8
1	<i>Bromus tectorum</i>	cheatgrass	2
1	<i>no vegetation</i>	no vegetation	90

Evaluation Unit: BC Control Zone
 ID: CP-LS-17
 Group: Legacy Source
 Operable Unit Cross-Walk: 200-OA-1
 Related EU: CP-LS-1
 Sites & Facilities: Surface contamination area to the south of 200-E (excluding the BC Cribs and Trenches).
 Key Data Sources Docs: DOE-RL-96-32-01; MSA Biological Resources Data²²
 Field Survey Date: 06/24-25/2015 and 06/29-30/2015
 Datasheet prepared by: KDH, 10/26/2015
 Datasheet reviewed by:



Figure J.41. CP-LS-17 (BC Control Zone) Site Location Map

CP-LS-17: BC Control Zone

²² MSA (Mission Support Alliance) maintains biological resource information for the Hanford Site for the Department of Energy

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the current Endangered and Threatened Species (Federal and State) distribution data; priority habitats as defined by Washington Department of Fish and Wildlife; available current aerial imagery, locations of Hanford Site waste units and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data tables.

The following steps were taken to assess the EU associated with the BC Control Zone:

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. Visual surveys were conducted within the EU boundary by experienced shrub-steppe ecologists.
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2013 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.
6. PNNL biologists assembled the information from field surveys, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

Encompassing a total of nearly 8,599 acres, the BC Control Zone EU is the single largest EU evaluated under this risk review. Most of the area within the EU boundary is classified as either a Radiological Contamination Area (CA) or a Radiological Surface Contamination Area (SCA), and as such, access is restricted and controlled. Pedestrian surveys within representative regions of the habitat were conducted by PNNL biologists between June 24 and 30, 2015. Because of constraints of time and the restrictions involved in performing active work within CAs/SCAs, only visual estimates (no transect measurements) of vegetation cover were taken.

The EU consists of relatively undisturbed and intact successional and climax shrub-steppe habitats. The level 4 area (Figure J.42) in the northcentral portion of the EU (including visual survey areas CA1, CA2, CA3, and CA5) is characterized by approximately 23% canopy cover of mature big sagebrush (*Artemisia tridentata*), a native climax shrub, with a mixed understory of introduced and native grasses (Table J.39). The south and east portions of the EU (including visual survey areas SCA NE, SCA SE, and SCA West) have lower shrub cover due to the effects of fires; this area contains approximately 3% native successional shrubs with a mix of introduced and native grasses (Table J.39). This level 5 area (Figure J.42) is classified as a plant community element occurrence by the Washington Natural Heritage Program and contains several sand dune complexes throughout. The following wildlife species of concern, or their sign, were observed in the EU: several sage sparrows (*Amphispiza belli*, a Washington State Candidate species) were observed perching and singing within the level 4 habitat area, several adult and juvenile loggerhead shrikes (*Lanius ludovicianus*, a Washington State Candidate species) were seen throughout the EU, scat and trails of black-tailed jackrabbits (*Lepus californicus*, a Washington State Candidate species) was noted in the level 4 habitat area, and diggings of American badger (*Taxidea taxus*, a Washington State Monitor species) were observed in the western end of the level 5 area. See the Field Data Records section for the full lists of plant and animal species recorded during the pedestrian surveys.

Table J.39. Percent Canopy Cover and Surface Cover Estimated at the BC Control Zone Evaluation Unit

Vegetation/Surface Cover	Survey Areas (% Cover)							
	CA1	CA2	CA3	CA4	CA5	SCA NE	SCA SE	SCA West
Bare Ground	-	-	-	-	-	-	-	-
Introduced Forb	-	10	5	5	-	10	25	8
Introduced Grass	40	28	15	25	40	20	25	25
Native Forb	-	-	-	2	-	-	-	2
Native Grass	10	8	10	8	5	15	8	15
Successional Shrub	-	-	-	5	-	3	5	2
Climax Shrub	20	23	27	2	20	-	-	0

Note: a dash (-) indicates no percent cover data were collected

Landscape Evaluation and Resource Classification:

Nearly all of the area (8358.5 acres, 97.2%) within the BC Control Zone EU is classified as level 3 biological resources or above (Figure J.42, Table J.40). Only one small area of bare/disturbed level 0 (23 acres) is found along the northern boundary and two sections of level 2 habitats (totaling 217 acres) are found in the north half of the EU. The level 4 resource area is considered essential habitat (DOE/RL-96-32 2013) and reflects the high quality sagebrush-steppe community present there. The large level 5 area making up the south and east portion of the EU is considered irreplaceable habitat because it is a plant community and sand dune complex element occurrence (DOE/RL-96-32 2013).

The amount and proximity of biological resources surrounding the BC Control Zone EU were examined within the adjacent landscape buffer area, which extends 29,415 feet (8,966 m) from the geometric center of the EU (Figure J.42). Because of the large size of the EU, the adjacent landscape buffer encompasses an extensive area (53,863.8 acres) and includes the entire 200 East Area, the east half of the 200 West Area, a portion of the Laser Interferometer Gravitational-Wave Observatory (LIGO) Hanford Observatory, and a portion of the Fitzner/Eberhardt Arid Lands Ecology Reserve Unit of the Hanford Reach National Monument on the south side of State Highway 240. Approximately 6% of the combined total area (EU plus adjacent landscape buffer) consists of disturbed/industrial sites (level 0 and 1 biological resources), with most occurring within the 200 East and 200 West Areas, and 9.8% consists of level 2 resources. The majority (84.2%) of the total combined area is made up of level 3 biological resources or above (Figure J.42, Table J.40), with a significant portion (41.3% overall) consisting of level 5 resources alone. The proportion of level 3-5 resources lost from remediation actions in the EU would be approximately 13.7% (Table J.40).

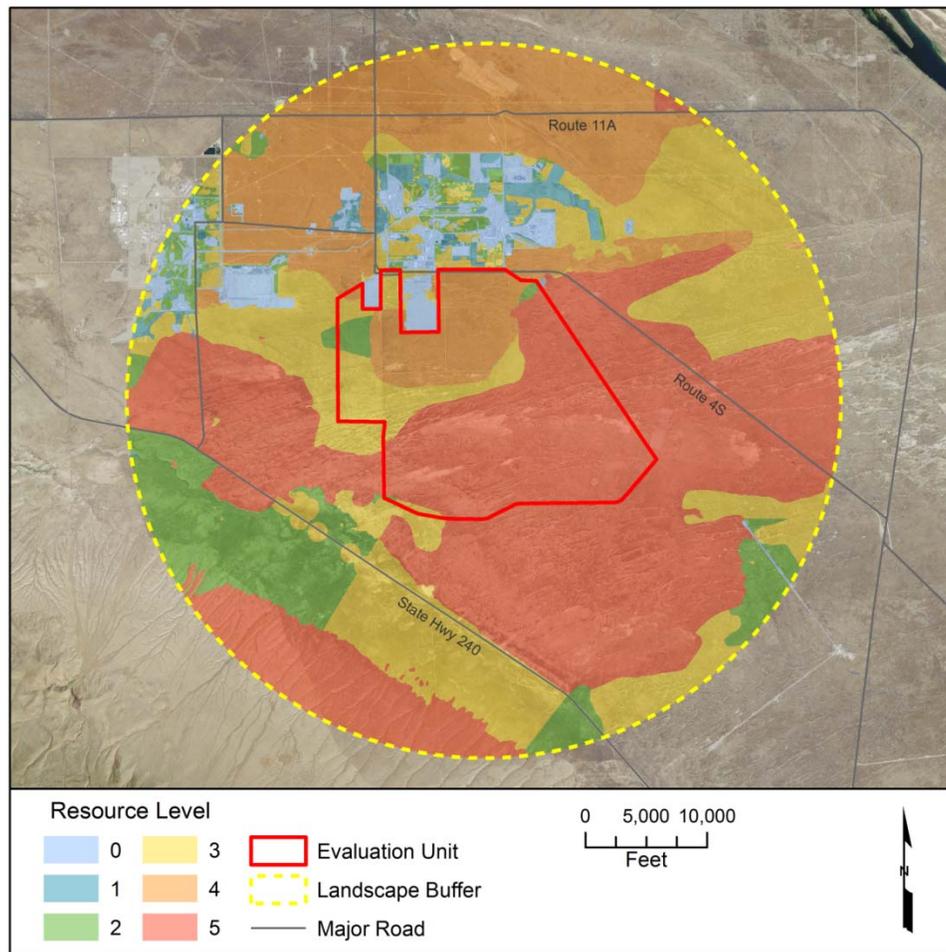


Figure J.42. Biological Resource Level Classifications Based on 06/24-25/2015 and 06/29-30/2015 Surveys at the BC Control Zone Evaluation Unit (red solid line) and Adjacent Landscape Buffer Area (yellow dashed line).

Table J.40. Area and Proportion of Each Biological Resource Level Within the BC Control Zone Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources.

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
0	23.0	2630.4	2653.4	4.25%	17.98%	13.73%
1	0	1068.5	1068.5	1.71%	1.71%	0.00%
2	217.0	5903.7	6120.7	9.80%	9.45%	-0.35%

3	1357.1	13999.1	15356.2	24.58%	22.41%	-2.17%
4	1942.6	9506.0	11448.6	18.33%	15.22%	-3.11%
5	5058.8	20756.2	25815.0	41.33%	33.23%	-8.10%
Total	8598.5	53863.8	62462.3	100%	100%	

1 Resource levels for both the evaluation unit and adjacent landscape boundary were reviewed in the field and via imagery during May-August 2015 and revised to reflect current habitats conditions.

2 Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.

Assumptions and Uncertainty:

Although all observations for species of concern and current conditions of biological resources were noted during surveys and evaluations conducted in 2015, the presence or absence of species cannot be assumed or predicted for future years. Field reconnaissance and surveys of evaluation units at the time of remediation will need to be conducted to verify resources and evaluate ecological conditions at that time.

Summary of Ecological Review:

- 97.2% of the EU consists of levels 3, 4, and 5 biological resources, with over half of the EU (58.8%) classified as level 5.
- Only 2.8% of the EU consists of levels 0, 1, or 2 biological resources.
- The level 3 area within the north half of the EU supports a mature climax shrub-steppe vegetation community.
- The level 5 area making up the south and east portion of the EU is classified as an element occurrence; it is centrally located among and contiguous with similar level 5 resources in the adjacent landscape.
- A loss of 13.7% of level 3-5 resources at the landscape scale associated with remediation would be significant, not only because of the proportion of high quality/valuable biological resources lost within the EU, but also due to the large size of the area involved and its connectivity to adjacent habitats.

References:

DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 0.

U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act. <http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>

U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington. http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902

Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. <http://wdfw.wa.gov/conservation/phs/list/>

Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington. <http://wdfw.wa.gov/conservation/endangered/>

Washington Noxious Weed Control Board. 2014. Noxious Weed List. <http://www.nwcb.wa.gov/>

Washington State Department of Natural Resources. 2014. Washington Natural Heritage Program Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

Definitions and Acronyms:

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Biological Resource Levels (from DOE-RL-96-32-01) –

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats.
- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks.
- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub-steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.
- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.
- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.
- Level 0 resources consist of non-native plants and animals (unless otherwise listed at a higher level), non-vegetated areas, and industrial areas.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential

impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

MBTA – Migratory Bird Treaty Act; referring to species listed and protected under the federal Act.

PNNL ECAP (Ecological Compliance and Assessment Project) Database – PNNL performed ecological reviews for individual projects and annually surveyed selected areas and buildings on the Hanford Site for DOE-RL under the DOE's Public Safety and Resource Protection Program until 2011. The data collected during those surveys is archived in the ECAP database, and is used to supplement ecological evaluations as available.

Priority Habitats – Priority habitats are habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type (e.g., shrub-steppe) or dominant plant species (e.g., juniper savannah), a described successional stage (e.g., old-growth forest), or a specific habitat feature (e.g., cliffs).

Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

Field Data Records

Plant Species Identified During Visual Surveys June 24-30 2015, BC Control Zone EU			
Patch ID	Name	Common name	Abundance
CA1	<i>Achillea millefolium</i>	yarrow	
CA1	<i>Achnatherum hymenoides</i>	indian ricegrass	
CA1	<i>Agropyron cristatum</i>	crested wheatgrass	
CA1	<i>Ambrosia acanthicarpa</i>	bur ragweed	
CA1	<i>Artemisia tridentata</i>	big sagebrush	20
CA1	<i>Astragalus caricinus</i>	buckwheat milkvetch	
CA1	<i>Balsamorhiza careyana</i>	Carey's balsamroot	
CA1	<i>Bromus tectorum</i>	cheatgrass	40
CA1	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	
CA1	<i>Comandra umbellata</i>	bastard toadflax	
CA1	<i>Cryptantha circumscissa</i>	matted cryptantha	
CA1	<i>Eriogonum vimineum</i>	broom buckwheat	
CA1	<i>Festuca microstachys</i>	small sixweeks	
CA1	<i>Grayia spinosa</i>	spiny hopsage	
CA1	<i>Hesperostipa comata</i>	needle-and-thread grass	
CA1	<i>Machaeranthera canescens</i>	hoary aster	
CA1	<i>Microgilia minutiflora</i>	small-flowered ipomopsis	
CA1	<i>Microsteris gracilis</i>	pink microsteris	
CA1	<i>Phlox longifolia</i>	longleaf phlox	
CA1	<i>Poa secunda</i>	Sandberg's bluegrass	10
CA1	<i>Psoralea lanceolata</i>	dune scurfpea	
CA1	<i>Pteryxia terebinthina var. terebinthina</i>	turpentine springparsley	
CA1	<i>Purshia tridentata</i>	bitterbrush	
CA1	<i>Salsola tragus</i>	Russian thistle	
CA1	<i>Sisymbrium altissimum</i>	Jim Hill's tumbled mustard	
CA1	<i>Sitanion hystrix</i>	bottlebrush grass	
CA1	<i>Stephanomeria paniculata</i>	stiff wirelettuce	
CA1	<i>Tiquilia nuttallii</i>	desert mat	
CA1	<i>Tragopogon dubius</i>	Yellow salsify	
CA1	<i>unknown Chenopod</i>	Chenopod	
CA2	<i>Achillea millefolium</i>	yarrow	
CA2	<i>Achnatherum hymenoides</i>	indian ricegrass	
CA2	<i>Ambrosia acanthicarpa</i>	bur ragweed	
CA2	<i>Artemisia tridentata</i>	big sagebrush	22
CA2	<i>Astragalus caricinus</i>	buckwheat milkvetch	
CA2	<i>Astragalus sclerocarpus</i>	stalked-pod milkvetch	
CA2	<i>Balsamorhiza careyana</i>	Carey's balsamroot	
CA2	<i>Bromus tectorum</i>	cheatgrass	28
CA2	<i>Chaenactis douglasii</i>	hoary falseyarrow	
CA2	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	
CA2	<i>Comandra umbellata</i>	bastard toadflax	
CA2	<i>Cryptantha circumscissa</i>	matted cryptantha	
CA2	<i>Cryptantha fendleri</i>	Fendler's cryptantha	

Plant Species Continued June 24-30 2015, BC Control Zone EU			
Patch ID	Name	Common name	Abundance
CA2	<i>Ericameria nauseosa</i>	gray rabbitbrush	
CA2	<i>Erigeron filifolius</i>	threadleaf fleabane	
CA2	<i>Eriogonum vimineum</i>	broom buckwheat	
CA2	<i>Gilia sinuata</i>	shy gilia	
CA2	<i>Grayia spinosa</i>	spiny hopsage	1
CA2	<i>Hesperostipa comata</i>	needle-and-thread grass	
CA2	<i>Holosteum umbellatum</i>	jagged chickweed	
CA2	<i>Machaeranthera canescens</i>	hoary aster	
CA2	<i>Mentzelia albicaulis</i>	whitestem stickleaf	
CA2	<i>Microsteris gracilis</i>	pink microsteris	
CA2	<i>Nama densum</i>	purplemat	
CA2	<i>Penstemon acuminatus</i>	sand beardtongue	
CA2	<i>Phlox longifolia</i>	longleaf phlox	
CA2	<i>Poa secunda</i>	Sandberg's bluegrass	8
CA2	<i>Psoralea lanceolata</i>	dune scurfpea	
CA2	<i>Pteryxia terebinthina</i> var. <i>terebinthina</i>	turpentine springparsley	
CA2	<i>Purshia tridentata</i>	bitterbrush	
CA2	<i>Salsola tragus</i>	Russian thistle	10
CA2	<i>Sisymbrium altissimum</i>	Jim Hill's tumbled mustard	
CA2	<i>Sitanion hystrix</i>	bottlebrush grass	
CA2	<i>Tiquilia nuttallii</i>	desert mat	
CA2	<i>Tragopogon dubius</i>	Yellow salsify	
CA3	<i>Achillea millefolium</i>	yarrow	
CA3	<i>Achnatherum hymenoides</i>	indian ricegrass	
CA3	<i>Ambrosia acanthicarpa</i>	bur ragweed	
CA3	<i>Amsinckia species</i>	Amsinckia	
CA3	<i>Artemisia tridentata</i>	big sagebrush	25
CA3	<i>Astragalus caricinus</i>	buckwheat milkvetch	
CA3	<i>Balsamorhiza careyana</i>	Carey's balsamroot	
CA3	<i>Bromus tectorum</i>	cheatgrass	15
CA3	<i>Chaenactis douglasii</i>	hoary falseyarrow	
CA3	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	
CA3	<i>Comandra umbellata</i>	bastard toadflax	
CA3	<i>Cryptantha circumscissa</i>	matted cryptantha	
CA3	<i>Descurainia sophia</i>	flixweed	
CA3	<i>Ericameria nauseosa</i>	gray rabbitbrush	
CA3	<i>Eriogonum vimineum</i>	broom buckwheat	
CA3	<i>Festuca octoflora</i>	slender sixweeks	
CA3	<i>Grayia spinosa</i>	spiny hopsage	2
CA3	<i>Hesperostipa comata</i>	needle-and-thread grass	
CA3	<i>Holosteum umbellatum</i>	jagged chickweed	
CA3	<i>Machaeranthera canescens</i>	hoary aster	
CA3	<i>Microsteris gracilis</i>	pink microsteris	

Plant Species Continued June 24-30 2015, BC Control Zone EU			
Patch ID	Name	Common name	Abundance
CA3	<i>Nama densum</i>	purplemat	
CA3	<i>Phlox longifolia</i>	longleaf phlox	
CA3	<i>Poa secunda</i>	Sandberg's bluegrass	10
CA3	<i>Psoralea lanceolata</i>	dune scurfpea	
CA3	<i>Pteryxia terebinthina var. terebinthina</i>	turpentine springparsley	
CA3	<i>Salsola tragus</i>	Russian thistle	5
CA3	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	
CA3	<i>Stephanomeria paniculata</i>	stiff wirelettuce	
CA3	<i>Tiquilia nuttallii</i>	desert mat	
CA3	<i>Tragopogon dubius</i>	Yellow salsify	
CA4	<i>Achillea millefolium</i>	yarrow	
CA4	<i>Achnatherum hymenoides</i>	indian ricegrass	
CA4	<i>Ambrosia acanthicarpa</i>	bur ragweed	
CA4	<i>Amsinckia species</i>	fiddleneck	
CA4	<i>Artemisia tridentata</i>	big sagebrush	5
CA4	<i>Astragalus caricinus</i>	buckwheat milkvetch	
CA4	<i>Astragalus sclerocarpus</i>	stalked-pod milkvetch	
CA4	<i>Balsamorhiza careyana</i>	Carey's balsamroot	
CA4	<i>Bromus tectorum</i>	cheatgrass	25
CA4	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	2
CA4	<i>Comandra umbellata</i>	bastard toadflax	
CA4	<i>Crepis atriobarba</i>	slender hawkbeard	
CA4	<i>Cryptantha circumscissa</i>	matted cryptantha	
CA4	<i>Cryptantha fendleri</i>	Fendler's cryptantha	
CA4	<i>Ericameria nauseosa</i>	gray rabbitbrush	2
CA4	<i>Erysimum species</i>	wallflower	
CA4	<i>Hesperostipa comata</i>	needle-and-thread grass	5
CA4	<i>Ipomopsis minutiflora</i>	littleflower ipomopsis	
CA4	<i>Lactuca serriola</i>	prickly lettuce	
CA4	<i>Lupinus pusillus</i>	low lupine	
CA4	<i>Machaeranthera canescens</i>	hoary aster	
CA4	<i>Mentzelia albicaulis</i>	whitestem stickleaf	
CA4	<i>Nama densum</i>	purplemat	
CA4	<i>Oenothera pallida</i>	pale evening primrose	
CA4	<i>Penstemon acuminatus</i>	sand beardtongue	
CA4	<i>Phacelia hastata</i>	whiteleaf scorpionweed	
CA4	<i>Phlox longifolia</i>	longleaf phlox	
CA4	<i>Poa secunda</i>	Sandberg's bluegrass	
CA4	<i>Pseudoroegneria spicata</i>	bluebunch wheatgrass	
CA4	<i>Psoralea lanceolata</i>	dune scurfpea	
CA4	<i>Pteryxia terebinthina var. terebinthina</i>	turpentine springparsley	
CA4	<i>Purshia tridentata</i>	bitterbrush	
CA4	<i>Rumex venosus</i>	winged dock	

Plant Species Continued June 24-30 2015, BC Control Zone EU			
Patch ID	Name	Common name	Abundance
CA4	<i>Salsola tragus</i>	Russian thistle	5
CA4	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledmustard	
CA4	<i>Tragopogon dubius</i>	Yellow salsify	
CA4	<i>unknown Chenopod</i>	goosefoot	
CA5	<i>Achnatherum hymenoides</i>	indian ricegrass	
CA5	<i>Agropyron cristatum</i>	crested wheatgrass	
CA5	<i>Ambrosia acanthicarpa</i>	bur ragweed	
CA5	<i>Amsinckia species</i>	fiddleneck	
CA5	<i>Artemisia tridentata</i>	big sagebrush	20
CA5	<i>Balsamorhiza careyana</i>	Carey's balsamroot	
CA5	<i>Bromus tectorum</i>	cheatgrass	40
CA5	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	
CA5	<i>Comandra umbellata</i>	bastard toadflax	
CA5	<i>Crepis atribarba</i>	slender hawksbeard	
CA5	<i>Cryptantha circumscissa</i>	matted cryptantha	
CA5	<i>Eriogonum vimineum</i>	broom buckwheat	
CA5	<i>Festuca microstachys</i>	small sixweeks	
CA5	<i>Grayia spinosa</i>	spiny hopsage	
CA5	<i>Hesperostipa comata</i>	needle-and-thread grass	
CA5	<i>Machaeranthera canescens</i>	hoary aster	
CA5	<i>Microsteris gracilis</i>	pink microsteris	
CA5	<i>Phlox longifolia</i>	longleaf phlox	
CA5	<i>Poa secunda</i>	Sandberg's bluegrass	5
CA5	<i>Pteryxia terebinthina var. terebinthina</i>	turpentine springparsley	
CA5	<i>Purshia tridentata</i>	bitterbrush	
CA5	<i>Salsola tragus</i>	Russian thistle	
CA5	<i>Stephanomeria paniculata</i>	stiff wirelettuce	
CA5	<i>Tragopogon dubius</i>	Yellow salsify	
SCA NE	<i>Achillea millefolium</i>	yarrow	
SCA NE	<i>Achnatherum hymenoides</i>	indian ricegrass	
SCA NE	<i>Ambrosia acanthicarpa</i>	bur ragweed	
SCA NE	<i>Amsinckia species</i>	fiddleneck	
SCA NE	<i>Artemisia tridentata</i>	big sagebrush	
SCA NE	<i>Astragalus caricinus</i>	buckwheat milkvetch	
SCA NE	<i>Astragalus sclerocarpus</i>	stalked-pod milkvetch	
SCA NE	<i>Balsamorhiza careyana</i>	Carey's balsamroot	
SCA NE	<i>Bromus tectorum</i>	cheatgrass	20
SCA NE	<i>Chorispermum villosum</i>	Hairy bugseed	
SCA NE	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	5
SCA NE	<i>Cryptantha circumscissa</i>	matted cryptantha	
SCA NE	<i>Fritillaria pudica</i>	yellow bell	
SCA NE	<i>Grayia spinosa</i>	spiny hopsage	
SCA NE	<i>Hesperostipa comata</i>	needle-and-thread grass	10

Plant Species Continued June 24-30 2015, BC Control Zone EU			
Patch ID	Name	Common name	Abundance
SCA NE	<i>Hymenopappus filifolius</i>	columbia cutleaf	
SCA NE	<i>Ipomopsis minutiflora</i>	littleflower ipomopsis	
SCA NE	<i>Lupinus pusillus</i>	low lupine	
SCA NE	<i>Machaeranthera canescens</i>	hoary aster	
SCA NE	<i>Mentzelia albicaulis</i>	whitestem stickleaf	
SCA NE	<i>Oenothera pallida</i>	pale evening primrose	
SCA NE	<i>Opuntia polyacantha</i>	starvation pricklypear	
SCA NE	<i>Phacelia hastata</i>	whiteleaf scorpionweed	
SCA NE	<i>Phacelia linearis</i>	threadleaf scorpionweed	
SCA NE	<i>Phlox longifolia</i>	longleaf phlox	
SCA NE	<i>Poa secunda</i>	Sandberg's bluegrass	10
SCA NE	<i>Psoralea lanceolata</i>	dune scurfpea	
SCA NE	<i>Pteryxia terebinthina</i> var. <i>terebinthina</i>	turpentine springparsley	
SCA NE	<i>Purshia tridentata</i>	bitterbrush	
SCA NE	<i>Salsola tragus</i>	Russian thistle	10
SCA NE	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledmustard	
SCA NE	<i>Tiquilia nuttallii</i>	desert mat	
SCA NE	<i>Tragopogon dubius</i>	Yellow salsify	
SCA SE	<i>Abronia mellifera</i>	white sand verbena	
SCA SE	<i>Achillea millefolium</i>	yarrow	
SCA SE	<i>Achnatherum hymenoides</i>	indian ricegrass	
SCA SE	<i>Agropyron dasytachyum</i>	thickspike wheatgrass	
SCA SE	<i>Ambrosia acanthicarpa</i>	bur ragweed	
SCA SE	<i>Artemisia tridentata</i>	big sagebrush	
SCA SE	<i>Astragalus caricinus</i>	buckwheat milkvetch	
SCA SE	<i>Astragalus sclerocarpus</i>	stalked-pod milkvetch	
SCA SE	<i>Balsamorhiza careyana</i>	Carey's balsamroot	
SCA SE	<i>Bromus tectorum</i>	cheatgrass	20
SCA SE	<i>Chaenactis douglasii</i>	hoary falseyarrow	
SCA SE	<i>Chondrilla juncea</i>	Rush skeletonweed	
SCA SE	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	5
SCA SE	<i>Cryptantha circumscissa</i>	matted cryptantha	
SCA SE	<i>Cryptantha fendleri</i>	Fendler's cryptantha	
SCA SE	<i>Ericameria nauseosa</i>	gray rabbitbrush	
SCA SE	<i>Hesperostipa comata</i>	needle-and-thread grass	10
SCA SE	<i>Ipomopsis minutiflora</i>	littleflower ipomopsis	
SCA SE	<i>Lupinus pusillus</i>	low lupine	
SCA SE	<i>Machaeranthera canescens</i>	hoary aster	
SCA SE	<i>Mentzelia albicaulis</i>	whitestem stickleaf	
SCA SE	<i>Oenothera pallida</i>	pale evening primrose	
SCA SE	<i>Opuntia polyacantha</i>	starvation pricklypear	
SCA SE	<i>Orobanche species</i>	broomrape	
SCA SE	<i>Penstemon acuminatus</i>	sand beardtongue	

Plant Species Continued June 24-30 2015, BC Control Zone EU			
Patch ID	Name	Common name	Abundance
SCA SE	<i>Phacelia hastata</i>	whiteleaf scorpionweed	
SCA SE	<i>Phacelia linearis</i>	threadleaf scorpionweed	
SCA SE	<i>Phlox longifolia</i>	longleaf phlox	
SCA SE	<i>Poa secunda</i>	Sandberg's bluegrass	
SCA SE	<i>Psoralea lanceolata</i>	dune scurfpea	
SCA SE	<i>Pteryxia terebinthina var. terebinthina</i>	turpentine springparsley	
SCA SE	<i>Purshia tridentata</i>	bitterbrush	
SCA SE	<i>Rumex venosus</i>	winged dock	
SCA SE	<i>Salsola tragus</i>	Russian thistle	25
SCA SE	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	
SCA SE	<i>Tiquilia nuttallii</i>	desert mat	
SCA SE	<i>Tragopogon dubius</i>	Yellow salsify	
SCA West	<i>Abronia mellifera</i>	white sand verbena	
SCA West	<i>Achillea millefolium</i>	yarrow	
SCA West	<i>Achnatherum hymenoides</i>	indian ricegrass	5
SCA West	<i>Agropyron dasytachyum</i>	thickspike wheatgrass	
SCA West	<i>Ambrosia acanthicarpa</i>	bur ragweed	2
SCA West	<i>Amsinckia species</i>	fiddleneck	
SCA West	<i>Artemisia tridentata</i>	big sagebrush	<1
SCA West	<i>Astragalus caricinus</i>	buckwheat milkvetch	
SCA West	<i>Astragalus sclerocarpus</i>	stalked-pod milkvetch	
SCA West	<i>Balsamorhiza careyana</i>	Carey's balsamroot	
SCA West	<i>Bromus tectorum</i>	cheatgrass	25
SCA West	<i>Calochortus macrocarpus</i>	sagebrush mariposa lily	
SCA West	<i>Chaenactis douglasii</i>	hoary falseyarrow	
SCA West	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	1
SCA West	<i>Comandra umbellata</i>	bastard toadflax	
SCA West	<i>Crepis atriobarba</i>	slender hawksbeard	
SCA West	<i>Cryptantha circumscissa</i>	matted cryptantha	
SCA West	<i>Cryptantha circumscissa</i>	matted cryptantha	
SCA West	<i>Cryptantha fendleri</i>	Fendler's cryptantha	
SCA West	<i>Ericameria nauseosa</i>	gray rabbitbrush	1
SCA West	<i>Erysimum occidentale</i>	pale wallflower	
SCA West	<i>Fritillaria pudica</i>	yellow bell	
SCA West	<i>Grayia spinosa</i>	spiny hopsage	
SCA West	<i>Hesperostipa comata</i>	needle-and-thread grass	10
SCA West	<i>Hymenopappus filifolius</i>	columbia cutleaf	
SCA West	<i>Ipomopsis minutiflora</i>	littleflower ipomopsis	
SCA West	<i>Lupinus pusillus</i>	low lupine	
SCA West	<i>Machaeranthera canescens</i>	hoary aster	
SCA West	<i>Mentzelia albicaulis</i>	whitestem stickleaf	
SCA West	<i>Nama densum</i>	purplemat	
SCA West	<i>Oenothera pallida</i>	pale evening primrose	

Plant Species Continued June 24-30 2015, BC Control Zone EU			
Patch ID	Name	Common name	Abundance
SCA West	<i>Opuntia polyacantha</i>	starvation pricklypear	
SCA West	<i>Penstemon acuminatus</i>	sand beardtongue	
SCA West	<i>Phacelia hastata</i>	whiteleaf scorpionweed	
SCA West	<i>Phacelia linearis</i>	threadleaf scorpionweed	
SCA West	<i>Phlox longifolia</i>	longleaf phlox	
SCA West	<i>Poa secunda</i>	Sandberg's bluegrass	3
SCA West	<i>Psoralea lanceolata</i>	dune scurfpea	
SCA West	<i>Pteryxia terebinthina</i> var. <i>terebinthina</i>	turpentine springparsley	
SCA West	<i>Rumex venosus</i>	winged dock	
SCA West	<i>Salsola tragus</i>	Russian thistle	8
SCA West	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	
SCA West	<i>Sporobolus cryptandrus</i>	sand dropseed	
SCA West	<i>Tiquilia nuttallii</i>	desert mat	
SCA West	<i>Tragopogon dubius</i>	Yellow salsify	
SCA West	<i>Tribulus terrestris</i>	puncture vine	
SCA West	<i>Triteleia grandiflora</i>	largeflower triteleia	

Bird, Mammal and Herpetofauna Species Identified During Visual Surveys June 24-30 2015, BC Control Zone EU			
Patch ID	Name	Common name	Comment
CA1	<i>Amphispiza belli</i>	sage sparrow	1 perch shrub & sing
CA1	<i>Chondestes grammacus</i>	lark sparrow	2 sing
CA1	<i>Chordeiles minor</i>	common nighthawk	call, overhead
CA1	<i>Hirundo rustica</i>	barn swallow	1 flyby
CA1	<i>Sturnella neglecta</i>	western meadowlark	2 flyover, sing S end
CA1	<i>Zenaida macroura</i>	mourning dove	perch on wire, W side
CA1	<i>Canis latrans</i>	coyote	tracks, many digs
CA1	<i>Lepus californicus</i>	black-tailed jackrabbit	scat, trails
CA1	<i>Odocoileus hemionus</i>	mule deer	scat
CA1	<i>Thomomys talpoides</i>	northern pocket gopher	mounds
CA1		unidentified sparrow	3 hide in shrubs
CA1		small mammal	holes
CA1		unidentified lizard	tracks
CA2	<i>Amphispiza belli</i>	sage sparrow	1 sing, 3 perch
CA2	<i>Chondestes grammacus</i>	lark sparrow	sing, N end
CA2	<i>Chordeiles minor</i>	common nighthawk	2 call, overhead
CA2	<i>Lanius ludovicianus</i>	loggerhead shrike	1 perch, W side
CA2	<i>Sturnella neglecta</i>	western meadowlark	2 sing
CA2	<i>Zenaida macroura</i>	mourning dove	1 flyby
CA2	<i>Canis latrans</i>	coyote	den, scat, tracks
CA2	<i>Cervus elaphus nelsoni</i>	Rocky Mountain elk	scat, tracks
CA2	<i>Lepus californicus</i>	black-tailed jackrabbit	scat, trails

Bird, Mammal and Herpetofauna Species Identified During Visual Surveys June 24-30 2015, BC Control Zone EU			
Patch ID	Name	Common name	Comment
CA2	<i>Odocoileus hemionus</i>	mule deer	tracks, scat
CA2	<i>Thomomys talpoides</i>	northern pocket gopher	mounds
CA2	<i>Uta stansburiana</i>	side-blotched lizard	1 lizard
CA2		small mammal	holes
CA3	<i>Amphispiza belli</i>	sage sparrow	2-3 sing, perch
CA3	<i>Chondestes grammacus</i>	lark sparrow	sing
CA3	<i>Chordeiles minor</i>	common nighthawk	call, overhead
CA3	<i>Eremophila alpestris</i>	horned lark	sing
CA3	<i>Lanius ludovicianus</i>	loggerhead shrike	3 NE (1 is juv)
CA3	<i>Sturnella neglecta</i>	western meadowlark	5 sing, perch
CA3	<i>Zenaida macroura</i>	mourning dove	1 flyby
CA3	<i>Canis latrans</i>	coyote	tracks, scat, digs
CA3	<i>Cervus elaphus nelsoni</i>	Rocky Mountain elk	tracks
CA3	<i>Lepus californicus</i>	black-tailed jackrabbit	scat, trails
CA3	<i>Odocoileus hemionus</i>	mule deer	scat
CA3	<i>Thomomys talpoides</i>	northern pocket gopher	mounds
CA3	<i>Uta stansburiana</i>	side-blotched lizard	tracks, 1 lizard
CA3		small mammal	holes
CA4	<i>Amphispiza belli</i>	sage sparrow	1 sing
CA4	<i>Chondestes grammacus</i>	lark sparrow	sing E end
CA4	<i>Eremophila alpestris</i>	horned lark	flocks of 5 & 6
CA4	<i>Sturnella neglecta</i>	western meadowlark	2 sing
CA4	<i>Canis latrans</i>	coyote	tracks, scat, digs, juv skull
CA4	<i>Odocoileus hemionus</i>	mule deer	scat
CA4	<i>Thomomys talpoides</i>	northern pocket gopher	mounds
CA4	<i>Uta stansburiana</i>	side-blotched lizard	4 lizards
CA4		small mammal	holes
CA5	<i>Amphispiza belli</i>	sage sparrow	1 sing
CA5	<i>Eremophila alpestris</i>	horned lark	2 flyover
CA5	<i>Zenaida macroura</i>	mourning dove	1 flyby
CA5	<i>Canis latrans</i>	coyote	tracks, beds
CA5	<i>Lepus californicus</i>	black-tailed jackrabbit	scat, trails
CA5	<i>Thomomys talpoides</i>	northern pocket gopher	mounds
CA5	<i>Uta stansburiana</i>	side-blotched lizard	many tracks, 2 lizards
CA5		small mammal	holes
SCA West	<i>Eremophila alpestris</i>	horned lark	flock of 7
SCA West	<i>Sturnella neglecta</i>	western meadowlark	2 sing, flyby, perch
SCA West	<i>Canis latrans</i>	coyote	tracks, scat, digs
SCA West	<i>Cervus elaphus nelsoni</i>	Rocky Mountain elk	scat
SCA West	<i>Odocoileus hemionus</i>	mule deer	scat
SCA West	<i>Taxidea taxus</i>	badger	tracks, digs
SCA West	<i>Thomomys talpoides</i>	northern pocket gopher	mounds
SCA West	<i>Uta stansburiana</i>	side-blotched lizard	tracks, 3 lizards

Bird, Mammal and Herpetofauna Species Identified During Visual Surveys June 24-30 2015, BC Control Zone EU			
Patch ID	Name	Common name	Comment
SCA West		small mammal	holes
SCA West		unidentified lizard	2 small lizards
SCA NE	<i>Eremophila alpestris</i>	horned lark	1 bird, calls
SCA NE	<i>Lanius ludovicianus</i>	loggerhead shrike	1 perch shrub
SCA NE	<i>Canis latrans</i>	coyote	tracks, scat, digs
SCA NE	<i>Cervus elaphus nelsoni</i>	Rocky Mountain elk	scat
SCA NE	<i>Thomomys talpoides</i>	northern pocket gopher	mounds
SCA NE		small mammal	holes
SCA NE		unidentified lizard	tracks, holes
SCA SE	<i>Eremophila alpestris</i>	horned lark	calls, several flitting
SCA SE	<i>Canis latrans</i>	coyote	tracks, digs
SCA SE	<i>Cervus elaphus nelsoni</i>	Rocky Mountain elk	scat
SCA SE	<i>Thomomys talpoides</i>	northern pocket gopher	mounds
SCA SE		small mammal	holes
SCA SE		unidentified lizard	tracks, holes

Evaluation Unit: Outer Area Sites
 ID: CP-LS-18
 Group: Legacy Source
 Operable Unit Cross-Walk: 200-CW-1, 200-CW-3, 200-OA-1, 200-SW-1
 Related EU: NA
 Sites & Facilities: Outer Area solid waste disposal sites (e.g. NRDWL, SWL, etc.) and other Outer Area waste sites, miscellaneous buildings, and structures.
 Key Data Sources Docs: DOE-RL-96-32-01; Mission Support Alliance maps ²³
 Field Survey Date: 06/18/2015
 Datasheet prepared by: KDH 11/12/2015
 Datasheet reviewed by:



Figure J.43. CP-LS-18 (Outer Area Sites) Site Location Map

²³ MSA (Mission Support Alliance) maintains biological resource information for the Hanford Site for the Department of Energy.

CP-LS-18: Outer Area Sites

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the current Endangered and Threatened Species (Federal and State) distribution data; priority habitats as defined by Washington Department of Fish and Wildlife; available current aerial imagery, locations of Hanford Site waste units and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data tables.

The following steps were taken to assess the EU associated with Outer Area Sites (Central Landfill):

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. A pedestrian survey was conducted within the EU boundary by experienced shrub-steppe ecologists.
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2012 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.

6. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

The Outer Area Sites (Central Landfill) EU is a former solid waste disposal site that has been closed and revegetated with native vegetation. It is bordered on the east side by Army Loop Road (Figure J.43). The footprint of the landfill covers most of the area within the EU boundary and is characterized by native successional shrubs in the overstory and native grasses in the understory. The north approximate one-third (Survey Area 3-1) of the landfill footprint currently supports 2% cover of gray rabbitbrush (*Ericameria nauseosa*), 15% cover of Indian ricegrass (*Achnatherum hymenoides*), and 5% cover of needle-and-thread grass (*Hesperostipa comata*); the south approximate two-thirds (Survey Areas 3-2 and 3-3) of the landfill footprint currently supports 15% gray rabbitbrush, 10% Indian ricegrass, and 5% needle-and-thread grass (Table J.41). Various other native and non-native grasses and forbs are present in the area as well.

The west margin (Survey Area 5-2) and south corner (Survey Area 5-1) of the EU consist of shrub-steppe habitat relatively undisturbed by landfill activities, though past fires have affected the vegetation by reducing shrub cover. These areas are characterized by the native climax shrubs big sagebrush (*Artemisia tridentata*) and antelope bitterbrush (*Purshia tridentata*) in the overstory, with a combined canopy cover ranging from 2-12%. The dominant understory grasses include: native Indian ricegrass (10%) and native needle-and-thread grass (15%) in Survey Area 5-2, native Sandberg's bluegrass (25%) in Survey Area 5-1, and non-native cheatgrass (*Bromus tectorum*) ranging from 20-30% across both areas (Table J.41). A wide variety of native and non-native forbs and other grasses are also present in the area; see the field data records at the end of this section for the full list of plant species recorded during the survey.

Several wildlife species typical of such habitats, or their sign, were observed during the survey. Of note are loggerhead shrike (*Lanius ludovicianus*) a Washington State Candidate species and American badger (*Taxidea taxus*) a Washington State Monitor species. See the field data records section for the full list of wildlife species recorded during the survey

Table J.41. Percent Canopy Cover and Surface Cover Estimated at the Outer Area Sites (Central Landfill) Evaluation Unit.

Vegetation/Surface Cover	Survey Areas (% Cover)				
	3-1	3-2	3-3	5-1	5-2
Bare Ground	-	-	-	-	-
Introduced Forb	10	-	-	10	-
Introduced Grass	-	-	-	20	30
Native Forb	-	-	-	-	-
Native Grass	20	15	15	25	25
Successional Shrub	2	15	15	-	5
Climax Shrub	-	-	-	12	2

Note: a dash (-) indicates no percent cover data were collected

Landscape Evaluation and Resource Classification:

All of the Outer Area Sites EU is classified as level 3 or above biological resources: the majority (101.4 acres, 76%) is classified as level 3, while the remainder (32 acres, 24%) is classified as level 5 (Figure J.44, Table J.42). The level 5 areas are considered irreplaceable habitat and are part of a larger plant community classified as an element occurrence by the Washington Natural Heritage Program (DOE/RL-96-32 2013).

The amount and proximity of biological resources surrounding the Outer Area Sites EU were examined within the adjacent landscape buffer area, which extends 4,614 feet (1,406 m) from the geometric center of the EU (Figure J.44) and consists primarily of level 5 resources. Approximately 87% (1,341 ac) of the combined total area (EU plus adjacent landscape buffer) consists of level 5 resources; again this area is classified as an antelope bitterbrush/Indian ricegrass sand dune complex element occurrence. Level 3 resources make up the remainder of the combined total area (12.7%, 195 ac). The proportion of level 3 or above resources lost from remediation actions in the EU would be approximately 4% at the landscape level (Table J.42). The proportion of level 3 or above resources lost from remediation actions in the EU would be approximately 8.7% at the landscape level (Table J.42).

Assumptions and Uncertainty:

Although all observations for species of concern and current conditions of biological resources were noted during surveys and evaluations conducted in 2015, the presence or absence of species cannot be assumed or predicted for future years. Field reconnaissance and surveys of evaluation units at the time of remediation will need to be conducted to verify resources and evaluate ecological conditions at that time.

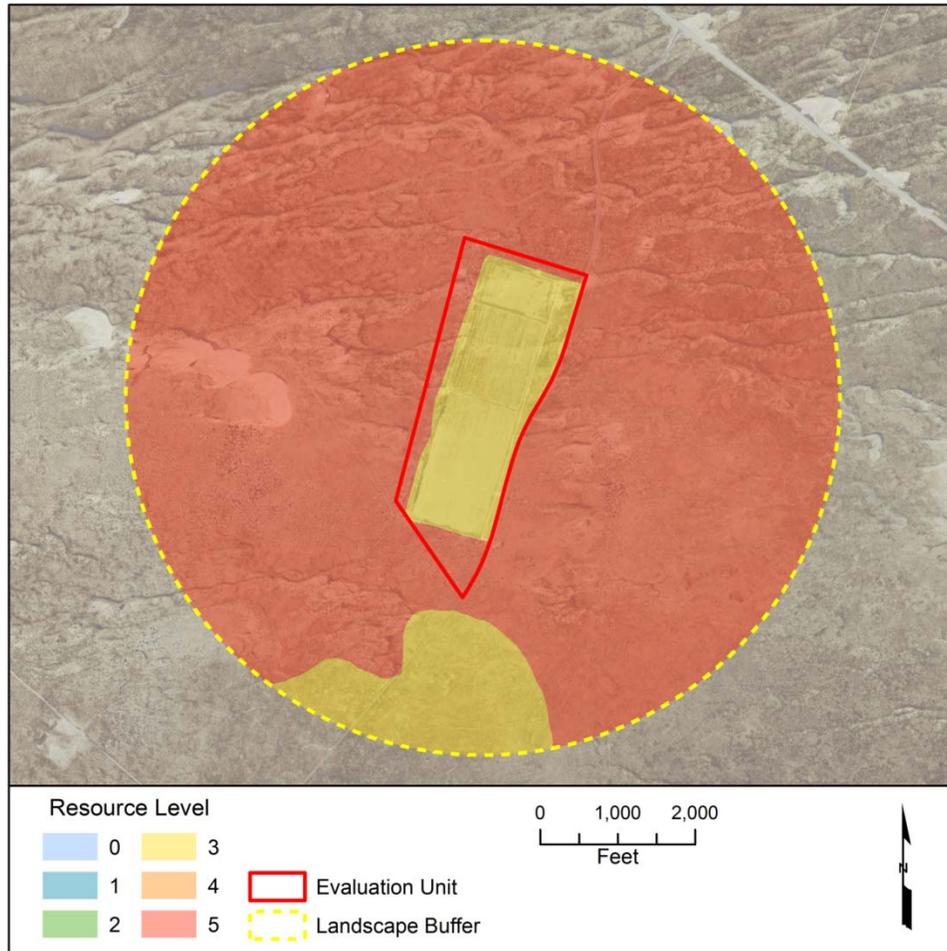


Figure J.44. Biological Resource Level Classifications Based on the June 18, 2015 Survey at the Outer Area Sites (Central Landfill) Evaluation Unit (red solid line) and Adjacent Landscape Buffer Area (yellow dashed line).

Table J.42. Area and Proportion of Each Biological Resource Level Within the Outer Area Sites (Central Landfill) Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources.

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
0	0	0	0	0.00%	8.69%	8.69%
1	0	0	0	0.00%	0.00%	0.00%
2	0	0	0	0.00%	0.00%	0.00%
3	101.4	93.4	194.8	12.69%	6.08%	-6.61%
4	0	0	0	0.00%	0.00%	0.00%
5	32.0	1308.6	1340.6	87.31%	85.23%	-2.09%
Total	133.5	1401.9	1535.4	100.00%	100.00%	

1 Resource levels for both the evaluation unit and adjacent landscape boundary were reviewed in the field and via imagery during May-August 2015 and revised to reflect current habitats conditions.

2 Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.

Summary of Ecological Review:

- 100% of the EU is classified as level 3 or above biological resources (76% level 3, 24% level 5).
- The level 3 area which makes up the majority of the EU consists of revegetated successional shrub-steppe habitat, while the level 5 area is classified as an element occurrence.
- A loss of 8.7% of level 3 or above resources would occur at the landscape level from remediation actions.

References:

DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 0.

U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act. <http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>

U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington. http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902

Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. <http://wdfw.wa.gov/conservation/phs/list/>

Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington. <http://wdfw.wa.gov/conservation/endangered/>

Washington Noxious Weed Control Board. 2014. Noxious Weed List. <http://www.nwcb.wa.gov/>

Washington State Department of Natural Resources. 2014. Washington Natural Heritage Program Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

Definitions and Acronyms:

Adjacent Landscape Buffer – a circular area adjacent to and outside the EU boundary with the center of the circle at the centroid of the EU, and with a radius that is 1 times the maximum dimension (width or length—whichever is greatest). This circular buffer area is used to evaluate indirect effects and assess the remediation in relation to the landscape features and resources adjacent to the EU. This circular area is generally at least 3 times the area of the EU.

Biological Resource Levels (from DOE-RL-96-32-01) –

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats.
- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks.
- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub-steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.
- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.
- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.
- Level 0 resources consist of non-native plants and animals (unless otherwise listed at a higher level), non-vegetated areas, and industrial areas.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

MBTA – Migratory Bird Treaty Act; referring to species listed and protected under the federal Act.

PNNL ECAP (Ecological Compliance and Assessment Project) Database – PNNL performed ecological reviews for individual projects and annually surveyed selected areas and buildings on the Hanford Site for DOE-RL under the DOE’s Public Safety and Resource Protection Program until 2011. The data collected during those surveys is archived in the ECAP database, and is used to supplement ecological evaluations as available.

Priority Habitats – Priority habitats are habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type (e.g., shrub-steppe) or dominant plant species (e.g., juniper savannah), a described successional stage (e.g., old-growth forest), or a specific habitat feature (e.g., cliffs).

Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

Field Data Records

Plant Species Identified During Visual Surveys June 18 2015, Outer Area Sites EU			
Patch ID	Name	Common name	Abundance
3-1	<i>Achillea millefolium</i>	yarrow	
3-1	<i>Achnatherum hymenoides</i>	indian ricegrass	15
3-1	<i>Ambrosia acanthicarpa</i>	bur ragweed	
3-1	<i>Bromus tectorum</i>	cheatgrass	
3-1	<i>Ericameria nauseosa</i>	gray rabbitbrush	2
3-1	<i>Hesperostipa comata</i>	needle-and-thread grass	5
3-1	<i>Machaeranthera canescens</i>	hoary aster	
3-1	<i>Oenothera pallida</i>	pale evening primrose	
3-1	<i>Salsola tragus</i>	Russian thistle	10
3-1	<i>Sisymbrium altissimum</i>	Jim Hill's tumbled mustard	
3-2	<i>Achillea millefolium</i>	yarrow	
3-2	<i>Achnatherum hymenoides</i>	indian ricegrass	10
3-2	<i>Agropyron cristatum</i>	crested wheatgrass	
3-2	<i>Ambrosia acanthicarpa</i>	bur ragweed	
3-2	<i>Artemisia tridentata</i>	big sagebrush	
3-2	<i>Astragalus sclerocarpus</i>	stalked-pod milkvetch	
3-2	<i>Bromus tectorum</i>	cheatgrass	
3-2	<i>Chaenactis douglasii</i>	hoary falseyarrow	
3-2	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	
3-2	<i>Cryptantha circumscissa</i>	matted cryptantha	
3-2	<i>Ericameria nauseosa</i>	gray rabbitbrush	15
3-2	<i>Hesperostipa comata</i>	needle-and-thread grass	5
3-2	<i>Lactuca serriola</i>	prickly lettuce	
3-2	<i>Machaeranthera canescens</i>	hoary aster	
3-2	<i>Oenothera pallida</i>	pale evening primrose	
3-2	<i>Poa secunda</i>	Sandberg's bluegrass	
3-2	<i>Psoralea lanceolata</i>	dune scurfpea	
3-2	<i>Rumex venosus</i>	winged dock	
3-2	<i>Salsola tragus</i>	Russian thistle	
3-2	<i>Tiquilia nuttallii</i>	desert mat	
3-2	<i>Tragopogon dubius</i>	Yellow salsify	
3-3	<i>Achillea millefolium</i>	yarrow	
3-3	<i>Achnatherum hymenoides</i>	indian ricegrass	10
3-3	<i>Agropyron cristatum</i>	crested wheatgrass	
3-3	<i>Ambrosia acanthicarpa</i>	bur ragweed	
3-3	<i>Artemisia tridentata</i>	big sagebrush	
3-3	<i>Astragalus sclerocarpus</i>	stalked-pod milkvetch	
3-3	<i>Bromus tectorum</i>	cheatgrass	
3-3	<i>Chaenactis douglasii</i>	hoary falseyarrow	
3-3	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	

Plant Species Identified During Visual Surveys June 18 2015, Outer Area Sites EU			
Patch ID	Name	Common name	Abundance
3-3	<i>Cryptantha circumscissa</i>	matted cryptantha	
3-3	<i>Ericameria nauseosa</i>	gray rabbitbrush	15
3-3	<i>Hesperostipa comata</i>	needle-and-thread grass	5
3-3	<i>Lactuca serriola</i>	prickly lettuce	
3-3	<i>Machaeranthera canescens</i>	hoary aster	
3-3	<i>Oenothera pallida</i>	pale evening primrose	
3-3	<i>Poa secunda</i>	Sandberg's bluegrass	
3-3	<i>Psoralea lanceolata</i>	dune scurfpea	
3-3	<i>Rumex venosus</i>	winged dock	
3-3	<i>Salsola tragus</i>	Russian thistle	
3-3	<i>Tiquilia nuttallii</i>	desert mat	
3-3	<i>Tragopogon dubius</i>	Yellow salsify	
5-1	<i>Achnatherum hymenoides</i>	indian ricegrass	
5-1	<i>Artemisia tridentata</i>	big sagebrush	12
5-1	<i>Bromus tectorum</i>	cheatgrass	20
5-1	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	
5-1	<i>Ericameria nauseosa</i>	gray rabbitbrush	
5-1	<i>Grayia spinosa</i>	spiny hopsage	
5-1	<i>Hesperostipa comata</i>	needle-and-thread grass	
5-1	<i>Melilotus altissimus</i>	yellow sweetclover	
5-1	<i>Poa bulbosa</i>	bulbous bluegrass	
5-1	<i>Poa secunda</i>	Sandberg's bluegrass	25
5-1	<i>Pseudoroegneria spicata</i>	bluebunch wheatgrass	
5-1	<i>Rumex venosus</i>	winged dock	
5-1	<i>Salsola tragus</i>	Russian thistle	10
5-1	<i>Sisymbrium altissimum</i>	Jim Hill's tumbled mustard	
5-1	<i>Sporobolus cryptandrus</i>	sand dropseed	
5-2	<i>Achillea millefolium</i>	yarrow	
5-2	<i>Achnatherum hymenoides</i>	indian ricegrass	10
5-2	<i>Agoseris heterophylla</i>	annual mountain dandelion	
5-2	<i>Ambrosia acanthicarpa</i>	bur ragweed	
5-2	<i>Artemisia tridentata</i>	big sagebrush	1
5-2	<i>Astragalus caricinus</i>	buckwheat milkvetch	
5-2	<i>Astragalus sclerocarpus</i>	stalked-pod milkvetch	
5-2	<i>Balsamorhiza careyana</i>	Carey's balsamroot	
5-2	<i>Bromus tectorum</i>	cheatgrass	30
5-2	<i>Chaenactis douglasii</i>	hoary falseyarrow	
5-2	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	3
5-2	<i>Cryptantha circumscissa</i>	matted cryptantha	
5-2	<i>Ericameria nauseosa</i>	gray rabbitbrush	2

Plant Species Identified During Visual Surveys June 18 2015, Outer Area Sites EU			
Patch ID	Name	Common name	Abundance
5-2	<i>Hesperostipa comata</i>	needle-and-thread grass	15
5-2	<i>Hymenopappus filifolius</i>	columbia cutleaf	
5-2	<i>Machaeranthera canescens</i>	hoary aster	
5-2	<i>Nama densum</i>	purplemat	
5-2	<i>Oenothera pallida</i>	pale evening primrose	
5-2	<i>Opuntia polyacantha</i>	starvation pricklypear	
5-2	<i>Phacelia hastata</i>	whiteleaf scorpionweed	
5-2	<i>Phacelia linearis</i>	threadleaf scorpionweed	
5-2	<i>Phlox longifolia</i>	longleaf phlox	
5-2	<i>Poa secunda</i>	Sandberg's bluegrass	
5-2	<i>Psoralea lanceolata</i>	dune scurfpea	3
5-2	<i>Pteryxia terebinthina var. terebinthi</i>	turpentine springparsley	
5-2	<i>Purshia tridentata</i>	bitterbrush	1
5-2	<i>Rumex venosus</i>	winged dock	
5-2	<i>Salsola tragus</i>	Russian thistle	

Bird, Mammal and Herpetofauna Species Identified During Visual Surveys June 18 2015, Outer Area Sites EU			
Patch ID	Name	Common name	Comment
3-2	<i>Chondestes grammacus</i>	lark sparrow	4 perch shrub
3-2	<i>Eremophila alpestris</i>	horned lark	2 perch shrub
3-2	<i>Canis latrans</i>	coyote	tracks
3-2		unidentified small mammal	holes
5-1	<i>Lanius ludovicianus</i>	loggerhead shrike	2 perch fence, poss nest nearby
5-2	<i>Eremophila alpestris</i>	horned lark	
5-2	<i>Canis latrans</i>	coyote	scat
5-2	<i>Cervus elaphus nelsoni</i>	Rocky Mountain elk	scat
5-2	<i>Taxidea taxus</i>	badger	burrows
5-2		unidentified lizard	side-blotched lizard?
5-2		unidentified small mammal	holes

Evaluation Unit: T Tank Farm
 ID: CP-TF-1
 Group: Tank Farm
 Operable Unit Cross-Walk: 200-DV-1
 WMA T
 200-WA-1
 Related EU: CP-LS-7
 CP-GW-2
 Sites & Facilities: T tank farm, ancillary structures, associated liquid waste sites, and soils contamination.
 Key Data Sources Docs: DOE/RL-96-32 2013
 PNNL ECAP Database²⁴
 Field Survey Date: July 16, 2014
 Data Sheet Prepared By: JLD, 10/08/2014

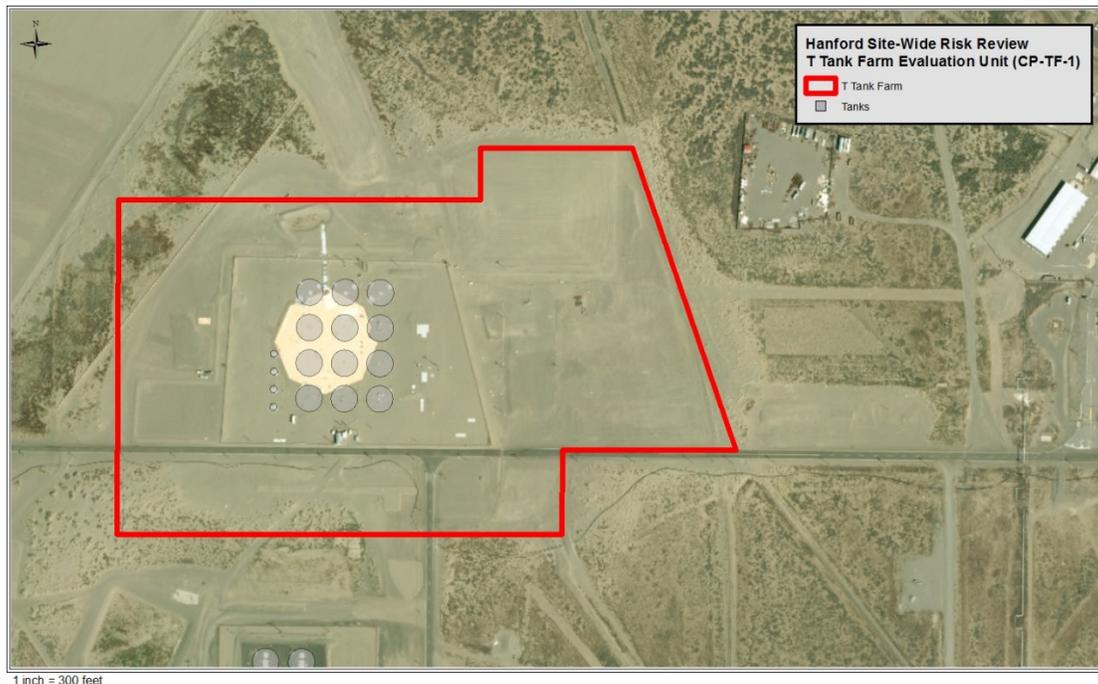
DRAFT

Figure J.45. Site Map with Evaluation Unit Boundaries and Tank Locations

CP-TF-1: T Tank Farm

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the

²⁴ The Ecological Compliance and Assessment Project (ECAP) database is an evolving set of data that is maintained by Pacific Northwest National Laboratory (PNNL) and updated as new ecological assessments are completed.

evaluation unit (EU). Additional information used in the ecological evaluation includes the current Endangered and Threatened Species (Federal and State) distribution data; priority habitats as defined by Washington Department of Fish and Wildlife; available current aerial imagery, locations of Hanford Site waste sites and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data tables.

The following steps were taken to assess the EU associated with the T Tank Farm:

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. A visual survey was conducted within the EU boundary by experienced shrub-steppe ecologists. Because the unit consists primarily of disturbed graveled/bare surfaces within the tank farm fence, and small patches of degraded shrub-steppe, no field measurements of vegetation were taken and no field data sheet is included in this summary. PNNL biologists also reviewed the observations and biological survey data available in the Ecological Compliance and Assessment Project (ECAP) database from the past 5 years for the EU to determine the status and resource level of the habitats within the EU and supplement the evaluation with previous wildlife or plant species observations.
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2012 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.

6. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

Approximately 90% of the T Tank Farm EU consists of graveled surfaces and paved areas. No vegetation measurements were taken in the areas adjacent to the actual tank farm, but previous information from PNNL ECAP surveys is included at the end of this summary. The existing resource level map indicates the presence of level 3 resources in the southwest corner of the EU to the south of the paved road associated with a point occurrence of a sensitive species (*Erigeron piperianus*) that has been observed at this location in past ECAP surveys but was not observed in 2010. No wildlife was observed in the area during a vehicle reconnaissance of the boundary, and in 2010, a previous PNNL ECAP survey of the habitat surrounding the tank farm noted only coyote (*Canis latrans*) tracks in the habitat to the west and northwest of the tank farm.

Table J.43. Percent Canopy Cover and Surface Cover Measured at T Tank Farm Evaluation Unit

Vegetation/Surface Cover	Inside Tank Farm Fence
BARE	100%

Landscape Evaluation and Resource Classification:

The amount and proximity of biological resources to the T Tank Farms EU was examined within the adjacent landscape buffer area radiating 574 m from the geometric center of the EU (equivalent to 256 acres). Approximately 44% of the adjacent landscape buffer area is classified as level 0 biological resources in the existing resource map (Table J.44, Figure J.46). The nearest level 3 resources within the buffer area are located south of the evaluation site (individual occurrences of sensitive plant species) and north and northeast of the evaluation site (Figure J.46). Review of historical ECAP data indicates the areas north and northwest of the EU contained shrub-steppe with a native climax big sagebrush (*Artemisia tridentata*) overstory with cheatgrass (*Bromus tectorum*) co-dominant in the understory with native bunchgrasses. These habitats have been degraded over the past 5 years with blowing sand and invasion by Russian thistle (*Salsola tragus*). No level 4 or 5 resources are present within the T tank farm adjacent landscape buffer.

Table J.44. Area and Proportion of Each Biological Resource Level Within the Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
0	31.0	96.7	127.7	49.9%	51.3%	1.4%
1	0.0	15.3	15.3	6.0%	6.0%	0.0%
2	3.4	84.0	87.4	34.1%	32.8%	-1.3%
3	0.3	25.3	25.6	10.0%	9.9%	-0.1%
4	0.0	0.0	0.0	0.0%	0.0%	0.0%
5	0.0	0.0	0.0	0.0%	0.0%	0.0%
Total	34.7	221.3	256.1	100.0%	100.0%	

1 Resource levels for both the evaluation unit and adjacent landscape boundary were reviewed in the field and via imagery during July 2014 and revised to reflect current habitats conditions.

2 Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.

Assumptions and Uncertainty:

Due to project time constraints, the field surveys and reconnaissance of this EU were conducted in mid-July. By the time of the survey, the cool-season annual and perennial herbaceous plants that dominate shrub-steppe habitat had completed seasonal growth and senesced making identification and inventory difficult and most likely incomplete. Although no records for plant species of concern have been noted, the absence of species cannot be confirmed by surveys during this time of year.

By mid-July, most migratory birds have completed their nesting cycles, and surveys may not reflect their occupancy and use of habitat within the EU earlier in the season. Their absence cannot be confirmed by surveys in July after the nesting season is over. Further surveys during the nesting season would be required to fully assess the ecological impacts to nesting migratory birds.

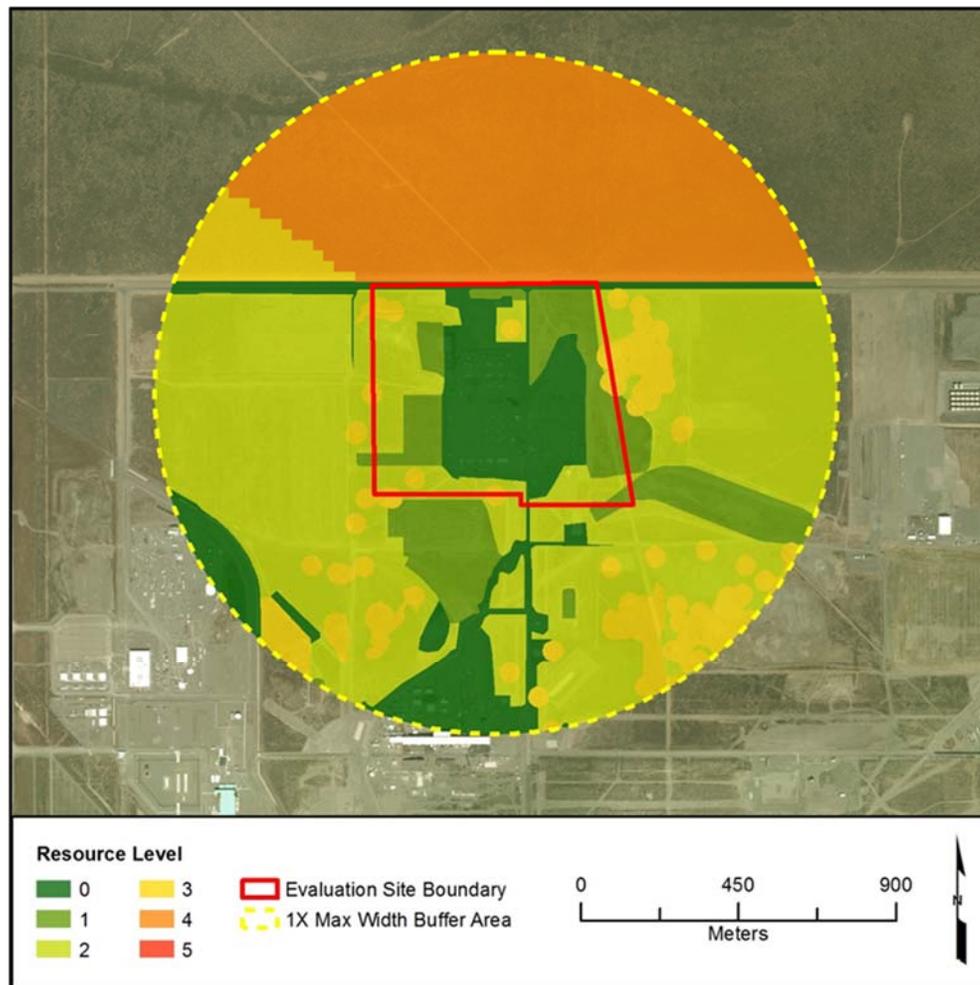


Figure J.46. Map of Biological Resource Level Classifications at the T Tank Farm Evaluation Unit (red boundary) and Adjacent Landscape Buffer Area (yellow dashed line boundary) Based on July 2014 Survey

Summary of Ecological Review:

- Approximately 90% of the T Tank Farm EU consists of graveled surfaces and paved areas.
- Individual occurrences of level 3 species have been previously documented at the T Tank Farm EU, however, no level 3 or greater habitat resources occur in patches greater than 0.5 ac within the EU.
- Loss of individual Piper's daisy plants would not be likely to affect the viability of populations of this species in the region.
- No wildlife was observed in the area during a vehicle reconnaissance of the boundary, and in 2010, a previous PNNL ECAP survey of the habitat surrounding the tank farm noted only coyote (*Canis latrans*) tracks in the habitat to the west and northwest of the tank farm.
- Cleanup activities would result in no net change in the amount of level 3 or higher resources within a 0.97 km radius.

- Because the EU is adjacent to paved roadways and multiple industrial areas and waste sites—no significant change in habitat connectivity would be expected if habitat resources within the EU are lost.

References:

- DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 0.
- U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act. <http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>
- U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington. http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902
- Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. <http://wdfw.wa.gov/conservation/phs/list/>
- Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington. <http://wdfw.wa.gov/conservation/endangered/>
- Washington Noxious Weed Control Board. 2014. Noxious Weed List. <http://www.nwcb.wa.gov/>
- Washington State Department of Natural Resources. 2014. Washington Natural Heritage Program Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

Definitions and Acronyms:

Adjacent Landscape Buffer – a circular area adjacent to and outside the EU boundary with the center of the circle at the centroid of the EU, and with a radius that is 1 times the maximum dimension (width or length—whichever is greatest). This circular buffer area is used to evaluate indirect effects and assess the remediation in relation to the landscape features and resources adjacent to the EU. This circular area is generally at least 3 times the area of the EU.

Biological Resource Levels (from DOE-RL-96-32-01) –

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats.
- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks.
- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake

hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.

- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.
- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

MBTA – Migratory Bird Treaty Act; referring to species listed and protected under the federal Act.

PNNL ECAP (Ecological Compliance and Assessment Project) Database – PNNL performed ecological reviews for individual projects and annually surveyed selected areas and buildings on the Hanford Site for DOE-RL under the DOE's Public Safety and Resource Protection Program until 2011. The data collected during those surveys is archived in the ECAP database, and is used to supplement ecological evaluations as available.

Priority Habitats – Priority habitats are habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type (e.g., shrub-steppe) or dominant plant species (e.g., juniper savannah), a described successional stage (e.g., old-growth forest), or a specific habitat feature (e.g., cliffs).

Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

ECAP Database Query Results for W-051a

Observer: *Hand, Kris* Date *7/28/2010*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
big sagebrush	Artemisia tridentata		Remnant few N end
Sandberg's bluegrass	Poa sandbergii		N end w/ Art
giant wildrye	Elymus cinereus		Lg grass
Russian thistle	Salsola kali	25	
gray rabbitbrush	Chrysothamnus nauseosus	1	
bur ragweed	Ambrosia acanthicarpa		
hoary aster	Machaeranthera canescens		
indian ricegrass	Oryzopsis hymenoides		

Mammal

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
coyote	Canis latrans		Present Tracks

Bird

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
No birds observed	No birds		

Evaluation Unit: S-SX Tank Farms
 ID: CP-TF-2
 Group: Tank Farm
 Operable Unit Cross-Walk: WMA S/SX
 200-DV-1
 200-WA-1
 Related EU: CP-LS-7
 CP-TF-9
 CP-GW-2
 Sites & Facilities: S-SX Tank Farms, ancillary structures, associated liquid waste sites, and soils contamination; includes 242-S Evaporator
 Key Data Sources Docs: DOE/RL-96-32 2013
 PNNL ECAP Database²⁵
 Field Survey Date: 10/14/2014
 Date Sheet Prepared By: KDH, JLD, MAC, KBL, SAM; 10/23/2014

DRAFT

Figure J.47. Site Map of the S-SX Tank Farms Evaluation Unit Boundary and Tank Locations

CP-TF-2: S-SX Tank Farms

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife

²⁵ The Ecological Compliance and Assessment Project (ECAP) database is an evolving set of data that is maintained by Pacific Northwest National Laboratory (PNNL) and updated as new ecological assessments are completed.

observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the current Endangered and Threatened Species (Federal and State) distribution data; priority habitats as defined by Washington Department of Fish and Wildlife; available current aerial imagery, locations of Hanford Site waste sites and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data tables.

The following steps were taken to assess the EU associated with the S-SX Tank Farms:

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. A visual survey was conducted within the EU boundary by experienced shrub-steppe ecologists. Because the unit consists of disturbed and revegetated areas and graveled surfaces, no field measurements of vegetation were taken. PNNL biologists also reviewed the observations and biological survey data available in the Ecological Compliance and Assessment Project (ECAP) database from the past 5 years for the EU to determine the status and resource level of the habitats within the EU and supplement the evaluation with previous wildlife or plant species observations.
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2012 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.
6. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

PNNL biologists conducted a reconnaissance and visual survey of the S-SX Tank Farms EU on October 14, 2014. The major portion of the unit consists of graveled surfaces, buildings, parking areas, and infrastructure related to the tanks. Small areas of remnant shrub-steppe vegetation occur within the EU near the west and south boundaries. The canopy cover was visually evaluated in the field for these patches. In the overstory successional shrub (gray rabbitbrush, *Ericameria nauseosa*) cover was approximately 5%, with mixed native and alien grasses and forbs in the understory (Table J.45).

No wildlife were observed within the EU during the October reconnaissance, however, PNNL ECAP surveys conducted in 2009 and 2010 noted the following wildlife: an American kestrel (*Falco sparverius*) apparently nesting in a building at the north end of the EU, loggerhead shrike (*Lanius ludovicianus*), Say's phoebe (*Sayornis saya*), barn swallow (*Hirundo rustica*), white-crowned sparrow (*Zonotrichia leucophrys*), western meadowlark (*Sturnella neglecta*), and black-tailed jackrabbit (*Lepus californicus*). All the bird species noted are protected by the Migratory Bird Treaty Act and, additionally, the loggerhead shrike is listed as a Washington State Species of Concern. The black-tailed jackrabbit is listed as a Washington State Candidate Species.

Table J.45. Percent Canopy Cover and Surface Cover Measured at S-SX Tank Farms Evaluation

Unit	
Vegetation/Surface Cover	Survey Area 2-16 (%)
Introduced Forb	6
Introduced Grass	1
Native Grass	2
Successional Shrubs	5

Landscape Evaluation and Resource Classification:

The amount of each category of biological resources at and near the S-SX Tank Farms EU was examined within a circular area radiating 623 m from the geometric center of the unit (equivalent to 300.9 acres). The majority of the area within the 47.7 acres of the EU is classified as level 0 (41.2 ac) biological resources, with the remainder classified as level 1 and 2. The adjacent landscape buffer consists primarily of level 0, 1, and 2. Small patches of level 3 resources are located to the north and south of the EU, including several point occurrences of sensitive species (Figure J.48). Overall, approximately 5.3 percent of the total combined area currently consists of level 3 or higher biological resources (Figure J.48, Table J.46).

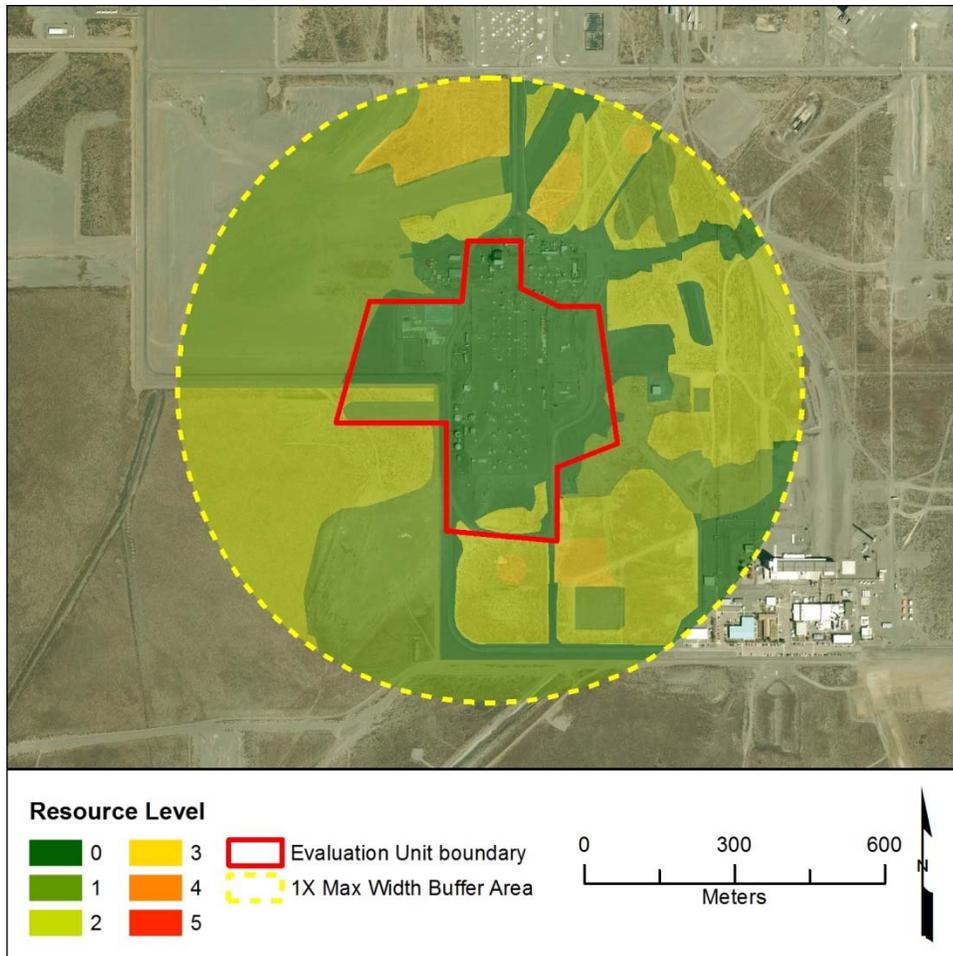


Figure J.48. Biological Resource Level Classifications Based on October 2014 Surveys for the S-SX Tank Farms Evaluation Unit (red solid line) and Adjacent Landscape Buffer (yellow dashed line)

Table J.46. Area and Proportion of Each Biological Resource Level Within the Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
0	41.2	41.1	82.2	27.3%	29.5%	2.2%
1	3.4	94.9	98.3	32.7%	31.5%	-1.1%
2	3.2	101.3	104.4	34.7%	33.6%	-1.1%
3	0.0	16.0	16.0	5.3%	5.3%	0.0%
4	0.0	0.0	0.0	0.0%	0.0%	0.0%
5	0.0	0.0	0.0	0.0%	0.0%	0.0%
<i>Total</i>	47.8	253.3	300.9	100.0%	100.0%	

1 Resource levels for both the evaluation unit and adjacent landscape boundary were reviewed in the field and via imagery during October 2014 and revised to reflect current habitats conditions.

2 Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.

Assumptions and Uncertainty:

Due to project time constraints, the field surveys and reconnaissance of this EU were conducted in mid-October. By the time of the survey, the cool-season annual and perennial herbaceous plants that dominate shrub-steppe habitat had completed seasonal growth and senesced making identification and inventory difficult, and most likely incomplete. Although no records for plant species of concern have been noted, the absence of such species cannot be confirmed by surveys during this time of year.

By mid-October, most migratory birds have completed their nesting cycles, and surveys may not reflect their occupancy and use of habitat within the EU earlier in the season. Their absence cannot be confirmed by surveys in October after the nesting season is over. Further surveys during the nesting season would be required to fully assess the ecological impacts to nesting migratory birds.

Summary of Ecological Review:

- The major portion of the unit (>85%) consists of graveled surfaces, buildings, parking areas, and infrastructure related to the tanks.
- No wildlife were observed within the EU during the October reconnaissance, however, 6 bird species as well as black tailed jackrabbit sign were noted in the vicinity during previous surveys.
- No level 3 or higher quality habitat patches occur within the S-SX Tank Farms EU.

- Cleanup activities undertaken within the EU boundary would result in no net change in the amount of level 3 or higher resources within a 0.6 km radius.
- Because the area is an industrial site, and is contiguous with adjacent tank farms and other industrial areas—no significant change in habitat connectivity would be expected if habitat resources within the EU are lost.

References

- DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 0.
- U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act. <http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>
- U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington. http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902
- Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. <http://wdfw.wa.gov/conservation/phs/list/>
- Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington. <http://wdfw.wa.gov/conservation/endangered/>
- Washington Noxious Weed Control Board. 2014. Noxious Weed List. <http://www.nwcb.wa.gov/>
- Washington State Department of Natural Resources. 2014. Washington Natural Heritage Program Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

Definitions and Acronyms:

Adjacent Landscape Buffer – a circular area adjacent to and outside the EU boundary with the center of the circle at the centroid of the EU, and with a radius that is 1 times the maximum dimension (width or length—whichever is greatest). This circular buffer area is used to evaluate indirect effects and assess the remediation in relation to the landscape features and resources adjacent to the EU. This circular area is generally at least 3 times the area of the EU.

Biological Resource Levels (from DOE-RL-96-32-01) –

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats.
- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks.
- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub-

steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.

- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.
- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

MBTA – Migratory Bird Treaty Act; referring to species listed and protected under the federal Act.

PNNL ECAP (Ecological Compliance and Assessment Project) Database – PNNL performed ecological reviews for individual projects and annually surveyed selected areas and buildings on the Hanford Site for DOE-RL under the DOE’s Public Safety and Resource Protection Program until 2011. The data collected during those surveys is archived in the ECAP database, and is used to supplement ecological evaluations as available.

Priority Habitats – Priority habitats are habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type (e.g., shrub-steppe) or dominant plant species (e.g., juniper savannah), a described successional stage (e.g., old-growth forest), or a specific habitat feature (e.g., cliffs).

Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

ECAP Database Query Results for W-503

Observer: *Chamness, Mickie* Date *5/6/2009*

Bird

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
white-crowned sparrow	Zonotrichia leucophrys	6	On grid
barn swallow	Hirundo rustica	1	Fly over
American kestrel	Falco sparverius	2	Flew to high light pole, nesting bar or on 242-S
Say's phoebe	Sayornis saya	1	Collecting nest stuff

Bird

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
loggerhead shrike	Lanius ludovicianus	1	Flew to W powerline

Observer: *Hand, Kris* Date *5/5/2009*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
chestgrass	Bromus tectorum		Saka

ECAP Database Query Results for W-044

Observer: <i>Freeman-Cadore, Natalie</i>		Date: <i>5/18/2010</i>
Plant		
<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance Comments</u>
gray rabbitbrush	<i>Chrysothamnus nauseosus</i>	5
Sandberg's bluegrass	<i>Poa sandbergii</i>	5
cheatgrass	<i>Bromus tectorum</i>	30
needle-and-thread grass	<i>Stipa comata</i>	1
crested wheatgrass	<i>Agropyron cristatum</i>	
stalked-pod milkvetch	<i>Astragalus sclerocarpus</i>	
slender hawk'sbeard	<i>Crepis atrabarba</i>	
slender sixweeks	<i>Festuca octoflora</i>	
jagged chickweed	<i>Holostium umbellatum</i>	
hoary aster	<i>Machaeranthera canescens</i>	
indian ricegrass	<i>Oryzopsis hymenoides</i>	
pine bluegrass	<i>Poa scabrella</i>	
Russian thistle	<i>Salsola kali</i>	
Mammal		
<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance Comments</u>
black-tailed jackrabbit	<i>Lepus californicus</i>	Present Saw the rabbit
Bird		
<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance Comments</u>
western meadowlark	<i>Sturnella neglecta</i>	2
Observer: <i>Simmons, Mary Ann</i>		Date: <i>5/18/2010</i>
Plant		
<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance Comments</u>
cheatgrass	<i>Bromus tectorum</i>	60
gray rabbitbrush	<i>Chrysothamnus nauseosus</i>	1
Sandberg's bluegrass	<i>Poa sandbergii</i>	1
stalked-pod milkvetch	<i>Astragalus sclerocarpus</i>	
sagebrush mariposa lily	<i>Calochortus macrocarpus</i>	
slender hawk'sbeard	<i>Crepis atrabarba</i>	
winged cryptantha	<i>Cryptantha psarocarya</i>	
turpentine springparsley	<i>Cymopterus turbinatus</i>	
hoary aster	<i>Machaeranthera canescens</i>	
pale evening primrose	<i>Oenothera pallida</i>	
indian ricegrass	<i>Oryzopsis hymenoides</i>	
pine bluegrass	<i>Poa scabrella</i>	
Jim Hill's tumbloamstard	<i>Sisymbrium altissimum</i>	
needle-and-thread grass	<i>Stipa comata</i>	

ECAP Database Query Results for W-107d

Observer: *Hand, Kris* Date *6/1/2010*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
No vegetation present	No vegetation	80	gravel
Sandberg's bluegrass	<i>Poa sandbergii</i>	1	
Russian thistle	<i>Salsola kali</i>	1	
crested wheatgrass	<i>Agropyron cristatum</i>		
cheatgrass	<i>Bromus tectorum</i>		
gray rabbitbrush	<i>Chrysothamnus nauseosus</i>		

Bird

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
No birds observed	No birds		

Evaluation Unit: TX-TY Tank Farms
 ID: CP-TF-3
 Group: Tank Farm
 Operable Unit Cross-Walk: WMA TX/TY
 200-DV-1
 200-WA-1
 Related EU: CP-LS-7
 CP-GW-2
 Sites & Facilities: TX-TY tank farms, ancillary structures, associated liquid waste sites, and soils contamination; includes 242-T Evaporator
 Key Data Sources Docs: DOE/RL-96-32 2013
 PNNL ECAP Database²⁶
 Field Survey Date: 10/10/2014
 Data Sheet Prepared By: JLD, MAC, KBL, KDH, SAM; 10/22/2014

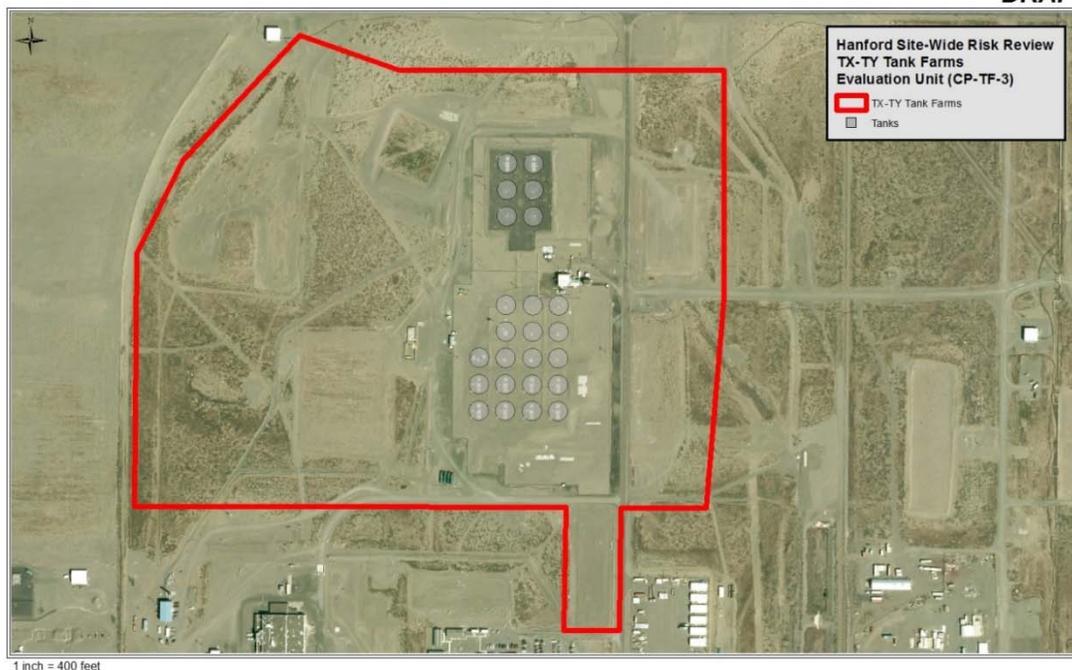
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Figure J.49. Site Map with Evaluation Unit Boundaries and Tank Locations

CP-TF-3: TX-TY Tank Farms

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the

²⁶ The Ecological Compliance and Assessment Project (ECAP) database is an evolving set of data that is maintained by Pacific Northwest National Laboratory (PNNL) and updated as new ecological assessments are completed.

evaluation unit (EU). Additional information used in the ecological evaluation includes the current Endangered and Threatened Species (Federal and State) distribution data; priority habitats as defined by Washington Department of Fish and Wildlife; available current aerial imagery, locations of Hanford Site waste sites and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data tables.

The following steps were taken to assess the EU associated with the TX-TY Tank Farms:

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. A visual and pedestrian survey was conducted within the EU boundary by experienced shrub-steppe ecologists. Vegetation was measured in the field in level 3 habitat resources. PNNL biologists also reviewed the observations and biological survey data available in the Ecological Compliance and Assessment Project (ECAP) database from the past 5 years for the EU to determine the status and resource level of the habitats within the EU and supplement the evaluation with previous wildlife or plant species observations.
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2012 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.
6. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

PNNL biologists conducted pedestrian and vehicle surveys throughout the TX-TY Tank Farms EU. Canopy cover of species was estimated visually in level 2 resource areas, and measured along a transect in a level 3 resource area (Table J.47). Much of the EU (~55 acres) has been previously disturbed by ongoing operations and the installation and operation of various pump and treat wells and remaining habitat occurs in strips and patches surrounded by roads and infrastructure (Table J.48 and Figure J.50). Several areas have been revegetated with a mixture of crested wheatgrass (*Agropyron cristatum*) and shrubs. Vegetation measurements confirmed the status of level 2 and level 3 resources within the EU (Table J.47).

Wildlife signs observed during the October field survey included coyote (*Canis latrans*) tracks, rabbit tracks, small mammal burrows, and harvester ant hills. Previous PNNL ECAP surveys conducted in 2009 and 2010 identified the following wildlife in habitats within the EU: side-blotched lizard (*Uta stansburiana*), western meadowlark (*Sturnella neglecta*), rock dove (*Columba livia*), and northern pocket gopher (*Thomomys talpoides*).

Table J.47. Percent Canopy Cover and Surface Cover Measured at the TX-TY Tank Farms Evaluation Unit

Vegetation/Surface Cover	Survey Area 2-03	Survey Area 2-04a	Survey Area 2-04b	Survey Area 2-05	Survey Area 3-06
Bare Ground	-	-	-	-	35.9
Crust	-	-	-	-	7.0
Litter	-	-	-	-	24.1
Introduced Forb	5	3	1	30	4.0
Introduced Grass	1	1	1	-	6.0
Native Forb	-	-	-	-	9.0
Native Grass	45	41	43	18	34.5
Climax Shrubs	-	-	-	-	12.8
Successional Shrubs	5	1	-	10	2.2

Landscape Evaluation and Resource Classification:

More than 60% of the acreage in the TX-TY Tank Farms EU is classified as level 0 or level 1 habitat and does not provide significant habitat resources (Table J.48, Figure J.50). The EU contains approximately 8 acres of level 3 biological resources. The amount and proximity of the biological resources to the EU was examined within the adjacent landscape buffer area radiating approximately 864 m from the geometric center of the EU (equivalent to 579 acres). More than 60% of the combined total area (EU and adjacent landscape buffer area) is classified

as level 0 or 1 habitat. One individual level 3 species occurrence lies within the adjacent landscape buffer—likely Piper’s daisy (*Erigeron piperianus*).

Level 2 habitat on the eastern side of the EU is contiguous with larger patches of habitat within the adjacent landscape buffer area that are connected by narrow corridors to habitat outside the 200-West Area. These connections are bisected by various roadways. The level 3 habitat within the EU is isolated from any connections to habitats outside the 200-West Area, although it is contiguous with small amounts of level 3 or level 2 habitats to the south within the adjacent landscape buffer area. Habitats to the south fall within the EU for Plutonium Contaminated Waste Sites and may be affected by remediation actions taken for that unit.

Table J.48. Area and Proportion of Each Biological Resource Level Within the TX-TY Tank Farms Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
0	37.9	323.9	361.8	62.5%	70.9%	8.5%
1	16.8	9.7	26.5	4.6%	1.7%	-2.9%
2	24.2	138.7	162.9	28.1%	23.9%	-4.2%
3	8.1	19.9	28.0	4.8%	3.4%	-1.4%
4	0.0	0.0	0.0	0.0%	0.0%	0.0%
5	0.0	0.0	0.0	0.0%	0.0%	0.0%
Total	87.0	492.2	579.2	100.0%	100.0%	

¹ Resource levels for both the evaluation unit and adjacent landscape boundary were reviewed in the field and via imagery during October 2014 and revised to reflect current habitats conditions.

² Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.

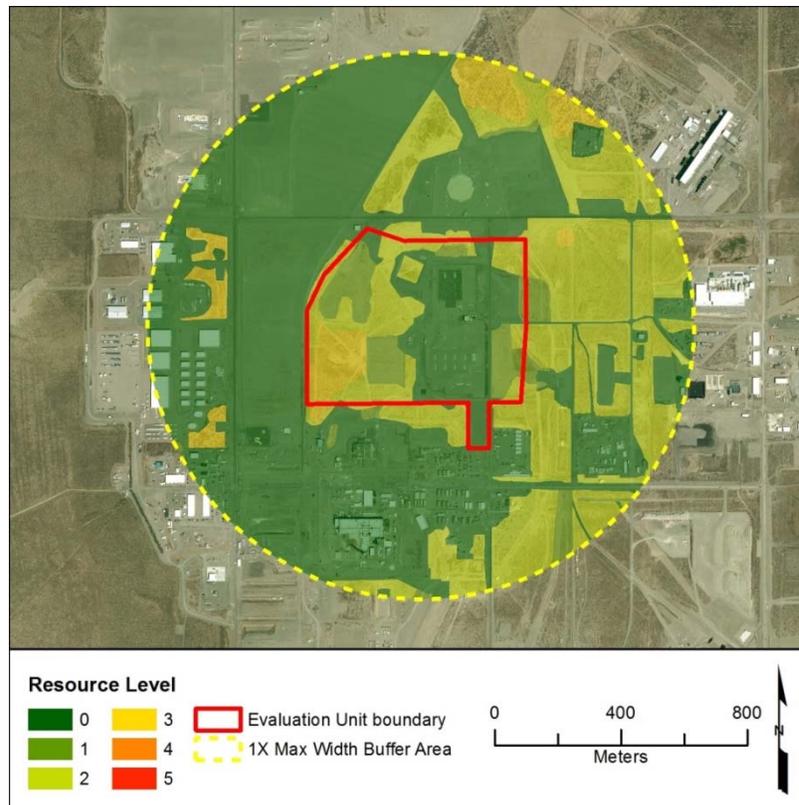


Figure J.50. Biological Resource Level Classifications at the TX-TY Tank Farms Evaluation Unit (red solid line) and Adjacent Landscape Buffer Area (yellow dashed line) Based on Surveys in October 2014

Assumptions and Uncertainty:

Due to project time constraints, the field surveys and reconnaissance of this EU were conducted in October. By the time of the survey, the cool-season annual and perennial herbaceous plants that dominate shrub-steppe habitat had completed seasonal growth and senesced making identification and inventory difficult and most likely incomplete. Although no records for plant species of concern have been noted, the absence of species cannot be confirmed by surveys during this time of year.

By October, migratory birds have completed their nesting cycles and many have migrated away from the region. Surveys conducted in late fall will not reflect migratory bird occupancy and use of habitat within the EU earlier in the season. Their absence cannot be confirmed by surveys after the nesting season is over. Further surveys during the nesting season would be required to fully assess the ecological impacts to nesting migratory birds.

Summary of Ecological Review:

- No species of concern were found within the EU.
- Much of the EU (~55 acres) is graveled, or has been previously disturbed by ongoing operations and the installation and operation of various pump-and-treat wells and remaining habitat occurs in strips and patches surrounded by roads and infrastructure.

- Wildlife signs observed during the October field survey included coyote tracks, rabbit tracks, small mammal burrows, and harvester ant hills; previous surveys identified side-blotched lizard, western meadowlark, rock dove, and northern pocket gopher in the vicinity.
- The TX-TY Tank Farms EU is adjacent and contiguous to other tank farms and waste site EUs.
- Level 3 habitat within the EU does not connect to any level 2 or level 3 habitat lying outside the 200-West Area. Potential loss of level 2 and level 3 habitats within the EU would not be likely to affect habitat connectivity at the landscape scale.

References

- DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 0.
- U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act. <http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>
- U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington. http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902
- Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. <http://wdfw.wa.gov/conservation/phs/list/>
- Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington. <http://wdfw.wa.gov/conservation/endangered/>
- Washington Noxious Weed Control Board. 2014. Noxious Weed List. <http://www.nwcb.wa.gov/>
- Washington State Department of Natural Resources. 2014. Washington Natural Heritage Program Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

Definitions and Acronyms:

Adjacent Landscape Buffer – a circular area adjacent to and outside the EU boundary with the center of the circle at the centroid of the EU, and with a radius that is 1 times the maximum dimension (width or length—whichever is greatest). This circular buffer area is used to evaluate indirect effects and assess the remediation in relation to the landscape features and resources adjacent to the EU. This circular area is generally at least 3 times the area of the EU.

Biological Resource Levels (from DOE-RL-96-32-01) –

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats.
- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington

State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks.

- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub-steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.
- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.
- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

MBTA – Migratory Bird Treaty Act; referring to species listed and protected under the federal Act.

PNNL ECAP (Ecological Compliance and Assessment Project) Database – PNNL performed ecological reviews for individual projects and annually surveyed selected areas and buildings on the Hanford Site for DOE-RL under the DOE’s Public Safety and Resource Protection Program until 2011. The data collected during those surveys is archived in the ECAP database, and is used to supplement ecological evaluations as available.

Priority Habitats – Priority habitats are habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type (e.g., shrub-steppe) or dominant plant species (e.g., juniper savannah), a described successional stage (e.g., old-growth forest), or a specific habitat feature (e.g., cliffs).

Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

PNNL ECAP Survey Data for the TX-TY Tank Farm

ECAP Database Query Results for W-065

Observer: *Simmons, Mary Ann* Date *7/14/2010*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
gray rabbitbrush	Chrysothamnus nauseosus	30	
cheatgrass	Bromus tectorum	20	
Sandberg's bluegrass	Poa sandbergii	10	
crested wheatgrass	Agropyron cristatum		
big sagebrush	Artemisia tridentata		
hoary aster	Machaeranthera canescens		
indian ricegrass	Oryzopsis hymenoides		
Russian thistle	Salsola kali		

Mammal

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
unknown/unidentified small mammal	small mammal	Present	Tracks and holes
Unidentified/Unlisted mammal	Unidentified/Unlisted mammal	Present	rabbit pellets

Herpt

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
Unidentified/Unlisted herpt	Unidentified/Unlisted herpt	Common	snake tracks
side-blotched lizard	Uta stansburiana	Present	

Bird

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
mourning dove	Zenaid macroura	3	Landed in radiological buffer area within W-065

Observer: *Stegen, Amanda* Date *7/14/2010*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
Russian thistle	Salsola kali	5	
gray rabbitbrush	Chrysothamnus nauseosus	15	
cheatgrass	Bromus tectorum	10	
crested wheatgrass	Agropyron cristatum		
stalked-pod milkvetch	Astragalus sclerocarpus		
matric cryptantha	Cryptantha circumscissa		
spring whitlowgrass	Draba verna		
hoary aster	Machaeranthera canescens		
indian ricegrass	Oryzopsis hymenoides		
Sandberg's bluegrass	Poa sandbergii		

Mammal

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
unknown/unidentified small mammal	small mammal	Present	Summa holes

ECAP Database Query Results for W-065a

Observer: *Chamness, Mickie* Date *5/6/2009*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
No vegetation present	No vegetation		

ECAP Database Query Results for W-069

Observer: *Simmons, Mary Ann* Date *7/14/2010*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
Sandberg's bluegrass	<i>Poa sandbergii</i>	5	
big sagobrush	<i>Artemisia tridentata</i>	20	
cheatgrass	<i>Bromus tectorum</i>	15	
yarrow	<i>Achillea millefolium</i>		
crested wheatgrass	<i>Agropyron cristatum</i>		
gray rabbitbrush	<i>Chrysothamnus nauseosus</i>		
green rabbitbrush	<i>Chrysothamnus viscidiflorus</i>		
bastard toadflax	<i>Comandra umbellata</i>		
matted cryptantha	<i>Cryptantha circumscissa</i>		
turpentine springparsley	<i>Cymopteris terobithimus</i>		
slender sixweeks	<i>Festuca octoflora</i>		
prickly lettuce	<i>Lactuca scariola</i>		
hoary aster	<i>Machaeranthera canescens</i>		
flattop broomrape	<i>Orobancha corymbosa</i>		
indian ricegrass	<i>Oryzopsis hymenoides</i>		
Russian thistle	<i>Salsola kali</i>		

Mammal

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
unknown/unidentified small mammal	small mammal	Common	Tracks and holes
Unidentified/Unlisted mammal	Unidentified/Unlisted mammal	Present	rabbit pellets

Bird

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
western meadowlark	<i>Sturnella neglecta</i>	1	Singing
rock dove	<i>Columba livia</i>	13	Flushed

Observer: *Stegen, Amanda* Date *7/14/2010*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
big sagobrush	<i>Artemisia tridentata</i>	20	
cheatgrass	<i>Bromus tectorum</i>	10	
gray rabbitbrush	<i>Chrysothamnus nauseosus</i>		
green rabbitbrush	<i>Chrysothamnus viscidiflorus</i>		
matted cryptantha	<i>Cryptantha circumscissa</i>		
turpentine springparsley	<i>Cymopteris terobithimus</i>		
spring whitlowgrass	<i>Draba verna</i>		
prickly lettuce	<i>Lactuca scariola</i>		
hoary aster	<i>Machaeranthera canescens</i>		

ECAP Database Query Results for W-069b

Observer: *Chamness, Mickie* Date *6/10/2009*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
cheatgrass	<i>Bromus tectorum</i>	10	
crested wheatgrass	<i>Agropyron cristatum</i>	1	
stalked-pod milkvetch	<i>Astragalus sclerocarpus</i>		
gray rabbitbrush	<i>Chrysothamnus nauseosus</i>		
indian ricegrass	<i>Oryzopsis hymenoides</i>		
bulbous bluegrass	<i>Poa bulbosa</i>		
Sandberg's bluegrass	<i>Poa sandbergii</i>		
Russian thistle	<i>Salsola kali</i>		

Mammal

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance Comments</u>	
coyote	<i>Canis latrans</i>	Present	Tracks

Observer: *Freeman-Cadoret, Natalie* Date *6/10/2009*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
crested wheatgrass	<i>Agropyron cristatum</i>		
cheatgrass	<i>Bromus tectorum</i>		
gray rabbitbrush	<i>Chrysothamnus nauseosus</i>		
hoary aster	<i>Machaeranthera canescens</i>		
bulbous bluegrass	<i>Poa bulbosa</i>		
Sandberg's bluegrass	<i>Poa sandbergii</i>		
Russian thistle	<i>Salsola kali</i>		

Mammal

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
unknown/unidentified small mammal	small mammal	Present	

Observer: *Hand, Kris* Date *6/10/2009*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
cheatgrass	<i>Bromus tectorum</i>	10	much bare sand/gravel in poly
gray rabbitbrush	<i>Chrysothamnus nauseosus</i>	1	
Russian thistle	<i>Salsola kali</i>	1	
indian ricegrass	<i>Oryzopsis hymenoides</i>	+	
crested wheatgrass	<i>Agropyron cristatum</i>		
thickupike wheatgrass	<i>Agropyron dasytachyum</i>		

ECAP Database Query Results for W-071

 Observer: *Simmons, Mary Ann* Date *7/14/2010*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
chestgrass	<i>Bromus tectorum</i>	5	
gray rabbitbrush	<i>Chrysothamnus nauseosus</i>	20	
crested wheatgrass	<i>Agropyron cristatum</i>		
bur ragweed	<i>Ambrosia acanthicarpa</i>		
big sagebrush	<i>Artemisia tridentata</i>		
green rabbitbrush	<i>Chrysothamnus viscidiflorus</i>		
hoary aster	<i>Machaeranthera canescens</i>		
pale evening primrose	<i>Oenothera pallida</i>		
indian ricegrass	<i>Oryzopsis hymenoides</i>		
Sandberg's bluegrass	<i>Poa sandbergii</i>		
Russian thistle	<i>Salsola kali</i>		
needle-and-thread grass	<i>Stipa comata</i>		

Herpt

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
side-blotched lizard	<i>Uta stansburiana</i>	Present	

 Observer: *Stegen, Amanda* Date *7/14/2010*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
chestgrass	<i>Bromus tectorum</i>	20	
gray rabbitbrush	<i>Chrysothamnus nauseosus</i>	15	
Russian thistle	<i>Salsola kali</i>	10	
crested wheatgrass	<i>Agropyron cristatum</i>		
bur ragweed	<i>Ambrosia acanthicarpa</i>		
bur ragweed	<i>Ambrosia acanthicarpa</i>		
big sagebrush	<i>Artemisia tridentata</i>		
stalked-pod milkvetch	<i>Astragalus sclarocarpus</i>		
green rabbitbrush	<i>Chrysothamnus viscidiflorus</i>		
matted cryptantha	<i>Cryptantha circumscissa</i>		
spring whitlowgrass	<i>Draba verna</i>		
hoary aster	<i>Machaeranthera canescens</i>		
indian ricegrass	<i>Oryzopsis hymenoides</i>		
Sandberg's bluegrass	<i>Poa sandbergii</i>		

Mammal

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
unknown/identified small mammal	small mammal	Present	summa holes

ECAP Database Query Results for W-073a

Observer: *Chamness, Mickie* Date *7/1/2010*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
No vegetation present	No vegetation		Baru 40%
crested wheatgrass	<i>Agropyron cristatum</i>	15	
gray rabbitbrush	<i>Chrysothamnus nauseosus</i>	+	
bur ragweed	<i>Ambrosia acanthicarpa</i>		
stalked-pod milkvetch	<i>Astragalus sclerocarpus</i>		
cheatgrass	<i>Bromus tectorum</i>		
prickly lettuce	<i>Lactuca scariola</i>		
hoary aster	<i>Machaeranthera canescens</i>		
whitestem stickleaf	<i>Munzelia albicaulis</i>		
indian ricegrass	<i>Oryzopsis hymenoides</i>		
Sandberg's bluegrass	<i>Poa sandbergii</i>		
Russian thistle	<i>Salsola kali</i>		
stiff wirelettuce	<i>Stephanomeria paniculata</i>		

Mammal

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
northern pocket gopher	<i>Thomomys talpoides</i>	Present	Mnds
unknown/unidentified small mammal	small mammal	Common	Holes
coyote	<i>Canis latrans</i>	Common	dig, tracks

ECAP Database Query Results for W-073b

Observer: *Chamness, Mickie* Date *7/1/2010*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
No vegetation present	No vegetation		

Bird

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
No birds observed	No birds		

ECAP Database Query Results for W-083

Observer: *Chamness, Mickie* Date *7/7/2010*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
Sandberg's bluegrass	<i>Poa sandbergii</i>	25	
gray rabbitbrush	<i>Chrysothamnus nauseosus</i>	20	
Russian thistle	<i>Salsola kali</i>	20	
cheatgrass	<i>Bromus tectorum</i>	10	
crested wheatgrass	<i>Agropyron cristatum</i>		
big sagebrush	<i>Artemisia tridentata</i>		
stalked-pod milkvetch	<i>Astragalus sclarocarpus</i>		
hoary aster	<i>Machaeranthera canescens</i>		
indian ricegrass	<i>Oryzopsis hymenoides</i>		
bulbous bluegrass	<i>Poa bulbosa</i>		
needle-and-thread grass	<i>Stipa comata</i>		

Mammal

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
Unidentified/Unlisted mammal	Unidentified/Unlisted mammal	Present	Rabbit poop
northern pocket gopher	<i>Thomomys talpoides</i>	Present	Mnds
unknown/unidentified small mammal	small mammal	Present	Holes

Bird

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
western meadowlark	<i>Sturnella neglecta</i>	1	Call, N pwerline
No birds observed	No birds		

Observer: *Simmons, Mary Ann* Date *7/7/2010*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
cheatgrass	<i>Bromus tectorum</i>		
gray rabbitbrush	<i>Chrysothamnus nauseosus</i>		
indian ricegrass	<i>Oryzopsis hymenoides</i>		
Sandberg's bluegrass	<i>Poa sandbergii</i>		
Russian thistle	<i>Salsola kali</i>		

ECAP Database Query Results for W-087

Observer: *Chamness, Mickie* Date *7/1/2010*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
gray rabbitbrush	Chrysothamnus nauseosus	5	
Russian thistle	Salsola kali	30	
Sandberg's bluegrass	Poa sandbergii	20	
cheatgrass	Bromus tectorum	15	
crested wheatgrass	Agropyron cristatum		
whitestem stickleaf	Mentzelia albicaulis		
indian ricegrass	Oryzopsis hymenoides		
stiff wirelettuce	Stephanomeria paniculata		

Mammal

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
coyote	Canis latrans	Present	Tracks
Unidentified/Unlisted mammal	Unidentified/Unlisted mammal	Present	Sym? tracks
unknown/unidentified small mammal	small mammal	Present	Holes

Observer: *Simmons, Mary Ann* Date *7/1/2010*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
Piper's daisy	Erigeron piperianus		1 plant; 2 seedlings
cheatgrass	Bromus tectorum	30	
gray rabbitbrush	Chrysothamnus nauseosus	15	
Sandberg's bluegrass	Poa sandbergii	10	
yarrow	Achillea millefolium		
crested wheatgrass	Agropyron cristatum		
big sagebrush	Artemisia tridentata		
asparagus	Asparagus officinalis		
buckwheat milkvetch	Astragalus caricinus		
prickly lettuce	Lactuca serriola		
hoary aster	Machaeranthera canescens		
whitestem stickleaf	Mentzelia albicaulis		
indian ricegrass	Oryzopsis hymenoides		
Russian thistle	Salsola kali		
sand dropseed	Sporobolus cryptandrus		
stiff wirelettuce	Stephanomeria paniculata		
needle-and-thread grass	Stipa comata		

Mammal

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
Unidentified/Unlisted mammal	Unidentified/Unlisted mammal	Present	tracks

ECAP Database Query Results for W-104

Observer: *Simmons, Mary Ann* Date *7/14/2010*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
cheatgrass	<i>Bromus tectorum</i>	5	
crested wheatgrass	<i>Agropyron cristatum</i>	20	
indian ricegrass	<i>Oryzopsis hymenoides</i>		
Sandberg's bluegrass	<i>Poa sandbergii</i>		
Russian thistle	<i>Salsola kali</i>		

Mammal

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
unknown/unidentified small mammal	small mammal	Present	Tracks and holes

Bird

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
No birds observed	No birds	0	

Evaluation Unit: TX-TY Tank Farms		Observers: MAC, KDH
Patch ID: 2-03		Date: 10/14/2014
Wildlife Observations Recorded During Pedestrian or Vehicle Surveys		
Species	Observation	
CALA	Tracks	
Harvester Ants		
Notes		

Evaluation Unit: TX-TY Tank Farms		Observers: MAC, KDH
Patch ID: 2-04 A & B		Date: 10/14/2014
Wildlife Observations Recorded During Pedestrian or Vehicle Surveys		
Species	Observation	
CALA	Tracks	
Harvester Ants		
Notes		

Evaluation Unit: TX-TY Tank Farms		Observers: MAC, KDH
Patch ID: 2-05		Date: 10/13/2014
Wildlife Observations Recorded During Pedestrian or Vehicle Surveys		
Species	Observation	
CALA	Tracks	
Harvester Ants	mounds	
Notes		

Evaluation Unit: TX-TY Tank Farms		Observers: JLD, MAC
Patch ID: 3-06		Date: 10/10/2014
Wildlife Observations Recorded During Pedestrian or Vehicle Surveys		
Species	Observation	
Coyote	Tracks	
Rabbitt	Tracks	
Harvester ants	mound	
Notes		

Evaluation Unit: U Tank Farm
 ID: CP-TF-4
 Group: Tank Farm
 Operable Unit Cross-Walk: WMA U
 200-WA-1
 Related EU: CP-LS-7
 CP-GW-2
 Sites & Facilities: U tank farm, ancillary structures, associated liquid waste sites,
 and soils contamination
 Key Data Sources Docs: DOE/RL-96-32 2013
 PNNL ECAP Database²⁷
 Field Survey Date: 10/10/2014
 Data Sheet Prepared By: JLD, MAC, SAM, KBL, KDH; 10/22/2014

DRAFT

Figure J.51. Site Map with Evaluation Unit Boundaries and Tank Locations

CP-TF-4: U Tank Farm

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the current Endangered and Threatened Species (Federal and State) distribution data; priority

²⁷ The Ecological Compliance and Assessment Project (ECAP) database is an evolving set of data that is maintained by Pacific Northwest National Laboratory (PNNL) and updated as new ecological assessments are completed.

habitats as defined by Washington Department of Fish and Wildlife; available current aerial imagery, locations of Hanford Site waste sites and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data tables.

The following steps were taken to assess the EU associated with the U Tank Farm:

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. A pedestrian and vehicle survey was conducted within the EU boundary by experienced shrub-steppe ecologists. PNNL biologists also reviewed the observations and biological survey data available in the Ecological Compliance and Assessment Project (ECAP) database from the past 5 years for the EU to determine the status and resource level of the habitats within the EU and supplement the evaluation with previous wildlife or plant species observations.
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2012 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.
6. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

The fenced portion of the U Tank Farm consists of graveled surfaces and tank farm infrastructure. Some level 2 habitat resources remain at the perimeters of the EU outside the fenced area. Pedestrian surveys of the habitat areas were conducted, and the canopy cover of dominant vegetation was estimated visually (Table J.49).

Table J.49. Percent Canopy Cover and Surface Cover Visually Estimated at U Tank Farm

Vegetation/Surface Cover	Survey Area 2-13	Survey Area 2-14 (Level 2)	Survey Area 2-14 (Level 3)	Survey Area 2-15
Bare Ground	30	25	-	-
Introduced Forb	10	10	-	10
Introduced Grass	-	5	-	5
Native Forb	-	-	-	1
Native Grass	21	12	30	12
Successional Shrubs	15	20	23	15
Climax Shrubs	-	-	5	-

Based on the field surveys, two small patches of habitat within the EU were re-classified from level 2 to level 3 because the understory was primarily native bunchgrasses with a mix of climax and successional species in the shrub layer.

Wildlife observations made during the October survey within the habitat along the borders of the EU included coyote tracks (*Canis latrans*), small mammal burrows, and harvester ant hills. These observations agreed with a sign noted in previous PNNL ECAP surveys of habitat within and around the EU. Those surveys also identified side-blotch lizard (*Uta stansburiana*), northern pocket gopher (*Thomomys talpoides*), lark sparrow (*Chondestes grammacus*), western kingbird (*Tyrannus verticalis*), Say's phoebe (*Sayornis saya*), American kestrel (*Falco sparverius*), western meadowlark (*Sturnella neglecta*), and mourning dove (*Zenaida macroura*).

Landscape Evaluation and Resource Classification:

Approximately 63% of the EU consists of level 0 habitat with graveled and bare surface conditions (Table J.50). Small areas of level 2 (3.6 acres) and level 3 habitat resources (3.5 acres) exist around the perimeter of the EU and are part of larger patches of habitat that extend into the adjacent landscape buffer area as seen in Figure J.52.

The amount and proximity of the biological resources to the EU was examined within the adjacent landscape buffer area radiating approximately 459 m from the geometric center of the

EU (equivalent to 163.3 acres). About half of the combined total area (EU and adjacent landscape buffer area) is classified as level 0 or 1 habitat, with level 2 habitat resources comprising 32.6% and level 3 and above resources comprising 16.5% of the area at the landscape level.

Table J.50. Area and Proportion of Each Biological Resource Level Within the U Tank Farm Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
0	12.3	38.7	51.0	31.3%	35.6%	4.3%
1	0.0	32.0	32.0	19.6%	19.6%	0.0%
2	3.6	49.7	53.3	32.6%	30.4%	-2.2%
3	3.5	23.5	27.0	16.5%	14.4%	-2.1%
4	0.0	0.0	0.0	0.0%	0.0%	0.0%
5	0.0	0.0	0.0	0.0%	0.0%	0.0%
Total	19.4	143.9	163.3	100.0%	100.0%	

1 Resource levels for both the evaluation unit and adjacent landscape boundary were reviewed in the field and via imagery during October 2014 and revised to reflect current habitats conditions.

2 Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.

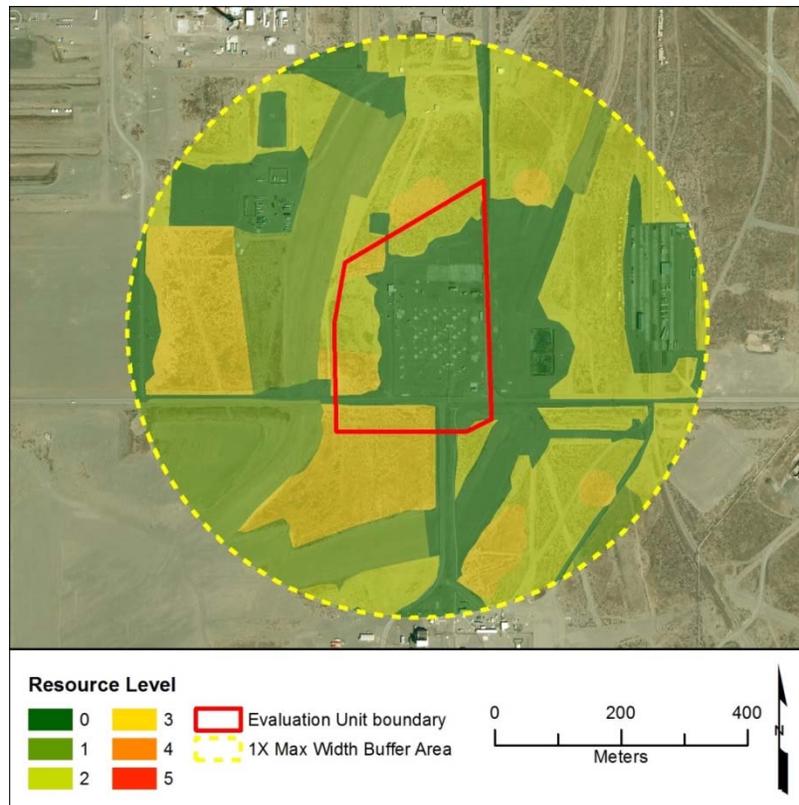


Figure J.52. Biological Resource Level Classifications at the U Tank Farm Evaluation Unit (red solid line) and Adjacent Landscape Buffer Area (yellow dashed line) Based on Surveys in October 2014

Assumptions and Uncertainty:

Due to project time constraints, the field surveys and reconnaissance of this EU were conducted in October. By the time of the survey, the cool-season annual and perennial herbaceous plants that dominate shrub-steppe habitat had completed seasonal growth and senesced making identification and inventory difficult and most likely incomplete. Although no records for plant species of concern have been noted, the absence of species cannot be confirmed by surveys during this time of year.

By October, migratory birds have completed their nesting cycles and many have migrated away from the region. Surveys conducted in late fall will not reflect migratory bird occupancy and use of habitat within the EU earlier in the season. Their absence cannot be confirmed by surveys after the nesting season is over. Further surveys during the nesting season would be required to fully assess the ecological impacts to nesting migratory birds.

Summary of Ecological Review:

- The fenced portion of the U Tank Farm consists of graveled surfaces and tank farm infrastructure (>60%). Level 2 and level 3 habitat resources remain at the perimeters of the EU outside the fenced area (~18% each).

- Wildlife observations made during the October survey within the habitat along the borders of the EU included coyote tracks, small mammal burrows, and harvester ant hills, which were also observed in previous surveys along with northern pocket gopher signs, side-blotched lizards, and 6 migratory bird species.
- Approximately 3.5 acres of level 3 habitat exist within the U Tank Farm EU; total loss of this habitat within the EU would result in a change of approximately 2% at the landscape level evaluated for this unit.
- The remaining level 2 and level 3 habitats within the EU are fragmented and isolated from habitat surrounding the 200-West Area.
- Individual species occurrences of Piper's daisy lie just outside the perimeter of the EU, but would not be expected to be impacted by clean up actions for U-Tank Farm.
- Loss of level 2 and level 3 habitat within the U Tank Farm EU would not be expected to affect habitat connectivity outside the 200-West Area.

References

- DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 0.
- U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act. <http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>
- U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington. http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902
- Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. <http://wdfw.wa.gov/conservation/phs/list/>
- Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington. <http://wdfw.wa.gov/conservation/endangered/>
- Washington Noxious Weed Control Board. 2014. Noxious Weed List. <http://www.nwcb.wa.gov/>
- Washington State Department of Natural Resources. 2014. Washington Natural Heritage Program Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

Definitions and Acronyms:

Adjacent Landscape Buffer – a circular area adjacent to and outside the EU boundary with the center of the circle at the centroid of the EU, and with a radius that is 1 times the maximum dimension (width or length—whichever is greatest). This circular buffer area is used to evaluate indirect effects and assess the remediation in relation to the landscape features and resources adjacent to the EU. This circular area is generally at least 3 times the area of the EU.

Biological Resource Levels (from DOE-RL-96-32-01) –

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats.
- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks.
- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub-steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.
- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.
- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

MBTA – Migratory Bird Treaty Act; referring to species listed and protected under the federal Act.

PNNL ECAP (Ecological Compliance and Assessment Project) Database – PNNL performed ecological reviews for individual projects and annually surveyed selected areas and buildings on the Hanford Site for DOE-RL under the DOE’s Public Safety and Resource Protection Program until 2011. The data collected during those surveys is archived in the ECAP database, and is used to supplement ecological evaluations as available.

Priority Habitats – Priority habitats are habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type (e.g., shrub-steppe) or dominant plant species (e.g., juniper savannah), a described successional stage (e.g., old-growth forest), or a specific habitat feature (e.g., cliffs).

Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

PNNL ECAP Data for U-Tank Farm

ECAP Database Query Results for W-034

Observer: *Chamness, Mickie* Date *7/7/2010*
Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
Russian thistle	<i>Salsola kali</i>	5	
gray rabbitbrush	<i>Chrysothamnus nauseosus</i>	30	
Sandberg's bluegrass	<i>Poa sandbergii</i>	20	
cheatgrass	<i>Bromus tectorum</i>	10	
indian ricegrass	<i>Oryzopsis hymenoides</i>	1	
needle-and-thread grass	<i>Stipa comata</i>	1	
yarrow	<i>Achillea millefolium</i>		
crested wheatgrass	<i>Agropyron cristatum</i>		
big sagebrush	<i>Artemisia tridentata</i>		
stalked-pod milkvetch	<i>Astragalus sclerocarpus</i>		
green rabbitbrush	<i>Chrysothamnus viscidiflorus</i>		
Fendler's cryptantha	<i>Cryptantha fendleri</i>		
turpentine springparsley	<i>Cymopteris torreyana</i>		
prairie Junegrass	<i>Koeleria cristata</i>		
hoary aster	<i>Machaeranthera canescens</i>		
pale evening primrose	<i>Oenothera pallida</i>		
threadleaf scorpionweed	<i>Phacelia linearis</i>		

Mammal

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
coyote	<i>Canis latrans</i>	Present	Tracks
northern pocket gopher	<i>Thomomys talpoides</i>	Present	Mud
unknown/unidentified small mammal	small mammal	Common	Holes, tracks

Herpt

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
Unidentified/Unlisted herpt	Unidentified/Unlisted herpt	Present	Lizard tracks

Bird

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
lark sparrow	<i>Chondestes grammacus</i>	2	On Chms
western kingbird	<i>Tyrannus verticalis</i>	2	Acrobatics

Observer: *Simmons, Mary Ann* Date *7/7/2010*
Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
cheatgrass	<i>Bromus tectorum</i>	25	
gray rabbitbrush	<i>Chrysothamnus nauseosus</i>	25	
indian ricegrass	<i>Oryzopsis hymenoides</i>	10	
needle-and-thread grass	<i>Stipa comata</i>	10	

Wednesday, October 15, 2014

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ECAP Database Query Results for W-054c

Observer: *Chamness, Mickie* Date *6/8/2010*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
Sandberg's bluegrass	<i>Poa sandbergii</i>	25	
gray rabbitbrush	<i>Chrysothamnus nauseosus</i>	20	
Russian thistle	<i>Salsola kali</i>	10	
cheatgrass	<i>Bromus tectorum</i>	1	
bur ragweed	<i>Ambrosia acanthicarpa</i>		
big sagebrush	<i>Artemisia tridentata</i>		
matted cryptantha	<i>Cryptantha circumscissa</i>		
hoary aster	<i>Machaeranthera canescens</i>		
whitestem stickleaf	<i>Munzelia albicaulis</i>		
indian ricegrass	<i>Oryzopsis hymenoides</i>		
Jim Hill's tumbled mustard	<i>Sisymbrium altissimum</i>		

Mammal

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
unknown/unidentified small mammal	small mammal	Common	holes

Herpt

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
side-blotched lizard	<i>Uta stansburiana</i>	Present	Hiding

Observer: *Simmons, Mary Ann* Date *6/8/2010*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
gray rabbitbrush	Chrysothamnus nauseosus	15	
Sandberg's bluegrass	Poa sandbergii	10	
yarrow	Achillea millefolium		
bur ragweed	Ambrosia acanthicarpa		
big sagebrush	Artemisia tridentata		
stalked-pod milkvetch	Astragalus sclarocarpus		
sagebrush mariposa lily	Calochortus macrocarpus		
green rabbitbrush	Chrysothamnus viscidiflorus		
matted cryptantha	Cryptantha circumscissa		
Fendler's cryptantha	Cryptantha fendleri		
turpentine springparsley	Cymopteris toroithimus		
hoary aster	Machaeranthera canescens		
pale evening primrose	Oenothera pallida		
indian ricegrass	Oryzopsis hymenoides		
threadleaf scorpionweed	Phacelia linearis		
Russian thistle	Salsola kali		
Jim Hill's tumbledustard	Sisymbrium altissimum		
needle-and-thread grass	Stipa comata		

Mammal

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
unknown/unidentified small mammal	small mammal	Present	Holes

Bird

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
western meadowlark	Sturnella neglecta	1	Singing
mourning dove	Zenaida macroura	2	Flushed

ECAP Database Query Results for W-508

Observer: *Hand, Kris* Date *5/6/2009*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
No vegetation present	No vegetation		

Bird

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
European starling	<i>Sturnus vulgaris</i>		

Field Data Collected at the U Tank Farm EU on October 10, 2014

Evaluation Unit: U Tank Farm		Observers: JLD, MAC
Patch ID: 2-13, 2-14, 2-15		Date: 10/10/2014
Wildlife Observations Recorded During Pedestrian or Vehicle Surveys		
Species	Observation	
Coyote	Tracks	
Harvester ants	Mound	
Small mammal	Burrows	
Notes		

Evaluation Unit: A-AX Tank Farms
 ID: CP-TF-5
 Group: Tank Farm
 Operable Unit Cross-Walk: WMA A/AX
 200-EA-1
 200-PW-3
 Related EU: CP-LS-7
 CP-TF-8
 CP-GW-1
 Sites & Facilities: A-AX tank farm, ancillary structures, associated liquid waste sites,
 and soils contamination
 Key Data Sources Docs: DOE/RL-96-32 2013
 PNNL ECAP Database²⁸
 Field Survey Date: 10/08/2014
 Data Sheet Prepared By: JLD, MAC, KDH, SAM, KBL 10/20/2014

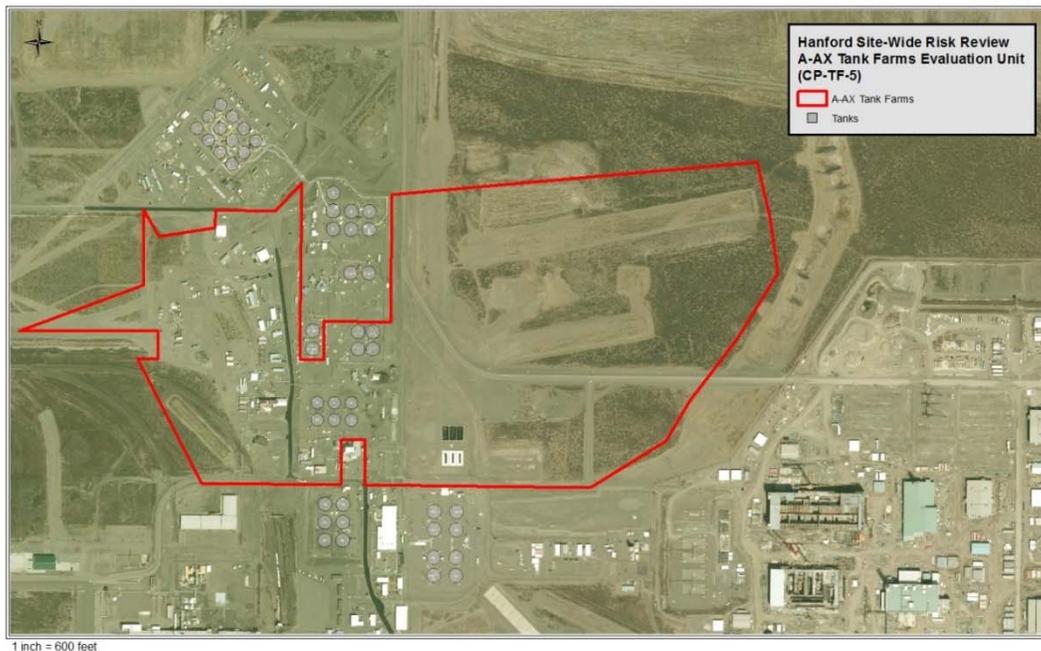
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Figure J.53. Site Map with Evaluation Unit Boundaries and Tank Locations

CP-TF-5: A-AX Tank Farms

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife

²⁸ The Ecological Compliance and Assessment Project (ECAP) database is an evolving set of data that is maintained by Pacific Northwest National Laboratory (PNNL) and updated as new ecological assessments are completed.

observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the current Endangered and Threatened Species (Federal and State) distribution data; priority habitats as defined by Washington Department of Fish and Wildlife; available current aerial imagery, locations of Hanford Unit waste sites and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data tables.

The following steps were taken to assess the EU associated with the A-AX Tank Farms:

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. A visual survey was conducted within the EU boundary of unvegetated industrial and graveled surfaces and buildings as well as field measurement and pedestrian surveys of habitat areas by experienced shrub-steppe ecologists. PNNL biologists also reviewed the observations and biological survey data available in the Ecological Compliance and Assessment Project (ECAP) database from the past 5 years for the EU to determine the status and resource level of the habitats within the EU and supplement the evaluation with previous wildlife or plant species observations.
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2012 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.
6. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

Field measurements and visual surveys were conducted in October 2014 in two habitat areas: one resource level 2 area (visual survey) and one resource level 3 area (two transects) (Table J.51). The field data confirmed the resource levels shown in Figure J.54. Previous ECAP survey data taken in 2010 noted an occurrence of Piper's daisy in the level 2 habitat in the southwest corner of the EU.

Wildlife observations within the level 3 habitat areas on the east side of the EU included harvester ant hills, small mammal burrows, coyote (*Canis latrans*) tracks, and an unidentified lizard. Previous ECAP survey data collected in 2010 for polygons within the EU also noted white-crowned sparrow (*Zonotrichia leucophrys*), western meadowlark (*Sturnella neglecta*), and house finch (*Carpodacus mexicanus*), as well as northern pocket gopher mounds (*Thomomys talpoides*).

Table J.51. Percent Canopy Cover and Surface Cover Measured at A-AX Tank Farms

Vegetation/Surface Cover	Survey Area 2-01 (%)	Survey Area 3-02a (%)	Survey Area 3-02b (%)
Bare Ground	-	15.3	23.6
Crust	25	12.3	36.6
Litter	-	40.4	51.6
Introduced Forb	5	8.4	1.4
Introduced Grass	8	10.9	5.8
Native Forb	-	7.0	2.5
Native Grass	16	32.0	7.6
Climax Shrubs	-	7.4	19.1
Successional Shrubs	25	1.0	-

Landscape Evaluation and Resource Classification:

Approximately 75% of the A-AX Tank Farms EU has been previously disturbed, or consists of graveled surfaces, buildings, industrial areas and tank farm infrastructure (levels 0 and 1 from Table J.52). Several large fragments of level 3 habitat remain within the eastern side of the EU (Figure J.54).

The amount of each biological resource category was examined in a circular buffer area radiating 1,386 m from the center of the EU (equivalent to 1,490.5 acres). Approximately 26% of the total combined area (EU and associated adjacent landscape) is classified as level 3 or

greater habitat. Areas classified as level 4 resources lie outside the 200-East Area fence and were not reviewed as part of this survey.

Table J.52. Area and Proportion of Each Biological Resource Level Within the Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
0	52.8	414.6	467.4	31.4%	36.4%	5.1%
1	44.9	383.3	428.2	28.7%	25.7%	-3.0%
2	3.3	203.1	206.4	13.8%	13.6%	-0.2%
3	27.4	258.4	285.8	19.2%	17.3%	-1.8%
4	0.0	102.7	102.7	6.9%	6.9%	0.0%
5	0.0	0.0	0.0	0.0%	0.0%	0.0%
Total	128.4	1362.1	1490.5	100.0%	100.0%	

1 Resource levels for the evaluation unit were reviewed in the field and via imagery during October 2014 and revised to reflect current habitats conditions.

2 Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.

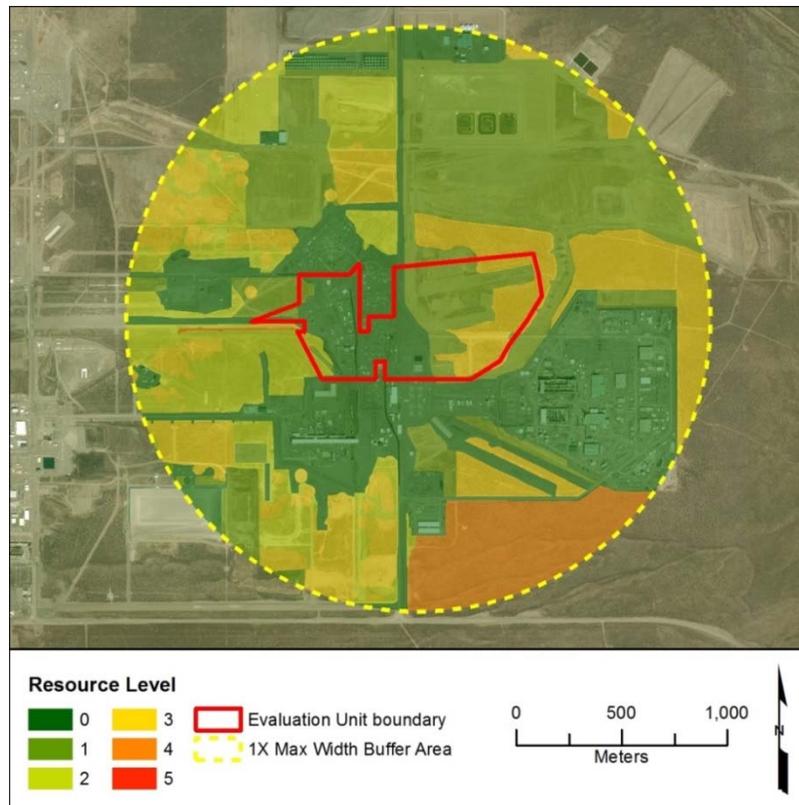


Figure J.54. Biological Resource Level Classifications Based on October 2014 Surveys for the A-AX Tank Farms Evaluation Unit (red solid line) and Adjacent Landscape Buffer (yellow dashed line)

Assumptions and Uncertainty:

Due to project time constraints, the field surveys and reconnaissance of this EU were conducted in October. By the time of the survey, the cool-season annual and perennial herbaceous plants that dominate shrub-steppe habitat had completed seasonal growth and senesced making identification and inventory difficult and most likely incomplete. Although no records for plant species of concern have been noted, the absence of species cannot be confirmed by surveys during this time of year.

By October, most migratory birds have completed their nesting cycles many have migrated away from the region. Surveys conducted in late fall will not reflect migratory bird occupancy and use of habitat within the EU earlier in the season. Their absence cannot be confirmed by surveys in October after the nesting season is over. Further surveys during the nesting season would be required to fully assess the ecological impacts to nesting migratory birds.

Summary of Ecological Review:

- More than 75% of the EU consists of level 0 and level 1 habitat resources.
- Up to 27 acres of level 3 habitat may be lost if remediation actions were to result in clearing the entire EU. This would represent a loss of 1.8% of this habitat level at the landscape scale considered for this EU.

- Wildlife observations within the level 3 habitat areas on the east side of the EU included harvester ant hills, small mammal burrows, coyote tracks, and an unidentified lizard; previous surveys noted 3 migratory bird species and northern pocket gopher mounds.
- One individual occurrence of a sensitive plant species (Piper's daisy) has been previously noted within the EU boundary, but was not relocated during the October 2014 survey. Loss of individual sensitive plant occurrences is unlikely to affect population viability for this species.
- The A-AX Tank Farms EU is surrounded by additional industrial and operations areas inside the 200-East Area. Loss of level 3 resources from within the EU would not be expected to significantly impact habitat connectivity.

References:

- DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 0.
- U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act. <http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>
- U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington. http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902
- Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. <http://wdfw.wa.gov/conservation/phs/list/>
- Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington. <http://wdfw.wa.gov/conservation/endangered/>
- Washington Noxious Weed Control Board. 2014. Noxious Weed List. <http://www.nwcb.wa.gov/>
- Washington State Department of Natural Resources. 2014. Washington Natural Heritage Program Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

Definitions and Acronyms:

Adjacent Landscape Buffer – a circular area adjacent to and outside the EU boundary with the center of the circle at the centroid of the EU, and with a radius that is 1 times the maximum dimension (width or length—whichever is greatest). This circular buffer area is used to evaluate indirect effects and assess the remediation in relation to the landscape features and resources adjacent to the EU. This circular area is generally at least 3 times the area of the EU.

Biological Resource Levels (from DOE-RL-96-32-01) –

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats.
- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks.

- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub-steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.
- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.
- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

MBTA – Migratory Bird Treaty Act; referring to species listed and protected under the federal Act.

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Priority Habitats – Priority habitats are habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type (e.g., shrub-steppe) or dominant plant species (e.g., juniper savannah), a described successional stage (e.g., old-growth forest), or a specific habitat feature (e.g., cliffs).

Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

ECAP Database Query Results for E-019a

 Observer: *Chamness, Mickie* Date *4/29/2010*
Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
Piper's daisy	<i>Erigeron piperianus</i>		took GPS
rush skeletonweed	<i>Chondrilla juncea</i>		Seedlings
hoary aster	<i>Machaeranthera canescens</i>	5	
Sandberg's bluegrass	<i>Poa sandbergii</i>	40	
cheatgrass	<i>Bromus tectorum</i>	30	
gray rabbitbrush	<i>Chrysothamnus nauseosus</i>	20	
crested wheatgrass	<i>Agropyron cristatum</i>		
fiddleneck	<i>Amsinckia lycopsoides</i>		
big sagobrush	<i>Artemisia tridentata</i>		
spring whitlowgrass	<i>Draba verna</i>		
stockbill	<i>Erodium cicutarium</i>		
jagged chickweed	<i>Holosteum umbellatum</i>		
bulbous bluegrass	<i>Poa bulbosa</i>		
Russian thistle	<i>Salsola kali</i>		
Jim Hill's tumblemustard	<i>Sisymbrium altissimum</i>		

Mammal

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
coyote	<i>Canis latrans</i>	Present	Scat
Unidentified/Unlisted mammal	Unidentified/Unlisted mammal	Present	Lg mammal digs
unknown/unidentified small mammal	small mammal	Present	Holes

Bird

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
white-crowned sparrow	<i>Zonotrichia leucophrys</i>	3	Flitting

 Observer: *Simmons, Mary Ann* Date *4/29/2010*
Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
cheatgrass	<i>Bromus tectorum</i>	60	
gray rabbitbrush	<i>Chrysothamnus nauseosus</i>	20	
Sandberg's bluegrass	<i>Poa sandbergii</i>	20	
big sagobrush	<i>Artemisia tridentata</i>	+	
crested wheatgrass	<i>Agropyron cristatum</i>		
buckwheat milkvetch	<i>Astragalus caricinus</i>		
Piper's daisy	<i>Erigeron piperianus</i>		
stockbill	<i>Erodium cicutarium</i>		
jagged chickweed	<i>Holosteum umbellatum</i>		
hoary aster	<i>Machaeranthera canescens</i>		

ECAP Database Query Results for E-019b

Observer: *Chamness, Mickie* Date: *4/29/2010*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
crested wheatgrass	<i>Agropyron cristatum</i>	40	
cheatgrass	<i>Bromus tectorum</i>	10	
Sandberg's bluegrass	<i>Poa sandbergii</i>	10	
slender sixweeks	<i>Festuca octoflora</i>		
bulbous bluegrass	<i>Poa bulbosa</i>		

Mammal

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
unknown/unidentified small mammal	small mammal	Present	Holes

Bird

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
No birds observed	No birds		

ECAP Database Query Results for E-021g

Observer: *Chamness, Mickie* Date *4/30/2010*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
crested wheatgrass	Agropyron cristatum	40	Crust devel.
cheatgrass	Bromus tectorum	10	
bulbous bluegrass	Poa bulbosa	10	
Sandberg's bluegrass	Poa sandbergii	10	
yarrow	Achillea millefolium		
fiddleneck	Amsinckia lycopsoides		
buckwheat milkvetch	Astragalus caricinus		
gray rabbitbrush	Chrysothamnus nauseosus		
hoary aster	Machaeranthera canescens		
indian ricegrass	Oryzopsis hymenoides		
Russian thistle	Salsola kali		
Jim Hill's tumbleweed	Sisymbrium altissimum		
sand dropseed	Sporobolus cryptandrus		

Mammal

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
northern pocket gopher	Thomomys talpoides	Present	Mnds
unknown/unidentified small mammal	small mammal	Present	Holes

Herpt

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
Unidentified/Unlisted herpt	Unidentified/Unlisted herpt	Present	Lizard ran under Saka

Bird

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
western meadowlark	Sturnella neglecta	2	up from gnd
white-crowned sparrow	Zonotrichia leucophrys	1	On Saka

Observer: *Freeman-Cadoret, Natalie* Date *4/30/2010*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
yarrow	Achillea millefolium		
yarrow	Achillea millefolium		
crested wheatgrass	Agropyron cristatum		
bur ragweed	Ambrosia acanthicarpa		
fiddleneck	Amsinckia lycopsoides		
buckwheat milkvetch	Astragalus caricinus		
cheatgrass	Bromus tectorum		
gray rabbitbrush	Chrysothamnus nauseosus		
jagged chickweed	Holosteum umbellatum		

ECAP Database Query Results for E-046

Observer: *Hand, Kris* Date *5/1/2009*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance Comments</u>
chestgrass	<i>Bromus tectorum</i>	
Russian thistle	<i>Salsola kali</i>	

ECAP Database Query Results for E-508

Observer: *Chamness, Mickie* Date *5/1/2009*

Bird

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
white-crowned sparrow	<i>Zonotrichia leucophrys</i>	1	On ground in AY farm
house finch	<i>Carpodacus mexicanus</i>	3	On fence, 2 nesting

Evaluation Unit: B-BX-BY Tank Farms
 ID: CP-TF-6
 Group: Tank Farm
 Operable Unit Cross-Walk: WMA B/BX/BY
 200-DV-1
 200-EA-1
 Related EU: CP-LS-7
 CP-GW-1
 Sites & Facilities: B-BX-BY tank farms, ancillary structures, associated liquid waste sites, and associated soils contamination
 Key Data Sources Docs: DOE/RL-96-32 2013
 PNNL ECAP Database²⁹
 Field Survey Date: 7/16/2014
 Data Sheet Prepared By: JLD 10/10/2014

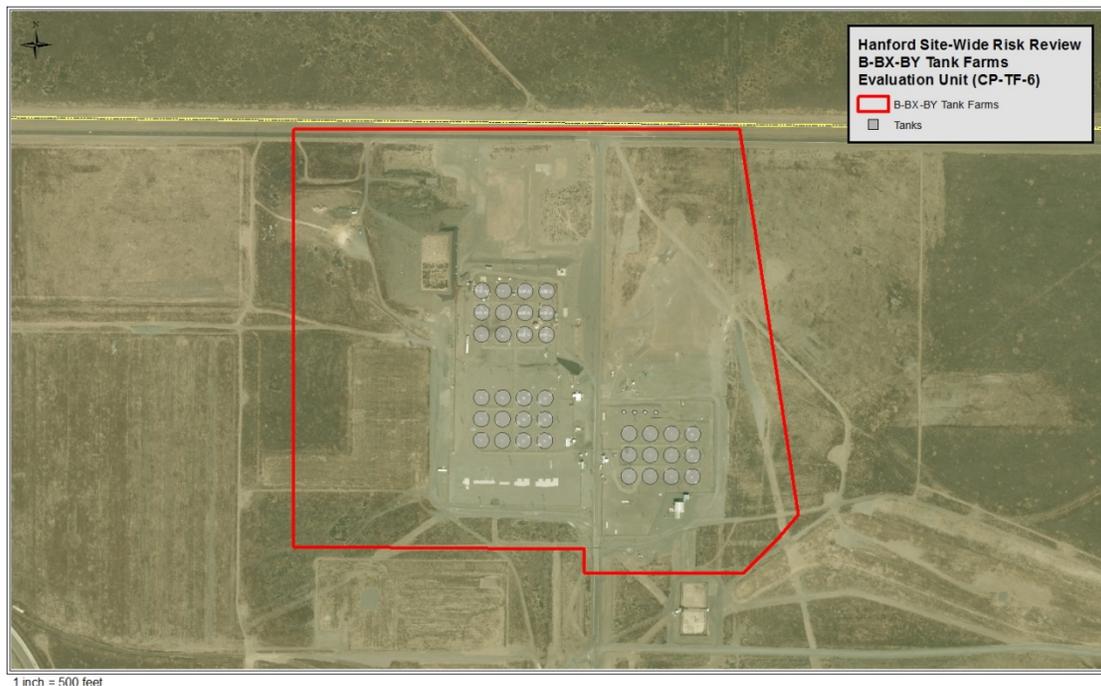
DRAFT

Figure J.55. Site Map with Evaluation Unit Boundaries and Tank Locations

CP-TF-6: B-BX-BY Tank Farms

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the

²⁹ The Ecological Compliance and Assessment Project (ECAP) database is an evolving set of data that is maintained by Pacific Northwest National Laboratory (PNNL) and updated as new ecological assessments are completed.

evaluation unit (EU). Additional information used in the ecological evaluation includes the current Endangered and Threatened Species (Federal and State) distribution data; priority habitats as defined by Washington Department of Fish and Wildlife; available current aerial imagery, locations of Hanford Site waste sites and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data tables.

The following steps were taken to assess the EU associated with the B-BX-BY Tank Farms:

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. A visual survey was conducted within the EU boundary by experienced shrub-steppe ecologists. Because the unit consists primarily of unvegetated industrial and graveled surfaces and structures, and revegetated areas, field measurements of vegetation were taken in only a single habitat patch. PNNL biologists also reviewed the observations and biological survey data available in the Ecological Compliance and Assessment Project (ECAP) database from the past 5 years for the EU to determine the status and resource level of the habitats within the EU and supplement the evaluation with previous wildlife or plant species observations.
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2012 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.
6. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

The B-BX-BY Tank Farms evaluation site includes levels 0, 1, 2, and 3 biological resources as classified in the existing resource level map (DOE/RL-96-32 2013) (Table J.53; Figure J.56). Most of the areas previously classified as level 3 have been degraded by activities within the EU. Several areas have been revegetated. Areas of level 3 resources within the evaluation site are associated with individual occurrences of sensitive species noted in previous ECAP surveys. Piper's daisy (*Erigeron piperianus*), a Washington state sensitive species, was observed in the southwest corner of the site during the 16 July 2014 survey, and has been observed near that location in past ECAP surveys. Field measurements were taken in the southwest corner of B-BX-BY EU (Table J.53).

Animal species (or their sign) observed during the 16 July 2014 survey include horned lark (*Eremophila alpestris*), northern pocket gopher (*Thomomys talpoides*), coyote (*Canis latrans*), and black-tailed jackrabbit (*Lepus californicus*). The black-tailed jackrabbit sign (very old scat) was observed in the southwest corner of the evaluation site. No other sign of recent presence (e.g., runs, fresh scat, animals) was observed. The black-tailed jackrabbit is a Federal Species of Concern and Washington State Candidate species.

Table J.53. Percent Canopy Cover and Surface Cover Measured at B-BX-BY Tank Farms

Vegetation/Surface Cover	CP-TF-6 SW Corner
BARE	10.7%
CRUST	0%
LITTER	31.0%
Introduced Forb	7.0%
Introduced Grass	0.5%
Native Forb	1.8%
Native Grass	15.0%
Climax Shrubs	7.0
Successional Shrubs	10.6%

Landscape Evaluation and Resource Classification:

The B-BX-BY Tank Farms EU has been heavily disturbed throughout and primarily contains level 0 and 1 resources. The existing resource level map (DOE/RL-96-32 2013) also shows areas of level 2 and 3 biological resources (Table J.54, Figure J.56). Areas of level 3 resources within the evaluation site are associated with point occurrences of sensitive species noted in previous

ECAP surveys. Piper’s daisy (*Erigeron piperianus*), a Washington state sensitive species, was observed in the southwest corner of the site during the 16 July 2014 survey, and has been observed near that location in past ECAP surveys. However, an occurrence of a sensitive species does not constitute a habitat “patch” as considered in this assessment, but field survey of the southwest corner of B-BX-BY EU confirmed the surrounding habitat is should be classified as level 2 resources. Climax shrubs (big sagebrush; *Artemisia tridentata*) are limited to a small patch in the center and the majority of the habitat patch is dominated by gray rabbitbrush (*Ericameria nauseosa*) (Figure J.57).

The amount and proximity of biological resources to the B-BX-BY Tank Farms EU was examined within the adjacent buffer area, which extends 974 m from the geometric center of the site (equivalent to 736 acres) to encompass a circle. Approximately 43% of the adjacent buffer area is classified as level 3 or higher biological resource in the existing resource classification. The level 3 habitat within the 200-East Area represents multiple locations where Piper’s daisy has been found. This species is often found in disturbed and gravelly areas on the 200-Area Plateau. The majority of the level 3 and level 4 resources are found across the paved road to the north, outside the 200-East boundary fence (Figure J.56).

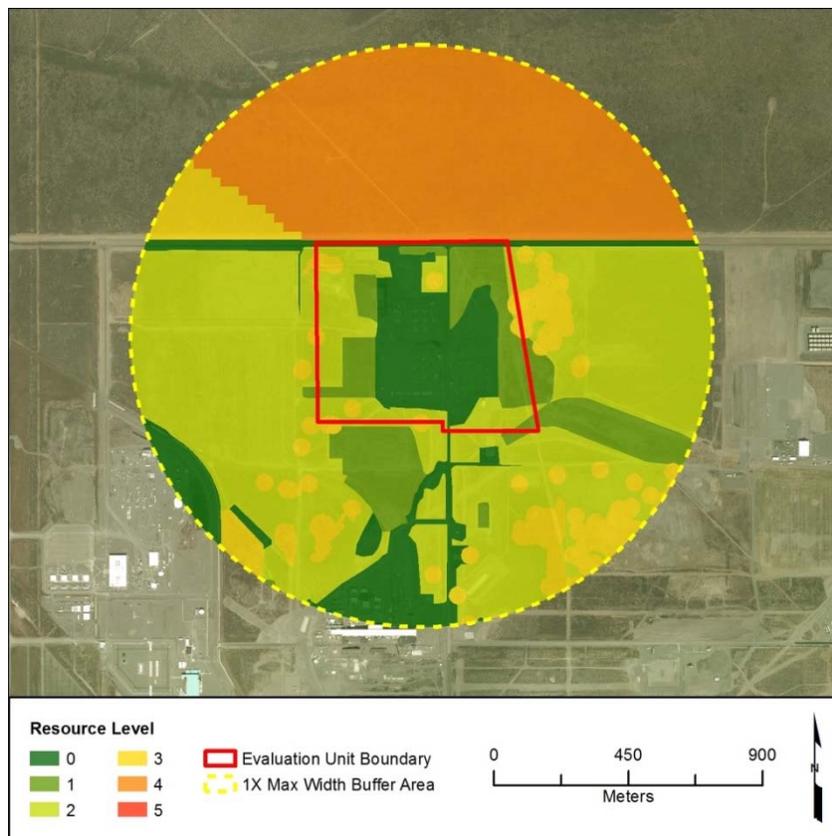


Figure J.56. Map of Biological Resource Level Classifications for the B-BX-BY Tank Farm Evaluation Unit Based on July 2014 Pedestrian and Vehicle Survey (red boundary) and Reconnaissance Survey of the Adjacent Landscape Buffer (yellow boundary)

Table J.54. Area and Proportion of Each Biological Resource Level Within the B-BX-BY Tank Farm Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources

Resource Level¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup²	Percent Difference at Landscape Scale After Cleanup²
0.0	45.6	49.5	95.1	12.9%	20.9%	8.0%
1.0	26.5	39.0	65.5	8.9%	5.3%	-3.6%
2.0	27.9	273.5	301.4	41.0%	37.2%	-3.8%
3.0	4.5	70.9	75.4	10.2%	9.6%	-0.6%
4.0	0.0	198.5	198.5	27.0%	27.0%	0.0%
5.0	0.0	0.0	0.0	0.0%	0.0%	0.0%
Total	104.4	631.4	735.8	100.0%	100.0%	

1 Resource levels for both the evaluation unit and adjacent landscape boundary were reviewed in the field and via imagery during July 2014 and revised to reflect current habitats conditions.

2 Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.



Figure J.57. Photograph of Habitat in Southwest Corner of Evaluation Unit Showing Small Patch of Sagebrush in Foreground and Rabbitbrush Throughout the Unit

Assumptions and Uncertainty:

Due to project time constraints, the field surveys and reconnaissance of this EU were conducted in mid-July. By the time of the survey, the cool-season annual and perennial herbaceous plants that dominate shrub-steppe habitat had completed seasonal growth and senesced making identification and inventory difficult and most likely incomplete. The absence of species cannot be confirmed by surveys during this time of year.

By mid-July, most migratory birds have completed their nesting cycles, and surveys may not reflect their occupancy and use of habitat within the EU earlier in the season. Their absence cannot be confirmed by surveys in July after the nesting season is over. Further surveys during the nesting season would be required to fully assess the ecological impacts to nesting migratory birds.

Summary of Ecological Review:

- Animal species (or their sign) observed during July 2014 survey include horned lark, northern pocket gopher, coyote, and black-tailed jackrabbit.
- Almost 70% of the EU consists of level 0 and level 1 habitat; level 2 habitats within the EU are fragmented by roadways, buildings, and infrastructure.
- Individual occurrences of level 3 resources associated with the sensitive plant species Piper's daisy have been previously documented at the B-BX-BY evaluation site and a single occurrence of Piper's daisy was noted within the EU during the survey. However,

there are no patches of level 3 or higher habitat greater than 0.5 ac within the evaluation site;

- Cleanup activities would result in no net change in the amount of level 3 or higher habitats within a 0.97 km radius;
- Loss of individual Piper's daisy (level 3 species) from within the EU would not be expected to affect population viability for this species.
- Habitats within the B-X-BY Tank Farm are highly fragmented and lie within the 200-East Area. Loss of remaining level 2 or level 3 habitat associated with remediation actions would not be expected to significantly alter habitat connectivity outside the 200-East Area.

References

- DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 0.
- U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act. <http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>
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- Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. <http://wdfw.wa.gov/conservation/phs/list/>
- Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington. <http://wdfw.wa.gov/conservation/endangered/>
- Washington Noxious Weed Control Board. 2014. Noxious Weed List. <http://www.nwcb.wa.gov/>
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State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks.

- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub-steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.
- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.
- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

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Previous PNNL ECAP Field Survey Data Collected in the B-BX-BY Tank Farms EU

ECAP Database Query Results for E-021a

Observer:	<i>Chamness, Mickie</i>	Date	<i>5/27/2010</i>
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Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
wheat	<i>Triticum aestivum</i>	30	
Sandberg's bluegrass	<i>Poa sandbergii</i>	10	
gray rabbitbrush	<i>Chrysothamnus nauseosus</i>		
Russian thistle	<i>Salsola kali</i>		

Mammal

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
unknown/unidentified small mammal	small mammal	Present	Holes

Bird

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
horned lark	<i>Eremophila alpestris</i>	2	Or more sing
mourning dove	<i>Zenaidura macroura</i>	2	Flaw by

Observer:	<i>Simmons, Mary Ann</i>	Date	<i>5/27/2010</i>
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Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
cheatgrass	<i>Bromus tectorum</i>	5	
Sandberg's bluegrass	<i>Poa sandbergii</i>	5	
crested wheatgrass	<i>Agropyron cristatum</i>	30	
Russian thistle	<i>Salsola kali</i>		
Russian thistle	<i>Salsola kali</i>		

Mammal

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
northern pocket gopher	<i>Thomomys talpoides</i>	Present	Mounds
unknown/unidentified small mammal	small mammal	Present	Holes old

Bird

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
mourning dove	<i>Zenaidura macroura</i>	3	Flushed
horned lark	<i>Eremophila alpestris</i>	2	

ECAP Database Query Results for E-029

 Observer: *Chamness, Mickie* Date *5/27/2010*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
crouching milkvetch	<i>Astragalus succumbens</i>		Lots
Sandberg's bluegrass	<i>Poa sandbergii</i>	40	
cheatgrass	<i>Bromus tectorum</i>	20	
gray rabbitbrush	<i>Chrysothamnus nauseosus</i>	20	
big sagebrush	<i>Artemisia tridentata</i>	1	
buckwheat milkvetch	<i>Astragalus caninus</i>	1	
fiddleneck	<i>Amsinckia lycopsoides</i>		
sagebrush mariposa lily	<i>Calochortus macrocarpus</i>		
hoary falseyarrow	<i>Chaenactis douglasii</i>		
threadleaf fleabane	<i>Erigeron filifolius</i>		
Piper's daisy	<i>Erigeron pipariannus</i>		
shaggy fleabane	<i>Erigeron pumilus</i>		
prickly lettuce	<i>Lactuca scariola</i>		
hoary aster	<i>Machaeranthera canescens</i>		
Russian thistle	<i>Salsola kali</i>		
Jim Hill's tumbleweed	<i>Sisymbrium altissimum</i>		
sand dropseed	<i>Sporobolus cryptandrus</i>		
Yellow salsify	<i>Tragopogon dubius</i>		
wheat	<i>Triticum aestivum</i>		

Mammal

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
northern pocket gopher	<i>Thomomys talpoides</i>	Present	old Mnds
unknown/unidentified small mammal	small mammal	Present	Holes

Bird

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
lark sparrow	<i>Chondestes grammacus</i>	1	Squawked to China
western meadowlark	<i>Sturnella neglecta</i>	2	Sing
western kingbird	<i>Tyrannus verticalis</i>	1	On chain
American robin	<i>Turdus migratorius</i>	2	On Artr
barn swallow	<i>Hirundo rustica</i>	1	Fly over
mourning dove	<i>Zenaidura macroura</i>	1	Fly over
Say's phoebe	<i>Sayornis saya</i>	5	Calling from China

 Observer: *Simmons, Mary Ann* Date *5/27/2010*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
Sandberg's bluegrass	<i>Poa sandbergii</i>	25	

ECAP Database Query Results for E-514a

Observer: *Hand, Kris* Date *5/6/2010*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
Munro's globemallow	Sphaeralcea munroana		Spnn7, test site, photo 1449
big sagebrush	Artemisia tridentata	10	Planted in test site, E side
bluebunch wheatgrass	Agropyron spicatum	10	Planted
cheatgrass	Bromus tectorum	20	
gray rabbitbrush	Chrysothamnus nauseosus	15	
blackwheat milkvetch	Astragalus caninus		
tumble knapweed	Centaurea diffusa		
storksbill	Erodium cicutarium		
hoary aster	Machaeranthera canescens		
Russian thistle	Salsola kali		
Jim Hill's tumbleweed	Sisymbrium altissimum		

Mammal

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
mountain cottontail	Sylvilagus nuttalli		Uncommon Poop

 ECAP Database Query Results for E-027a

 Observer: *Hand, Kris* Date *5/6/2010*
Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
gray rabbitbrush	<i>Chrysothamnus nauseosus</i>		Sprayed
Russian thistle	<i>Salsola kali</i>	15	
Sandberg's bluegrass	<i>Poa sandbergii</i>	10	
hoary aster	<i>Machaeranthera canescens</i>		

Evaluation Unit: C Tank Farm
 ID: CP-TF-7
 Group: Tank Farm
 Operable Unit Cross-Walk: WMA C
 Related EU: CP-LS-7
 CP-GW-1
 Sites & Facilities: C tank farm, ancillary structures, associated liquid waste sites, and soils contamination
 Key Data Sources Docs: DOE/RL-96-32 2013
 PNNL ECAP Database³⁰
 Field Survey Date: 10/7/2014
 Data Sheet Prepared By: JLD, MAC, KDH; 10/20/2014

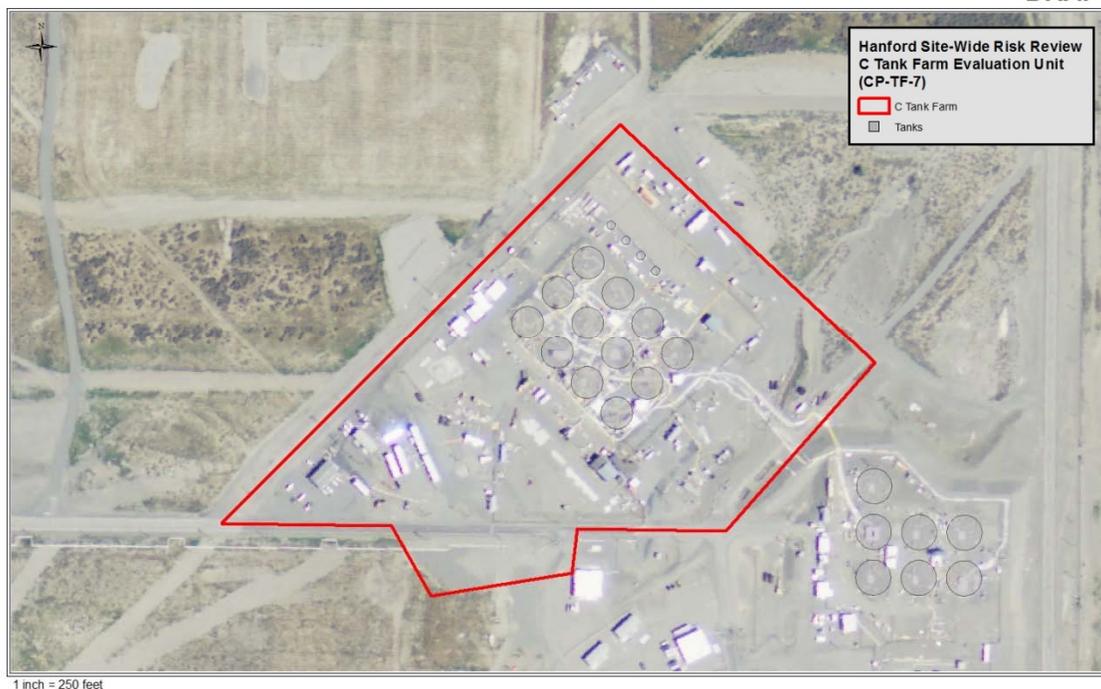
DRAFT

Figure J.58. Site Map with Evaluation Unit Boundaries and Tank Locations

CP-TF-7: C Tank Farm

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the current Endangered and Threatened Species (Federal and State) distribution data; priority

³⁰ The Ecological Compliance and Assessment Project (ECAP) database is an evolving set of data that is maintained by Pacific Northwest National Laboratory (PNNL) and updated as new ecological assessments are completed.

habitats as defined by Washington Department of Fish and Wildlife; available current aerial imagery, locations of Hanford Unit waste sites and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data tables.

The following steps were taken to assess the EU associated with the C Tank Farm:

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. A visual survey was conducted within the EU boundary by experienced shrub-steppe ecologists. Because the unit consists of unvegetated industrial and graveled surfaces and buildings, no field measurements of vegetation were taken. PNNL biologists also reviewed the observations and biological survey data available in the Ecological Compliance and Assessment Project (ECAP) database from the past 5 years for the EU to determine the status and resource level of the habitats within the EU and supplement the evaluation with previous wildlife or plant species observations.
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2012 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.
6. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

Visual survey and vehicle reconnaissance of the C Tank Farm EU confirmed that the area is primarily level 0 habitat (Figure J.59) with disturbed and graveled surfaces as shown in Figure J.60. Because the site is primarily industrial, no field measurements of vegetation were recorded and no field data sheet is included. No wildlife were observed within the EU during the October survey. Previous ECAP surveys in 2010 noted the presence of mountain cottontail (*Sylvilagus nuttallii*) in the area.

Table J.55. Percent Canopy Cover and Surface Cover Estimated Visually at C Tank Farm

Vegetation/Surface Cover	C Tank Farm EU
Bare Ground	95%
Successional Shrubs	5%

Landscape Evaluation and Resource Classification:

The EU for C-Tank Farm consists of level 0 habitat except for a very small area (0.1 acre) of level 2 habitat. The amount and proximity of biological resources to the C Tank Farms EU was examined within the adjacent landscape buffer area radiating 483 m from the geometric center of the EU (equivalent to 181 acres). No level 3 or greater habitat occurs within the EU. If remediation actions result in the loss of level 2 habitat within the EU, this change would only represent a 0.1% difference in available level 2 habitat resources at the landscape level. A little more than 15% of the combined total area (EU plus adjacent landscape buffer area) consists of level 3 or greater habitats. Some of the level 3 resources in the combined total area are individual occurrences of sensitive plant species (likely Piper's daisy, *Erigeron piperianus*).

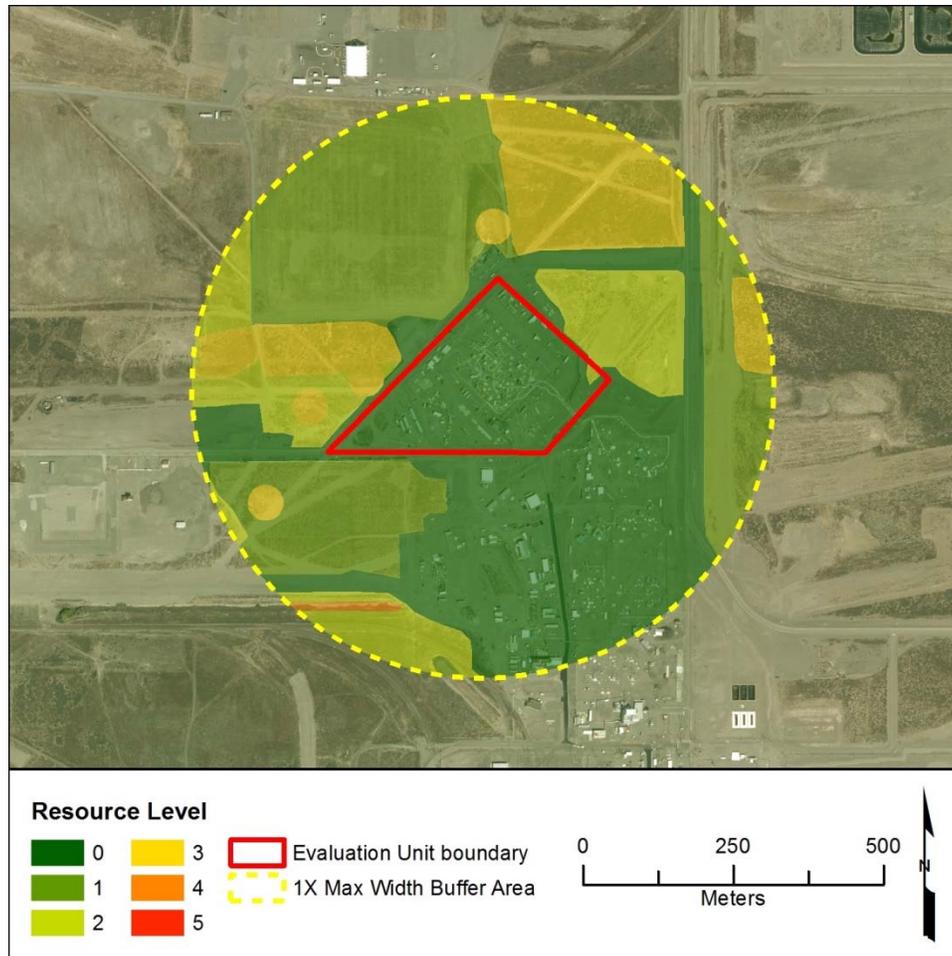


Figure J.59. Biological Resource Level Classifications for the C Tank Farm Evaluation Unit Based on October 2014 Pedestrian and Vehicle Survey (red boundary) and Reconnaissance of the Adjacent Landscape Buffer (yellow dashed line)

Assumptions and Uncertainty:

Due to project time constraints, the field surveys and reconnaissance of this EU were conducted in October. By the time of the survey, the cool-season annual and perennial herbaceous plants that dominate shrub-steppe habitat had completed seasonal growth and senesced making identification and inventory difficult and most likely incomplete. Although no records for plant species of concern have been noted, the absence of species cannot be confirmed by surveys during this time of year.

Table J.56. Area and Proportion of Each Biological Resource Level Within the Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
0	17.8	58.5	76.3	42.1%	42.1%	0.1%
1	0.0	55.2	55.2	30.5%	30.4%	0.0%
2	0.1	22.6	22.7	12.5%	12.5%	-0.1%
3	0.0	26.5	26.5	14.6%	14.6%	0.0%
4	0.0	0.7	0.7	0.4%	0.4%	0.0%
5	0.0	0.0	0.0	0.0%	0.0%	0.0%
Total	17.9	163.5	181.4	100.0%	100.0%	

1 Resource levels for the evaluation unit were reviewed in the field and via imagery during October 2014 and revised to reflect current habitats conditions.

2 Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.



Figure J.60. Surface Conditions at the C-Tank Farm Evaluation Unit in October 2014

By October, migratory birds have completed their nesting cycles, and most have migrated out of the region. Surveys conducted in late fall will not reflect their occupancy and use of habitat within the EU earlier in the season. Their absence cannot be confirmed by surveys in October after the nesting season is over. Further surveys during the nesting season would be required to fully assess the ecological impacts to nesting migratory birds.

Summary of Ecological Review:

- The EU for C-Tank Farm consists almost entirely of level 0 resources, and remediation actions will not have any negative effects on habitat resources within the EU.
- The EU is contiguous with the A-AX Tank Farms and 200-East Double Shell Tanks, but does adjoin small patches of level 2 and level 3 habitat to the west. However, disturbance to habitats within the EU would not have any effect on habitat connectivity.
- No wildlife were observed in the vicinity during the October survey.
- Individual occurrences of sensitive plant species are located within the landscape buffer area, but would be unlikely to be affected by any remediation action within the evaluation unit.

References:

- DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 0.
- U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act. <http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>
- U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington. http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902
- Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. <http://wdfw.wa.gov/conservation/phs/list/>
- Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington. <http://wdfw.wa.gov/conservation/endangered/>
- Washington Noxious Weed Control Board. 2014. Noxious Weed List. <http://www.nwcb.wa.gov/>
- Washington State Department of Natural Resources. 2014. Washington Natural Heritage Program Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

Definitions and Acronyms:

Adjacent Landscape Buffer – a circular area adjacent to and outside the EU boundary with the center of the circle at the centroid of the EU, and with a radius that is 1 times the maximum dimension (width or length—whichever is greatest). This circular buffer area is used to evaluate

indirect effects and assess the remediation in relation to the landscape features and resources adjacent to the EU. This circular area is generally at least 3 times the area of the EU.

Biological Resource Levels (from DOE-RL-96-32-01) –

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats.
- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks.
- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub-steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.
- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.
- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

MBTA – Migratory Bird Treaty Act; referring to species listed and protected under the federal Act.

PNNL ECAP (Ecological Compliance and Assessment Project) Database – PNNL performed ecological reviews for individual projects and annually surveyed selected areas and buildings on the Hanford Site for DOE-RL under the DOE’s Public Safety and Resource Protection Program until 2011. The data collected during those surveys is archived in the ECAP database, and is used to supplement ecological evaluations as available.

Priority Habitats – Priority habitats are habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type (e.g., shrub-steppe) or dominant plant species (e.g., juniper savannah), a described successional stage (e.g., old-growth forest), or a specific habitat feature (e.g., cliffs).

Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

PNNL ECAP Survey Data

ECAP Database Query Results for E-512

Observer: *Chamness, Mickie* Date *5/1/2009*

Mammal

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
mountain cottontail	<i>Sylvilagus nutalli</i>	Common	Lots of poop N end

Bird

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
cliff swallow	<i>Hirundo pyrzonota</i>	1	Flew over

Evaluation Unit: 200-East DSTs
 ID: CP-TF-8
 Group: Tank Farm
 Operable Unit Cross-Walk: NA
 Related EU: CP-LS-7
 CP-TF-5
 Sites & Facilities: AN, AP, AW, AY, AZ tank farms, ancillary structures, associated liquid waste sites, and soils contamination
 Key Data Sources Docs: DOE/RL-96-32 2013
 PNNL ECAP Database³¹
 Field Survey Date: 10/08/2014
 Data Sheet Prepared By: JLD, KDH, MAC, SAM, KBL; 10/20/2014

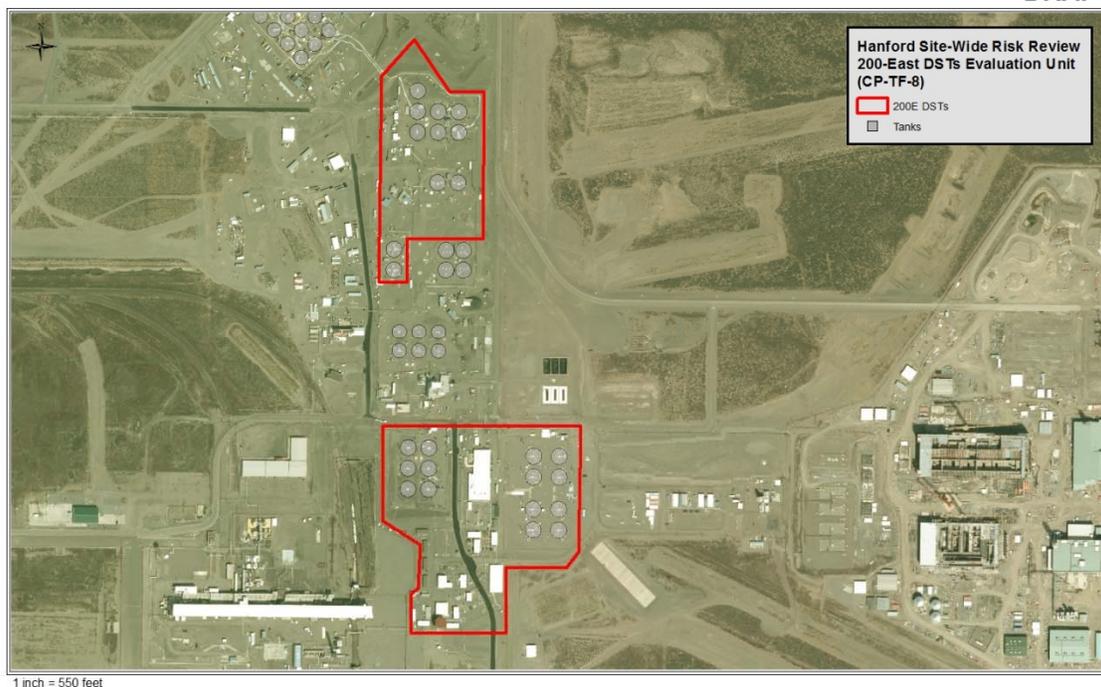
DRAFT

Figure J.61. Site Map with Evaluation Unit Boundaries and Tank Locations

CP-TF-8: 200-East Double Shell Tanks

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the current Endangered and Threatened Species (Federal and State) distribution data; priority

³¹ The Ecological Compliance and Assessment Project (ECAP) database is an evolving set of data that is maintained by Pacific Northwest National Laboratory (PNNL) and updated as new ecological assessments are completed.

habitats as defined by Washington Department of Fish and Wildlife; available current aerial imagery, locations of Hanford Site waste sites and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data tables.

The following steps were taken to assess the EU associated with the 200-East Double Shell Tanks:

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. A visual survey was conducted within the EU boundary by experienced shrub-steppe ecologists. Because the unit consists of disturbed areas and graveled surfaces, no field measurements of vegetation were taken. PNNL biologists also reviewed the observations and biological survey data available in the Ecological Compliance and Assessment Project (ECAP) database from the past 5 years for the EU to determine the status and resource level of the habitats within or around the EU and supplement the evaluation with previous wildlife or plant species observations.
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2012 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.
6. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

Field surveys conducted in October 2014 confirmed that the majority of the 200-East Double Shell Tanks EU consists of buildings, parking areas, graveled surfaces, and infrastructure related to the tanks. No vegetation measurements were taken and no field data sheets are included. Table J.57 documents the surface conditions of the EU. No wildlife was observed within the EU during the October 2014 survey; however, PNNL ECAP surveys conducted in 2009 noted the following wildlife on/near the buildings: house finch (*Carpodacus mexicanus*), Brewer's blackbird (*Euphagus cyanocephalus*), black-billed magpie (*Pica pica*), and western kingbird (*Tyrannus verticalis*).

Table J.57. Percent Canopy Cover and Surface Cover Measured at 200-East Double Shell Tanks Evaluation Unit

Vegetation/Surface Cover	Inside Tank Farm Fence
Bare Ground/Gravel	100%

Landscape Evaluation and Resource Classification:

The amount and proximity of the biological resources to the EUs were examined within the adjacent landscape buffer areas radiating approximately 386 m (northern polygon) and 420 m (southern polygon) from the geometric centers of the EU (equivalent to 228.6 acres combined). The major portion—that is, nearly 90%—of the 200-East Double Shell Tanks EU and adjacent landscape buffer is comprised of level 0 and level 1 habitat resources (Figure J.62 and Figure J.63, Table J.58). Small patches of level 2 habitat are located close to, but not contiguous with the northern and southern extents of the two EU polygons. A small patch (approximately 2 to 3 acres of level 3 habitat is located to the east of the two polygons (300 to 700 feet away from EU boundaries), and individual occurrences of level 3 plant species, Piper's daisy (*Erigeron piperianus*) are located to the south.

Table J.58. Area and Proportion of Each Biological Resource Level Within the 200-East Double Shell Tanks Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
0	31.4	131.3	162.7	71.2%	71.2%	0.0%
1	0.0	42.6	42.6	18.6%	18.6%	0.0%
2	0.0	14.5	14.5	6.3%	6.3%	0.0%
3	0.0	8.9	8.9	3.9%	3.9%	0.0%
4	0.0	0.0	0.0	0.0%	0.0%	0.0%
5	0.0	0.0	0.0	0.0%	0.0%	0.0%
Total	31.4	197.3	228.6	100.0%	100.0%	

1 Resource levels for both the evaluation unit and adjacent landscape boundary were reviewed in the field and via imagery during October 2014 and revised to reflect current habitats conditions.

2 Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.

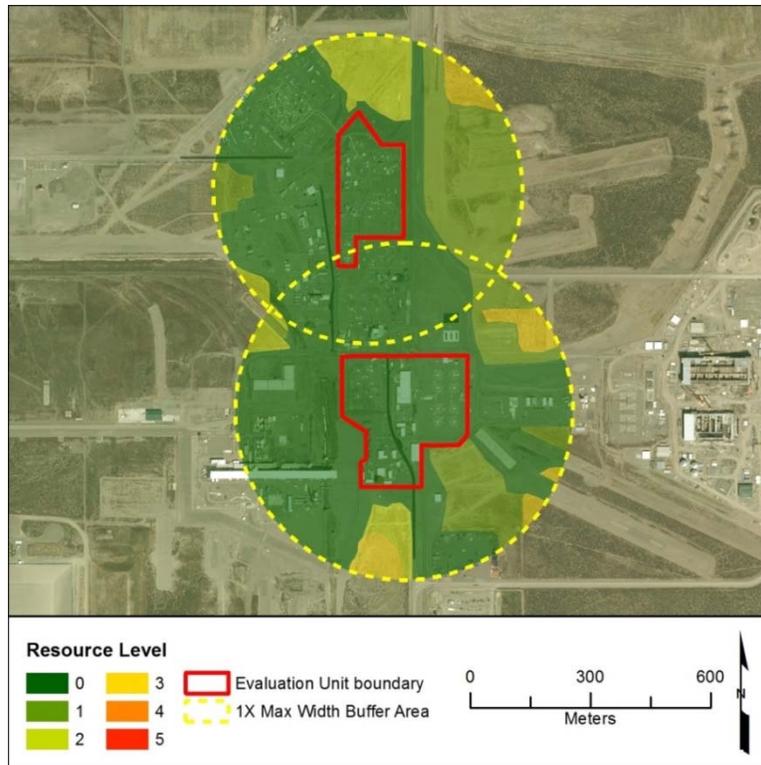


Figure J.62. Biological Resource Level Classifications for the 200-East Double Shell Tanks Evaluation Unit (red solid line) and Adjacent Landscape Buffer Area (yellow dashed line) Based on October 2014 Survey



Figure J.63. Surface Conditions of the 200-East Double Shell Tanks Evaluation Unit during October 2014 Survey

Assumptions and Uncertainty:

Due to project time constraints, the field surveys and reconnaissance of this EU were conducted in October. By the time of the survey, the cool-season annual and perennial herbaceous plants that dominate shrub-steppe habitat had completed seasonal growth and senesced making

identification and inventory difficult and most likely incomplete. Although no records for plant species of concern have been noted, the absence of species cannot be confirmed by surveys during this time of year.

By October, migratory birds have completed their nesting cycles, and most have migrated out of the region. Surveys conducted in late fall will not reflect their occupancy and use of habitat within the EU earlier in the season. Their absence cannot be confirmed by surveys in October after the nesting season is over. Further surveys during the nesting season would be required to fully assess the ecological impacts to nesting migratory birds.

Summary of Ecological Review:

- The EU is level 0 habitat, and no level 3 or greater resources exist within the 200-East Double Shell Tank EU boundaries.
- No wildlife were observed using the disturbed habitats within the EU boundaries.
- Because the area is an industrial site, and is contiguous with adjacent tank farms and other industrial areas—no significant change in habitat connectivity would be expected to result from remediation actions taken within the EU.

References

- DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 0.
- U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act. <http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>
- U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington. http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902
- Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. <http://wdfw.wa.gov/conservation/phs/list/>
- Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington. <http://wdfw.wa.gov/conservation/endangered/>
- Washington Noxious Weed Control Board. 2014. Noxious Weed List. <http://www.nwcb.wa.gov/>
- Washington State Department of Natural Resources. 2014. Washington Natural Heritage Program Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

Definitions and Acronyms:

Adjacent Landscape Buffer – a circular area adjacent to and outside the EU boundary with the center of the circle at the centroid of the EU, and with a radius that is 1 times the maximum dimension (width or length—whichever is greatest). This circular buffer area is used to evaluate indirect effects and assess the remediation in relation to the landscape features and resources adjacent to the EU. This circular area is generally at least 3 times the area of the EU.

Biological Resource Levels (from DOE-RL-96-32-01) –

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats.
- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks.
- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub-steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.
- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.
- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

MBTA – Migratory Bird Treaty Act; referring to species listed and protected under the federal Act.

PNNL ECAP (Ecological Compliance and Assessment Project) Database – PNNL performed ecological reviews for individual projects and annually surveyed selected areas and buildings on the Hanford Site for DOE-RL under the DOE's Public Safety and Resource Protection Program until 2011. The data collected during those surveys is archived in the ECAP database, and is used to supplement ecological evaluations as available.

Priority Habitats – Priority habitats are habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type (e.g., shrub-steppe) or dominant plant species (e.g., juniper savannah), a described successional stage (e.g., old-growth forest), or a specific habitat feature (e.g., cliffs).

Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

Previous PNNL ECAP Survey Data

ECAP Database Query Results for 200E Tank Farms

Observer:	Hand, Kvs	Date:	5/12/2009					
SchedBlade	BladeFaunaCode	BladeFaunaName	BladeObs	BladeNestStatus	Abundance	BladeAsused	BladeDetail	BladeComments
274-AW	Hof	finch, house: <i>Carpodacus mexicanus</i>	Crtr		1	SE	Perch fence, sing	
274-AW	Hof	finch, house: <i>Carpodacus mexicanus</i>	Crtr		1	E	Perch wiring	
MO-267	Bbl	blackbird, Brewer's: <i>Euphagus cyanocephalus</i>	Nest	Inactive	1	W	Pine shrub	
MO-268	Bbl	blackbird, Brewer's: <i>Euphagus cyanocephalus</i>	Nest	Inactive	1	S	Juniper	
MO-268	Bms	magpie, black-billed: <i>Pica pica</i>	Crtr		1	S	Flush juniper	No nest visible
MO-268	Wbl	kingbird, western: <i>Tyrannus verticalis</i>	Crtr		2	W	Perch powerline	1 flew W
272-AW	Hof	finch, house: <i>Carpodacus mexicanus</i>	Crtr		1	SW	Perch powerline	

Fridly, October 24, 2014

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Evaluation Unit: 200-West DSTs
 ID: CP-TF-9
 Group: Tank Farm
 Operable Unit Cross-Walk: WMA S/SX
 Related EU: CP-LS-7
 CP-TF-2
 Sites & Facilities: SY tank farm, ancillary structures, associated liquid waste sites, and soils contamination
 Key Data Sources Docs: DOE/RL-96-32 2013
 Field Survey Date: 10/10/2014
 Data Sheet Prepared By: KDH, JLD, MAC, KBL, SAM; 10/22/2014

DRAFT

Figure J.64. Site Map of the 200-West Double Shell Tanks Evaluation Unit Boundary and Tank Locations

CP-TF-9: 200-West Double Shell Tanks

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the current Endangered and Threatened Species (Federal and State) distribution data; priority habitats as defined by Washington Department of Fish and Wildlife; available current aerial imagery, locations of Hanford Site waste sites and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs

including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data tables.

The following steps were taken to assess the EU associated with the 200-West Double Shell Tanks:

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. A visual survey was conducted within the EU boundary by experienced shrub-steppe ecologists. Because the unit consists of unvegetated industrial and graveled surfaces and buildings, no field measurements of vegetation were taken. PNNL biologists also reviewed the observations and biological survey data available in the Ecological Compliance and Assessment Project (ECAP) database from the past 5 years for the EU to determine the status and resource level of the habitats within the EU and supplement the evaluation with previous wildlife or plant species observations.
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2012 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.
6. PNNL biologists assembled the information from field surveys, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

PNNL biologists conducted a reconnaissance and visual survey of the 200-West Double Shell Tanks EU on October 14, 2014. This field survey confirmed that nearly the entire EU consists of graveled surfaces, buildings, parking areas, and infrastructure related to the tanks. Only sparse

vegetation, consisting of alien grasses and forbs, occurs along roadside margins outside the tank farm fence. No vegetation measurements were taken and no field data sheets are included. Table J.59 documents the surface conditions of the EU.

No wildlife were observed within the EU during the October reconnaissance, however, PNNL ECAP surveys conducted in 2009 noted the following birds: an American kestrel (*Falco sparverius*) apparently nesting in a light pole or nearby building, Say's phoebe (*Sayornis saya*), barn swallow (*Hirundo rustica*), and white-crowned sparrow (*Zonotrichia leucophrys*).

Table J.59. Percent Surface Cover Estimated Visually at the 200-West DSTs EU

Vegetation/Surface Cover	200-West DSTs EU
Bare Ground	100%

Landscape Evaluation and Resource Classification:

The amount of each category of biological resources at and near the 200-West Double Shell Tanks EU was examined within a circular area radiating 204 m from the geometric center of the unit (equivalent to 32.2 acres). The entire EU (4.7 ac) is comprised of level 0 biological resources (Table J.60). The major portion (18.6 ac, 67.6%) of the adjacent landscape buffer is made up of level 0 and 1 resources, with the remainder comprised of several small patches of level 2 (6.9 ac, 25.1%) located north and east of the EU and a single patch of level 3 (1.9 ac, 6.9%) located north of the EU (Figure J.65, Table J.60). Overall, only six percent of the total combined area currently consists of higher quality (level 3 or above) biological resources based on habitat.

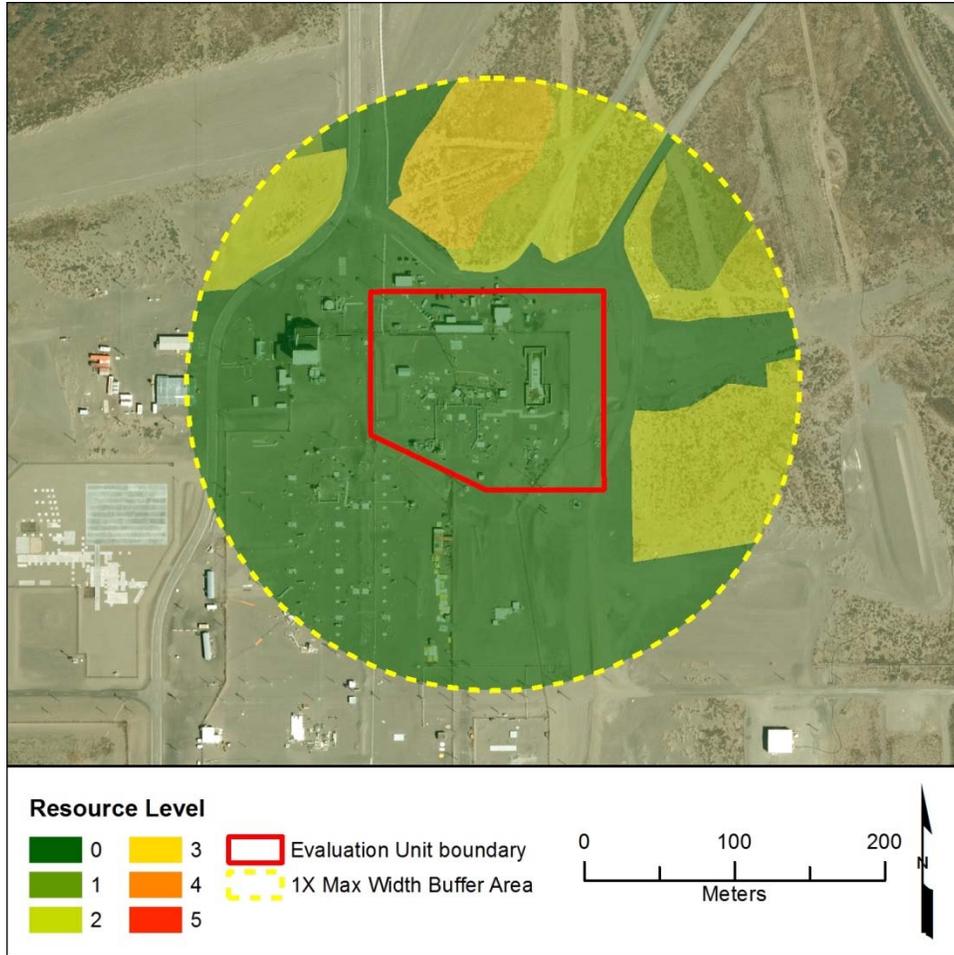


Figure J.65. Biological Resource Level Classifications Based on October 2014 Surveys for the 200-West Double Shell Tanks Evaluation Unit (red solid line) and Adjacent Landscape Buffer (yellow dashed line)

Table J.60. Area and Proportion of Each Biological Resource Level Within the Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
0	4.7	17.5	22.2	69.2%	69.2%	0.0%
1	0.0	1.1	1.1	3.4%	3.4%	0.0%
2	0.0	6.9	6.9	21.4%	21.4%	0.0%
3	0.0	1.9	1.9	6.0%	6.0%	0.0%
4	0.0	0.0	0.0	0.0%	0.0%	0.0%
5	0.0	0.0	0.0	0.0%	0.0%	0.0%
Total	4.7	27.4	32.2	100.0%	100.0%	

1 Resource levels for the evaluation unit were reviewed in the field and via imagery during October 2014 and revised to reflect current habitats conditions.

2 Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.

Assumptions and Uncertainty:

Due to project time constraints, the field surveys and reconnaissance of this EU were conducted in mid-October. By the time of the survey, the cool-season annual and perennial herbaceous plants that dominate shrub-steppe habitat had completed seasonal growth and senesced making identification and inventory difficult, and most likely incomplete. Although no records for plant species of concern have been noted, the absence of such species cannot be confirmed by surveys during this time of year.

By mid-October, most migratory birds have completed their nesting cycles, and surveys may not reflect their occupancy and use of habitat within the EU earlier in the season. Their absence cannot be confirmed by surveys in October after the nesting season is over. Further surveys during the nesting season would be required to fully assess the ecological impacts to nesting migratory birds.

Summary of Ecological Review:

- The EU for the 200-West DSTs consists entirely of level 0 habitat resources.
- No wildlife or signs were observed during the October survey of the EU.
- Remediation actions undertaken within the 200-West DSTs EU boundary would result in no net change in biological resources within a 2.1 km radius.

- Because the area is an industrial site, and is contiguous with adjacent tank farms and other industrial areas—no significant change in habitat connectivity would be expected if habitat resources within the EU are lost.

References

- DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 0.
- U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act. <http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>
- U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington. http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902
- Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. <http://wdfw.wa.gov/conservation/phs/list/>
- Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington. <http://wdfw.wa.gov/conservation/endangered/>
- Washington Noxious Weed Control Board. 2014. Noxious Weed List. <http://www.nwcb.wa.gov/>
- Washington State Department of Natural Resources. 2014. Washington Natural Heritage Program Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

Definitions and Acronyms:

Adjacent Landscape Buffer – a circular area adjacent to and outside the EU boundary with the center of the circle at the centroid of the EU, and with a radius that is 1 times the maximum dimension (width or length—whichever is greatest). This circular buffer area is used to evaluate indirect effects and assess the remediation in relation to the landscape features and resources adjacent to the EU. This circular area is generally at least 3 times the area of the EU.

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MBTA – Migratory Bird Treaty Act; referring to species listed and protected under the federal Act.

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Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

Field Data Sheets Embedded

ECAP Database Query Results for W-503

Observer: *Chamness, Mickie* Date *5/6/2009*

Bird

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
white-crowned sparrow	Zonotrichia leucophrys	6	On grid
barn swallow	Hirundo rustica	1	Fly over
American kestrel	Falco sparverius	2	Flew to high light pole, nesting here or on 242-S
Say's phoebe	Sayornis saya	1	Collecting nest stuff

Bird

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
loggerhead shrike	Lanius ludovicianus	1	Flew to W powerline

Observer: *Hand, Kris* Date *5/5/2009*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
cheatgrass	Bromus tectorum		Saka

ECAP Database Query Results for W-046ac

Observer: *Chamness, Mickie* Date *6/8/2010*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
No vegetation present	No vegetation		W of paved rd

Observer: *Simmons, Mary Ann* Date *6/8/2010*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
No vegetation present	No vegetation	95	gravel
crested wheatgrass	<i>Agropyron cristatum</i>	+	
whitestem stickleaf	<i>Montmelia albicaulis</i>		
indian ricegrass	<i>Oryzopsis hymenoides</i>		
Sandberg's bluegrass	<i>Poa sandbergii</i>		
Russian thistle	<i>Salsola kali</i>		

ECAP Database Query Results for W-107d

Observer: *Hand, Kris* Date *6/1/2010*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
No vegetation present	No vegetation	80	gravel
Sandberg's bluegrass	<i>Poa sandbergii</i>	1	
Russian thistle	<i>Salsola kali</i>	1	
crested wheatgrass	<i>Agropyron cristatum</i>		
cheatgrass	<i>Bromus tectorum</i>		
gray rabbitbrush	<i>Chrysothamnus nauseosus</i>		

Bird

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
No birds observed	No birds		

Evaluation Unit: 300 Area Groundwater Plumes
ID: RC-GW-1
Group: Groundwater
Operable Unit Cross-Walk: 300-FF-5
Related EU: RC-DD-1
Sites & Facilities: 300 Area uranium and associated contaminant plumes
Key Data Sources Docs: N/A

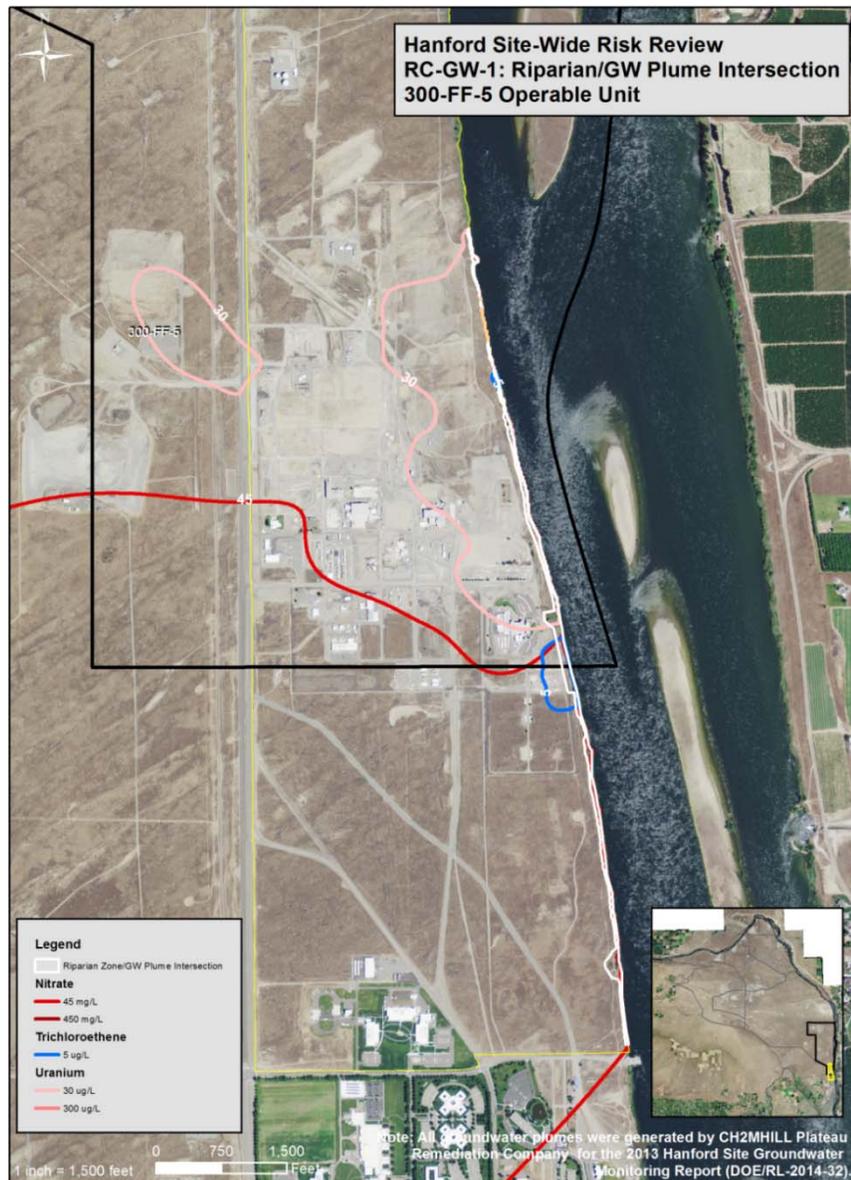


Figure J.66. Site Map with Evaluation Unit Boundaries

RC-GW-1: 300 Area GW Plumes

Survey and Analysis Methods:

The approach developed to assess potential impacts to ecological resources within the individual groundwater evaluation units includes consideration of the extent of potential direct and indirect interactions of ecological receptors and resources with the groundwater plume and remediation activities. The potential for ecological receptors to interact directly with any of the groundwater plumes is expected to be limited to those areas where the depth to groundwater is very shallow (<15 ft from the soil surface). In general, the depth to groundwater at Hanford is much greater than 15 feet, and it would be very unlikely that ecological receptors would be affected by the presence of the plume below ground except for areas where the groundwater approaches the surface. Along the shoreline adjacent to where groundwater plumes intercept and enter the river, the groundwater may not be as deep below the surface. In such areas, there could be mixing of river bank storage and groundwater at shallower depths accessible to biota, and plant roots and burrowing animals could potentially interact with portions of the groundwater plume.

For purposes of this assessment, we delineated the areas where the mapped riparian zone along the river shoreline intersects the estimated contours for the groundwater plume. Riparian areas along the river shoreline are considered priority habitats that are classified as level 4 biological resources. The delineated area and acreage for the intersection of the riparian zone with separate contaminant plumes are provided in Table J.61 and indicate the extent of biological resources that could potentially be affected by the groundwater plumes. In total for the four groundwater evaluation units with plumes that are estimated to intersect the Columbia River, there are approximately 109.5 acres of riparian habitat and resources along the river shoreline that could potentially be affected.

In addition to consideration of the area where ecological resources might be directly affected by the contaminant groundwater plumes, the direct and indirect effects of potential remediation actions should be taken into account. Remediation actions taken to reduce the contaminated groundwater plumes may have indirect effects on terrestrial ecological resources. Subsurface remediation actions such as pump and treat activities or development of subsurface chemical barriers to contaminant transport may indirectly affect ecological resources through several mechanisms:

- Injection and pumping wells might alter the hydrology in the vadose zone, and change soil water availability for plants.
- Injection of barrier constituents might alter soil chemistry and nutrient availability depending on rate or distance of migration of those constituents and whether the constituents interact with soils within the rooting zone
- Well pad and road construction may disturb the surface, degrade available habitat, and impact ecological resources/receptors
- Pedestrian and vehicle traffic during construction, maintenance, monitoring, and decommission may degrade habitats, disturb wildlife and affect animal behavior, and introduce exotic plant species.

Use of plants to accomplish phytoremediation would incur both direct and indirect effects to ecological receptors within the area of the EU used for treatment. Direct effects include surface disturbance and habitat removal associated with preparation and planting of the phytoremediation species to be used. Removal of the treatment plant species at conclusion of the remediation action would also be likely to cause surface and noise disturbance as well as dust and transport of potentially contaminated plant materials as waste. As with subsurface treatment activities, pedestrian and vehicle traffic during construction, maintenance, monitoring, and decommission may degrade habitats, disturb wildlife and affect animal behavior, and introduce exotic plant species.

Table J.61. Areal Extent (Acres) of Riparian Zone Intersected by 2013 Groundwater Plumes Within Each Groundwater Operable Unit

Evaluation Unit Groundwater Operable Unit COPC	Reference Value	RC-GW-	RC-GW-	RC-GW-	RC-GW-	CP-GW-	RC-GW-	Total Area
		3	3	2	3	1	1	
		100-BC- 5	100-KR- 4	100-NR- 2	100-HR- 3	200-PO- 1	300-FF-5	
Carbon-14	2,000 pCi/L ^a	-	-	-	-	-	-	-
Cyanide	200 µg/L ^a	-	-	-	-	-	-	-
Chromium	10 µg/L ^b	7.61	2.78	0.04	29.90	-	-	40.32
Carbon Tetrachloride	5 µg/L ^a	-	-	-	-	-	-	-
Iodine-129	1 pCi/L ^a	-	-	-	-	-	-	-
Nitrate	45 mg/L ^a	-	-	0.38	-	-	0.61	0.99
Strontium-90	8 pCi/L ^a	2.00	-	1.14	0.14	-	-	3.28
Technetium-99	900 pCi/L ^a	-	-	-	-	-	-	-
Trichloroethylene	5 µg/L ^a	-	0.73	-	-	-	0.66	1.39
TPH-D	200 µg/L ^c	-	-	0.10	-	-	-	0.10
Tritium	20,000 pCi/L ^a	-	-	0.11	-	52.84	-	52.94
Uranium	30 µg/L ^a	-	-	-	-	-	3.21	3.21
Total Extent of Plumes^d	-	7.61	3.55	1.54	30.51	52.84	4.20	100.25
Total Riparian Area^e	-	491.52	78.04	11.38	792.84	357.37	208.42	2660.78

(a) EPA and/or DOH Drinking Water Standard

- (b) Criteria for chronic exposure in fresh water, WAC 173-201A-240. "Water Quality Standards for Surface Waters of the State of Washington," "Toxic Substances," Table 240(3).
- (c) EPA and/or DOH Secondary Drinking Water Standard for Total Dissolved Solids. Secondary drinking water standards are not associated with health effects, but associated with taste, odor, staining, or other aesthetic qualities.
- (d) The Total Extent of Plumes for a given Operable Unit is not equal the sum of individual COPC plume areas because some plumes overlap; i.e., the total represents the combined 2-dimensional extent of individual COPC plumes.
- (e) The Total Riparian Area is based on the areal extent of mapped riparian vegetation along the Benton County shoreline of the Hanford Site. The total riparian area listed (2660.78 ac) includes riparian area within 100-FR-3 (721.2 ac), which is part of the Hanford Reach but is not listed in other parts of the table because there is no plume intersection with the riparian zone.

Notes:

1. All groundwater plumes were generated by CH2M HILL Plateau Remediation Company for the 2013 Hanford Site Groundwater Monitoring Report (DOE/RL-2014-32).
2. Riparian cover type was documented in the Hanford Site Environmental Report for Calendar Year 2004 (PNNL-15222).
3. The impacted riparian zone corresponds to the areal extent of the plume above the corresponding reference value listed for each COPC. Riparian cover type in 200-East Area was not included because those plants are not removing groundwater; groundwater is more than 100 ft deep in 200-East Area.

These data depict the areal intersection between mapped riparian vegetation and estimated contaminated groundwater plumes on the U.S. Department of Energy Hanford Site in southcentral Washington State. Riparian spatial data was obtained from a map of plant community types of the Hanford Site, which has been updated periodically since 1993 (PNL-8942; Soll et al. 1999; PNNL-13688; PNNL-15222). Additional updates to the plant community map have been made to reflect changes due to wildfires that occurred between 2000 and 2011 (unpublished data). Spatial data for groundwater plumes was obtained from CH2M HILL Plateau Remediation Company and can be found in the 2013 Hanford Site Groundwater Monitoring Report (DOE/RL-2014-32). Plumes are based on spatial interpolation of contaminant concentrations as measured at monitoring wells. Riparian cover type in 200 East Area was not included because those plants are not removing groundwater; groundwater is more than 100 ft deep in 200 East Area.

References

DOE/RL-2014-32. 2014. Hanford Site Groundwater Monitoring Report for 2013. CH2M HILL Plateau Remediation Company, Richland, Washington.

Downs JL, MR Sackschewsky, KD Hand, RE Durham, and RK Zufelt. 2005. Plant Communities and Population Surveys on the Hanford Site. In Section 8.10 in the Hanford Site Environmental Report for Calendar Year 2004 (Including Some Early 2005 Information), TM Poston, RW Hanf, and RL Dirkes (eds.), PNNL-15222, Pacific Northwest National Laboratory, Richland, Washington.

Downs JL, WH Rickard, CA Brandt, LL Cadwell, CE Cushing, DR Geist, RM Mazaika, DA Neitzel, LE Rogers, MR Sackschewsky, and JJ Nugent. PNL-8942. 1993. Habitat Types on the Hanford Site: Wildlife and Plant Species of Concern. Pacific Northwest Laboratory, Richland, Washington.

Sackschewsky MR and JL Downs. 2001. Vascular Plants of the Hanford Site. PNNL-13688. Pacific Northwest National Laboratory, Richland, Washington.

Soll J, JA Hall, R Pabst, and C Soper (eds.). 1999. Biodiversity Inventory and Analysis of the Hanford Site – Final Report 1994-1999. The Nature Conservancy of Washington, Seattle, Washington.

Evaluation Unit: 100-N GW Plume
 ID: RC-GW-2
 Group: Groundwater
 Operable Unit Cross-Walk: 100-NR-2
 Related EU: NA
 Sites & Facilities: 100-N strontium and associated contaminant plumes
 Key Data Sources Docs: NA

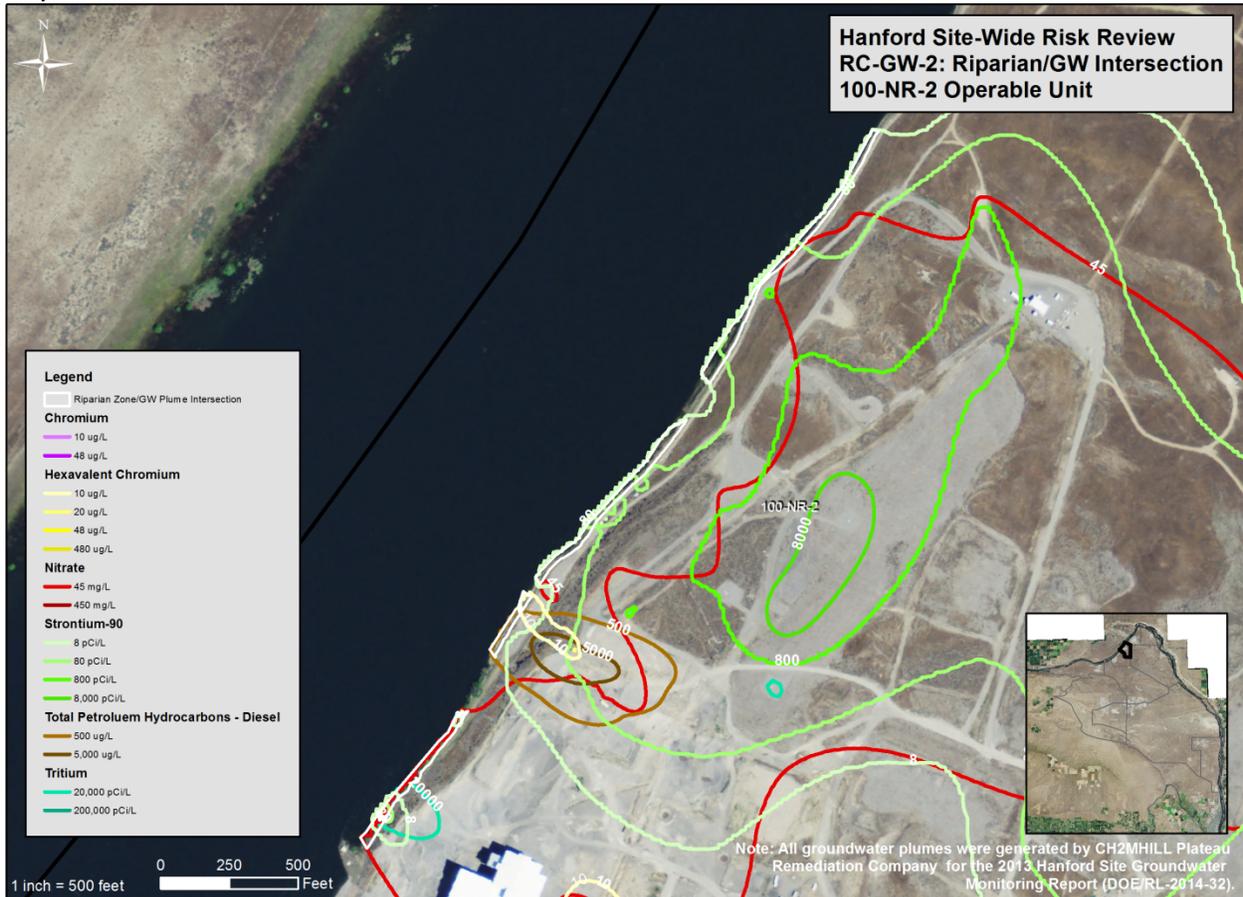


Figure J.67. Site Map with Evaluation Unit Boundaries

RC-GW-2: 100-N GW Plume

See discussion for RC-GW-1.

Evaluation Unit: 100-B/D/H/F/K Area GW Plumes
 ID: RC-GW-3
 Group: Groundwater
 Operable Unit Cross-Walk: 100-BC-5
 100-KR-4
 100-HR-3
 (100-FR-3 is not included because the groundwater plumes are not currently intercepting the riparian areas)
 Related EU: NA
 Sites & Facilities: 100-B/D/H/F/K Area Chromium and associated contaminant plumes. Includes pump and treat systems
 Key Data Sources Docs: SGW-40938, Rev 0

NOTE: There is no discussion of riparian areas for 100-FR-3 because the groundwater plumes in that Operable Unit are not currently intercepting the riparian areas.

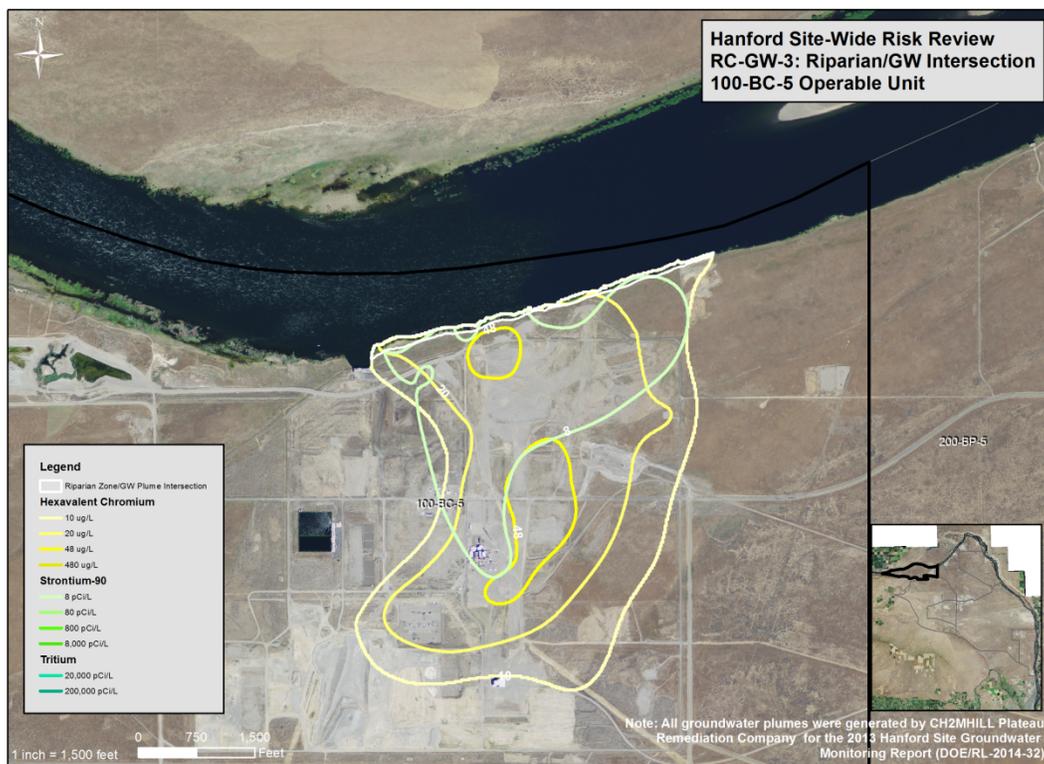


Figure J.68. Groundwater Plumes Intercepting the Riparian Areas Around 100-BC-5

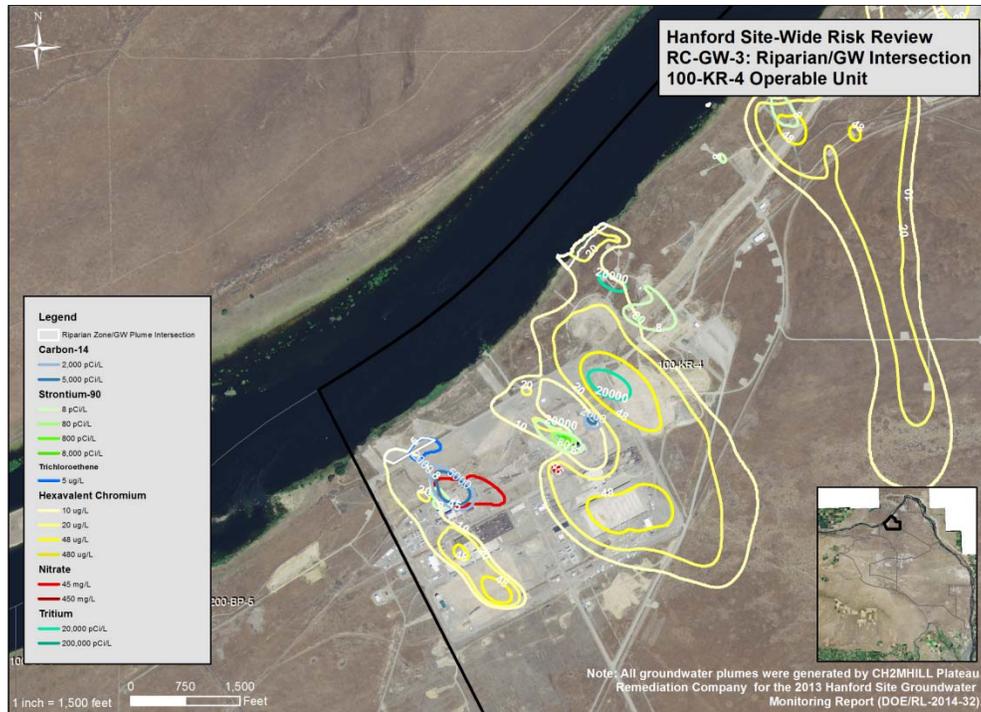


Figure J.69. Groundwater Plumes Intercepting the Riparian Areas Around 100-KR-4

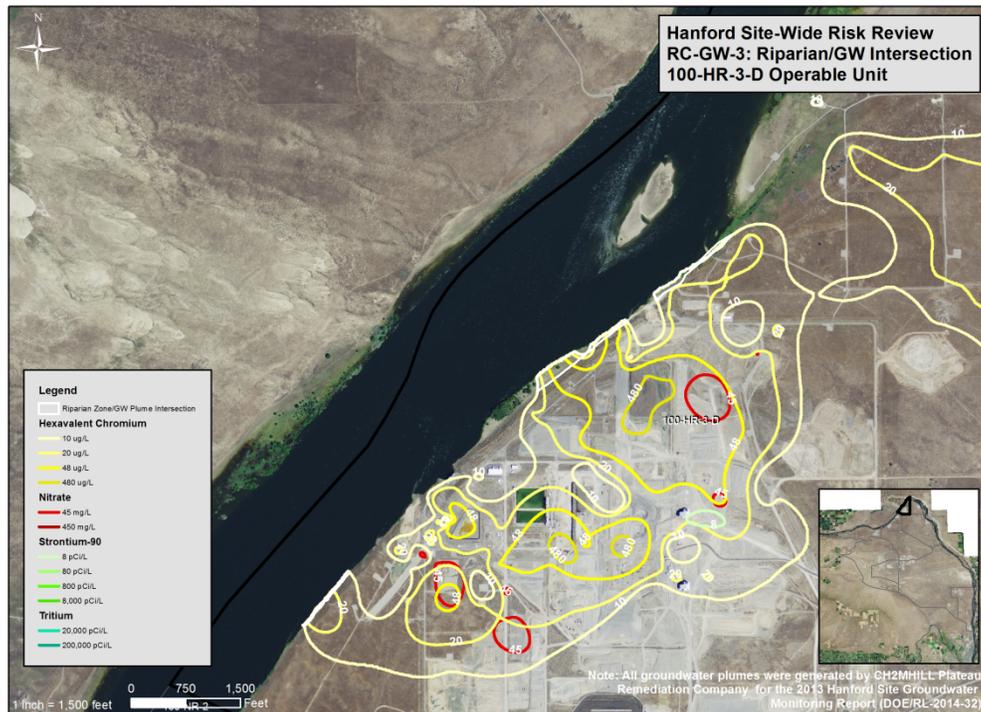


Figure J.70. Groundwater Plumes Intercepting the Riparian Areas on the Western Portion of 100-HR-3

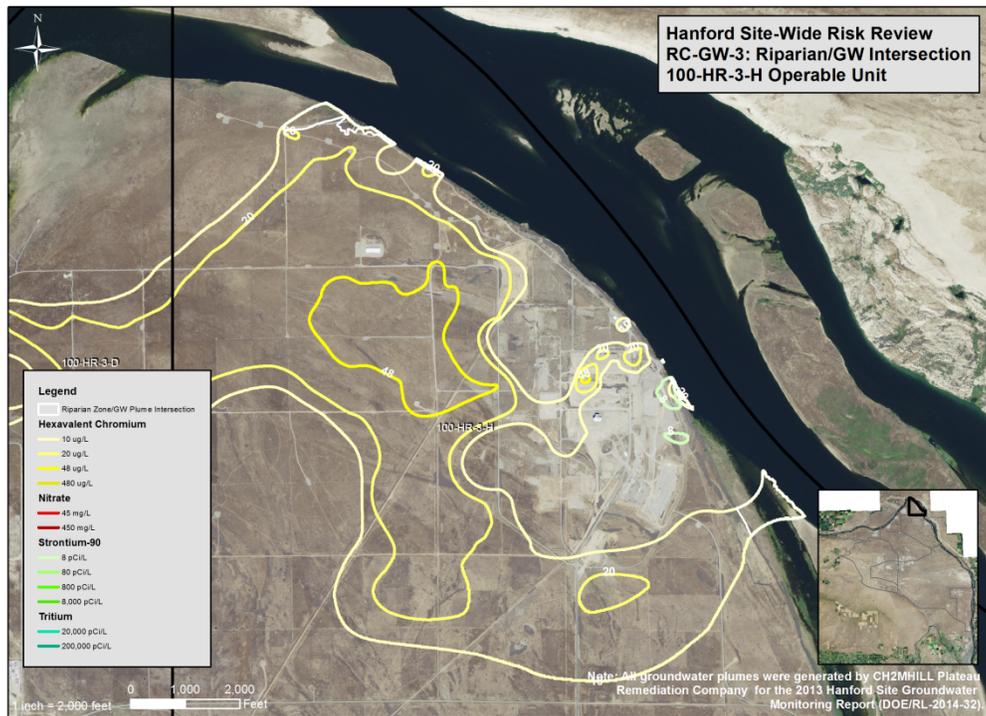


Figure J.71. Groundwater Plumes Intercepting the Riparian Areas on the Eastern Portion of 100-HR-3

RC-GW-3: 100-B/D/H/F/K Area GW Plumes

See discussion for RC-GW-1.

Evaluation Unit: 200-East Groundwater
 ID: CP-GW-1
 Group: Groundwater
 Operable Unit Cross-Walk: 200-BP-2
 200-PO-1
 Related EU: CP-LS-1, 8, 9, 10, 11; CP-TF-5, 6, 7
 Sites & Facilities: Existing groundwater plumes emanating from the 200-East area
 Key Data Sources Docs: NA

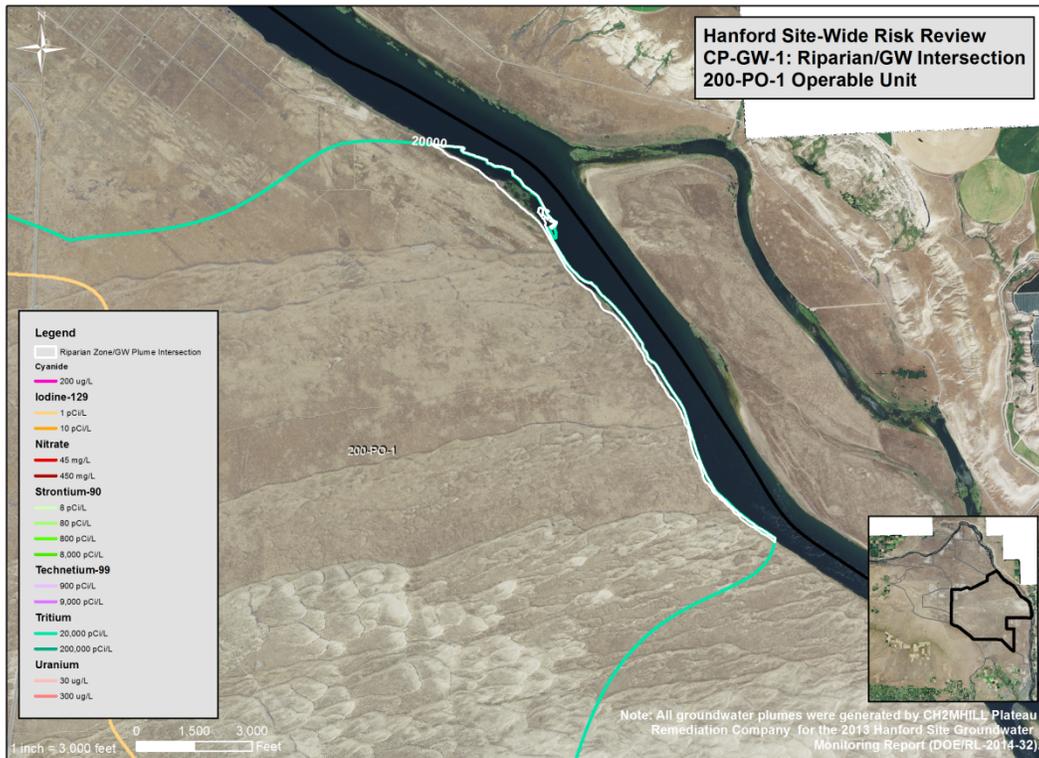


Figure J.72. 200-East Groundwater Plumes Intercepting the Riparian Areas

CP-GW-1: 200-East Groundwater

See discussion for RC-GW-1.

Evaluation Unit: 200-West Groundwater
 ID: CP-GW-2
 Group: Groundwater
 Operable Unit Cross-Walk: 200-ZP-5
 200-UP-1
 Related EU: CP-LS-2, 3, 4, 5, 6
 CP-TF-1, 2, 3, 4
 Sites & Facilities: Existing groundwater plumes emanating from the 200-West Area.
 Includes pump and treat systems.
 Key Data Sources Docs: NA

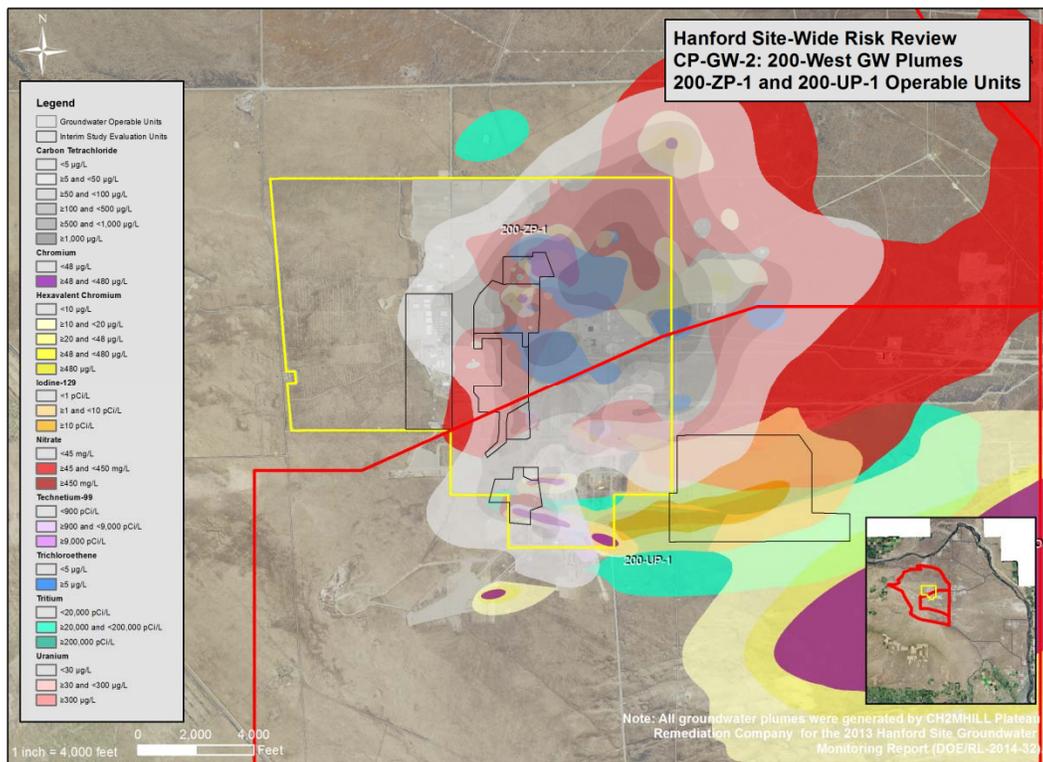


Figure J.73. Site Map with Evaluation Unit Boundaries

CP-GW-2: 200-West Groundwater

This review is limited to the region of the evaluation units where groundwater intercepts the riparian vegetation. In CP-GW-2, there is no area where groundwater intercepts riparian vegetation, so no additional information is included at this time.

Evaluation Unit: 324 Building
 ID: RC-DD-1
 Group: D&D
 Operable Unit Cross-Walk: 300-FF-2
 Related EU: RC-GW-1
 Units & Facilities: 324 Building and associated soils contamination under the building
 Key Data Sources Docs: DOE/RL-96-32 2013
 PNNL ECAP Database³²
 Field Survey Date: 7/16/2014
 Data Sheet prepared by: JLD 10/5/2014



Figure J.74. Unit Map with Evaluation Unit Boundaries

RC-DD-1: 324 Building

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the current Endangered and Threatened Species (Federal and State) distribution data; priority habitats as defined by Washington Department of Fish and Wildlife; available current aerial

³² The Ecological Compliance and Assessment Project (ECAP) database is an evolving set of data that is maintained by Pacific Northwest National Laboratory (PNNL) and updated as new ecological assessments are completed.

imagery, locations of Hanford Site waste sites and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data tables.

The following steps were taken to assess the EU associated with the 324 building:

7. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
8. A visual survey was conducted within the EU boundary by experienced shrub-steppe ecologists. Because the unit consists of unvegetated industrial and graveled surfaces and buildings, no field measurements of vegetation were taken. PNNL biologists also reviewed the observations and biological survey data available in the Ecological Compliance and Assessment Project (ECAP) database from the past 5 years for the EU to determine the status and resource level of the habitats within the EU and supplement the evaluation with previous wildlife or plant species observations.
9. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
10. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2012 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
11. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.
12. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

Reconnaissance and visual survey of the 324 Building EU indicated the unit consists entirely of non-vegetated areas, paved, concrete, and compacted gravel areas (i.e., level 0 resources), and no field measurements of vegetation abundance were collected during the July 2014 survey. Some weedy species such as cheatgrass and Russian thistle were sparsely established around the road edges and parking lot boundaries. No wildlife were observed within the EU. Previous ECAP building survey data indicated that the starling (*Sturnus vulgaris*), which is not protected by the Migratory Bird Treaty Act (MBTA), was the only bird species observed nesting on the building as recently as 2009.

Table J.62. Percent Canopy Cover and Surface Cover Measured at 324 Building

No field measurements of vegetation were taken; the EU consists entirely of graveled surfaces (parking areas and roadways), sidewalks, building, and disturbed bare ground.

Landscape Evaluation and Resource Classification:

The amount of each category of biological resources was evaluated at two scales: 1) within the 324 Building EU and 2) within a circular area radiating 231 m from the geometric center of the unit (equivalent to 41.5 acres) (Figure J.75). The EU and buffer area north, south, and east of the unit were previously classified as level 3 because it is within 0.25 miles of the Columbia River. These areas were reclassified for this assessment to level 0 to reflect current habitat conditions (Table J.63).

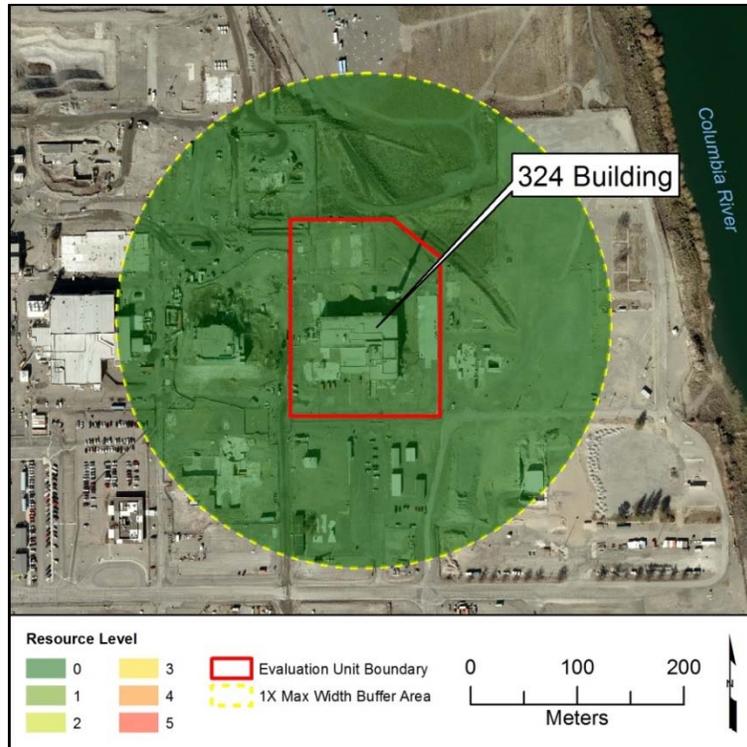


Figure J.75. Map of Biological Resource Level Classifications for the 324 Building Evaluation Unit Based on July 2014 Pedestrian and Vehicle Survey (red boundary) and Reconnaissance Survey of the Adjacent Landscape Buffer (yellow boundary)

Table J.63. Area and Proportion of Each Biological Resource Level Within the 324 Building Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
0	6.2	35.3	41.5	100.0%	100.0%	0.0%
1	0.0	0.0	0.0	0.0%	0.0%	0.0%
2	0.0	0.0	0.0	0.0%	0.0%	0.0%
3	0.0	0.0	0.0	0.0%	0.0%	0.0%
4	0.0	0.0	0.0	0.0%	0.0%	0.0%
5	0.0	0.0	0.0	0.0%	0.0%	0.0%
<i>Total</i>	6.2	35.3	41.5	100.0%	100.0%	

1 Resource levels for both the evaluation unit and adjacent landscape boundary were reviewed in the field and via imagery during July 2014 and revised to reflect current habitats conditions.

2 Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.

Assumptions and Uncertainty:

Due to project time constraints, the field surveys and reconnaissance of this EU were conducted in mid-July. By the time of the survey, the cool-season annual and perennial herbaceous plants that dominate shrub-steppe habitat had completed seasonal growth and senesced making identification and inventory difficult and most likely incomplete. Although no plant species of concern have been noted during previous surveys of the area, and presence of species of concern is very unlikely in graveled industrial areas, the absence of species cannot be confirmed by surveys during this time of year.

By mid-July, most migratory birds have completed their nesting cycles, and surveys may not reflect their occupancy and use of habitat within the evaluation unit earlier in the season. Previous survey data gathered by the ECAP project in 2009 did not indicate use of the 324 building by any MBTA species and although the likelihood is low that MBTA species nested within the EU during the current year, their absence cannot be confirmed by surveys in July after the nesting season is over.

Summary of Ecological Review:

- The EU consists entirely of level 0 resources (Table J.63; Figure J.75);
- No species listed by the US Fish and Wildlife Service or listed by Washington State as species of conservation concern were observed within or in the vicinity of the EU;
- No level 3 or higher habitat resources exist within a 231 m radius of the unit;
- Because the EU lies within and adjacent to a highly disturbed industrial area, the cleanup activities associated with the 324 building would not be expected to impact habitat connectivity.

References

- DOE/RL-96-32. 2013. Hanford Unit Biological Resources Management Plan, Revision 1.
- PNNL. 2009. 300 Area Buildings Survey for 2009, Ecological Compliance and Assessment Project Database. Data collected by PNNL for DOE/RL under the Public Safety and Resource Protection Program.
- U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington.
http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902
- U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act.
<http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>
- Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. Available at:
<http://wdfw.wa.gov/conservation/phs/list/>
- Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington.
<http://wdfw.wa.gov/conservation/endangered/>
- Washington Noxious Weed Control Board. 2014. Noxious Weed List. Available on line at
<http://www.nwcb.wa.gov/>
- Washington State Department of Natural Resources. 2014. Washington Natural Heritage Program Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

Definitions and Acronyms:

Adjacent Landscape Buffer – a circular area adjacent to and outside the EU boundary with the center of the circle at the centroid of the EU, and with a radius that is 1 times the maximum dimension (width or length—whichever is greatest). This circular buffer area is used to evaluate indirect effects and assess the remediation in relation to the landscape features and resources adjacent to the EU. This circular area is generally at least 3 times the area of the EU.

Biological Resource Levels (from DOE-RL-96-32-01) –

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats.

- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks.
- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub-steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.
- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.
- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

MBTA – Migratory Bird Treaty Act; referring to species listed and protected under the federal Act.

PNNL ECAP (Ecological Compliance and Assessment Project) Database – PNNL performed ecological reviews for individual projects and annually surveyed selected areas and buildings on the Hanford Site for DOE-RL under the DOE’s Public Safety and Resource Protection Program until 2011. The data collected during those surveys is archived in the ECAP database, and is used to supplement ecological evaluations as available.

Priority Habitats – Priority habitats are habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type (e.g., shrub-steppe) or dominant plant species (e.g., juniper savannah), a described successional stage (e.g., old-growth forest), or a specific habitat feature (e.g., cliffs).

Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

Previous Field Observations for the 324 Building

ECAP Database Query Results for 324

Observer: *Chamness, Mickie* Date *6/14/2009*

Bird

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
European starling	<i>Sturnus vulgaris</i>		Nest/Active/W/In direct

Evaluation Unit: KE/KW Reactors
 ID: RC-DD-2
 Group: D&D
 Operable Unit Cross-Walk: 100-KR-1
 100-KR-2
 Related EU: RC-LS-2
 RC-GW-3
 Sites & Facilities: KE/KW reactors, basin, ancillary buildings, sludge, and associated soils contamination
 Key Data Sources Docs: DOE/RL-96-32 2013
 PNNL ECAP Database³³
 Field Survey Date: 10/16/2014
 Data Sheet Prepared By: JLD, KBL, SAM; 10/23/2014

DRAFT

Figure J.76. Site Map with Evaluation Unit Boundaries

RC-DD-2: KE/KW Reactors

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the

³³ The Ecological Compliance and Assessment Project (ECAP) database is an evolving set of data that is maintained by Pacific Northwest National Laboratory (PNNL) and updated as new ecological assessments are completed.

current Endangered and Threatened Species (Federal and State) distribution data; priority habitats as defined by Washington Department of Fish and Wildlife; available current aerial imagery, locations of Hanford Unit waste sites and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data tables.

The following steps were taken to assess the EU associated with the 618-11 burial ground:

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. A visual survey was conducted within the EU boundary by experienced shrub-steppe ecologists. Because the unit consists of unvegetated industrial and graveled surfaces and buildings, no field measurements of vegetation were taken. PNNL biologists also reviewed the observations and biological survey data available in the Ecological Compliance and Assessment Project (ECAP) database from the past 5 years for the EU to determine the status and resource level of the habitats within the EU and supplement the evaluation with previous wildlife or plant species observations.
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2012 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.
6. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

The 100-K East and West Reactors EU and adjacent habitat were evaluated by vehicle and pedestrian surveys on October 16, 2014. The EU consists entirely of built structures and graveled and concrete surfaces and no field measurements of vegetation were made. Some sparse Russian thistle (*Salsola tragus*) was noted around the periphery of parking areas and graveled slopes (Table J.64). No wildlife was observed at the reactors during the October survey. Data collected during an ECAP survey of 100-K Area buildings is included at the end of this summary and notes various bird species using the reactors buildings at that time. Much of the infrastructure around the reactors has been removed since that survey was completed, and the available nesting/perching areas that were used by birds likely no longer exist.

Table J.64. Percent Canopy Cover and Surface Cover Visually Estimated at the KE/KW Reactors Evaluation Unit

Vegetation/Surface Cover	Survey Location
Bare Ground	95%
Introduced Forb	5%

Landscape Evaluation and Resource Classification:

The amount and proximity of biological resources to the two reactors in the EU was examined within two adjacent landscape buffer areas; each landscape buffer area is defined by a circle radiating approximately 146 m from the geometric center of each reactor (equivalent to 27.8 acres for the two buffer zones combined) (Figure J.77). Most of the EU the adjacent landscape buffer areas consist of level 0 biological resources—94.2% of the combined total area (Table J.65, Figure J.77 and Figure J.78). The adjacent landscape buffer area includes a small area designated as resource level 4. The level 4 area is a species resource and is considered a level 4 resource because it intersects a designated buffer zone for a bald eagle (*Haliaeetus leucocephalus*) roosting area at the river's edge close to the northwest corner of the 100-K Area.

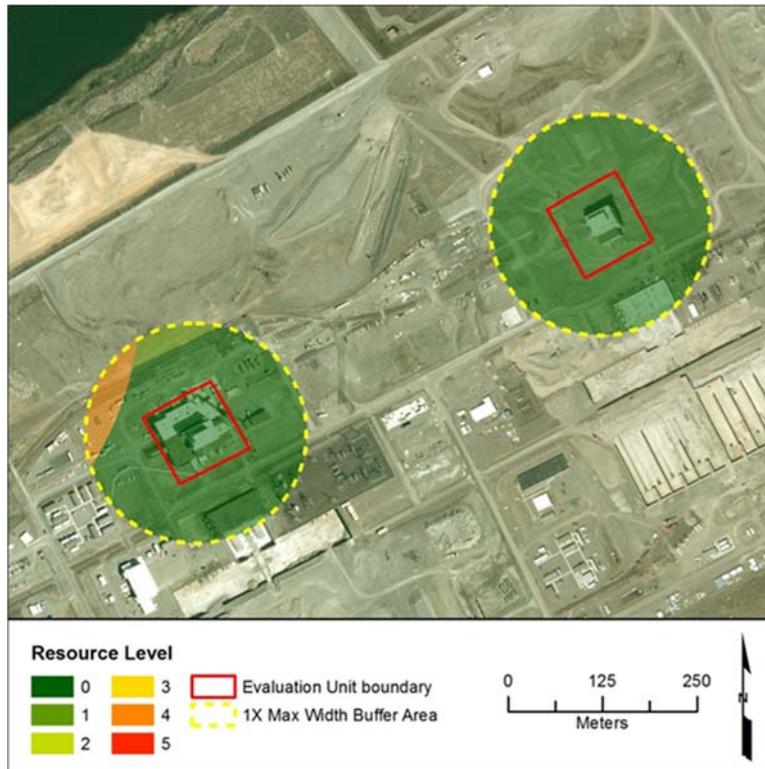


Figure J.77. Biological Resource Level Classifications Based on October 2014 Surveys for the KE/KW Reactors Evaluation Unit (red solid line) and Adjacent Landscape Buffer (yellow dashed line)



Figure J.78. Condition of Landscape around the 100-K East Reactor in October 2014

Table J.65. Area and Proportion of Each Biological Resource Level Within the Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
0	5.2	25.9	31.1	94.2%	94.2%	0.0%
1	0.0	0.7	0.7	2.1%	2.1%	0.0%
2	0.0	0.0	0.0	0.0%	0.0%	0.0%
3	0.0	0.0	0.0	0.0%	0.0%	0.0%
4	0.0	1.2	1.2	3.6%	3.6%	0.0%
5	0.0	0.0	0.0	0.0%	0.0%	0.0%
Total	5.2	27.8	33.0	100.0%	100.0%	

1 Resource levels for the evaluation unit were reviewed in the field and via imagery during October 2014 and revised to reflect current habitats conditions.

2 Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.

Assumptions and Uncertainty:

Due to project time constraints, the field surveys and reconnaissance of this EU were conducted in October. By the time of the survey, the cool-season annual and perennial herbaceous plants that dominate shrub-steppe habitat had completed seasonal growth and senesced making identification and inventory difficult and most likely incomplete. Although no records for plant species of concern have been noted, the absence of species cannot be confirmed by surveys during this time of year.

By October, migratory birds have completed their nesting cycles, and most have migrated out of the region. Surveys conducted in late fall will not reflect their occupancy and use of habitat within the EU earlier in the season. Their absence cannot be confirmed by surveys October after the nesting season is over. Further surveys during the nesting season would be required to fully assess the ecological impacts to nesting migratory birds.

Summary of Ecological Review:

- Deconstruction and decommissioning of the KE/KW reactors would not be expected to result in loss of any additional habitat at the EU. All habitat resources are level 0.
- Previous surveys noted nesting birds associated with the reactor buildings; however it is not evident that the infrastructure and building features that supported nesting are still in existence.
- Remediation actions taken for this EU are not expected to impact habitat connectivity within the adjacent landscape.

- A portion of the adjacent landscape buffer area for the 100-K west reactor is relatively near (within 400 meters) an active bald eagle roost site. Noise and construction activities associated with deconstruction and decommissioning could potentially influence eagle use of the roost.

References:

- DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 0.
- U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act. <http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>
- U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington. http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902
- Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. <http://wdfw.wa.gov/conservation/phs/list/>
- Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington. <http://wdfw.wa.gov/conservation/endangered/>
- Washington Noxious Weed Control Board. 2014. Noxious Weed List. <http://www.nwcb.wa.gov/>
- Washington State Department of Natural Resources. 2014. Washington Natural Heritage Program Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

Definitions and Acronyms:

Adjacent Landscape Buffer – a circular area adjacent to and outside the EU boundary with the center of the circle at the centroid of the EU, and with a radius that is 1 times the maximum dimension (width or length—whichever is greatest). This circular buffer area is used to evaluate indirect effects and assess the remediation in relation to the landscape features and resources adjacent to the EU. This circular area is generally at least 3 times the area of the EU.

Biological Resource Levels (from DOE-RL-96-32-01) –

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats.
- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks.
- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub-steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify

for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.

- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.
- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

MBTA – Migratory Bird Treaty Act; referring to species listed and protected under the federal Act.

PNNL ECAP (Ecological Compliance and Assessment Project) Database – PNNL performed ecological reviews for individual projects and annually surveyed selected areas and buildings on the Hanford Site for DOE-RL under the DOE's Public Safety and Resource Protection Program until 2011. The data collected during those surveys is archived in the ECAP database, and is used to supplement ecological evaluations as available.

Priority Habitats – Priority habitats are habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type (e.g., shrub-steppe) or dominant plant species (e.g., juniper savannah), a described successional stage (e.g., old-growth forest), or a specific habitat feature (e.g., cliffs).

Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

Excerpt from ECAP Survey 2010-100-073; 105 KE includes the east reactor building and 105 KW includes the west reactor building

BLANKET BIOLOGICAL REVIEW OF 100-K AREA MAINTENANCE AND OPERATION ACTIVITIES; 100-K AREA; ECR #2010-100-073

Survey Results:

Most of the area within the 100-K boundary fence is highly disturbed with substrate consisting primarily of compacted gravel. Vegetation consists primarily of widely scattered weedy species, with most of the area having essentially no vegetation. An exception is 116-KW-3 (an approximately 2.6 hectare area in the northwest corner of the site) which has been remediated and is characterized by Sandberg's bluegrass (*Poa secunda*), and bluebunch wheatgrass (*Pseudoroegneria spicata*).

The following migratory bird activity was observed. Nest sites active at the time of the survey are underlined.

105KE -Two common ravens (*Corvus corax*) searching within the exposed north side.

-One inactive common raven nest on a catwalk on the west side.

-One active Say's phoebe (*Sayornis saya*) nest inside a propped-open door at the southeast corner.

105KW -One active house finch (*Carpodacus mexicanus*) nest behind the light above Door 607 on the north side.

-A pair of house finches perched on the west side.

-One inactive western kingbird (*Tyrannus verticalis*) nest on a pipe bracket on the northeast corner.

Evaluation Unit: Final Reactor Disposition
 ID: RC-DD-3
 Group: D&D
 Operable Unit Cross-Walk: TBD
 Related EU: NA
 Sites & Facilities: C, D, DR, F, H, KE, KW, and N Reactors
 Key Data Sources Docs: DOE/RL-96-32 2013; Mission Support Alliance maps³⁴
 Field Survey Date: 07/9, 13, 14, 17/2015
 Datasheet prepared by: KDH, 11/05/2015
 Datasheet reviewed by:

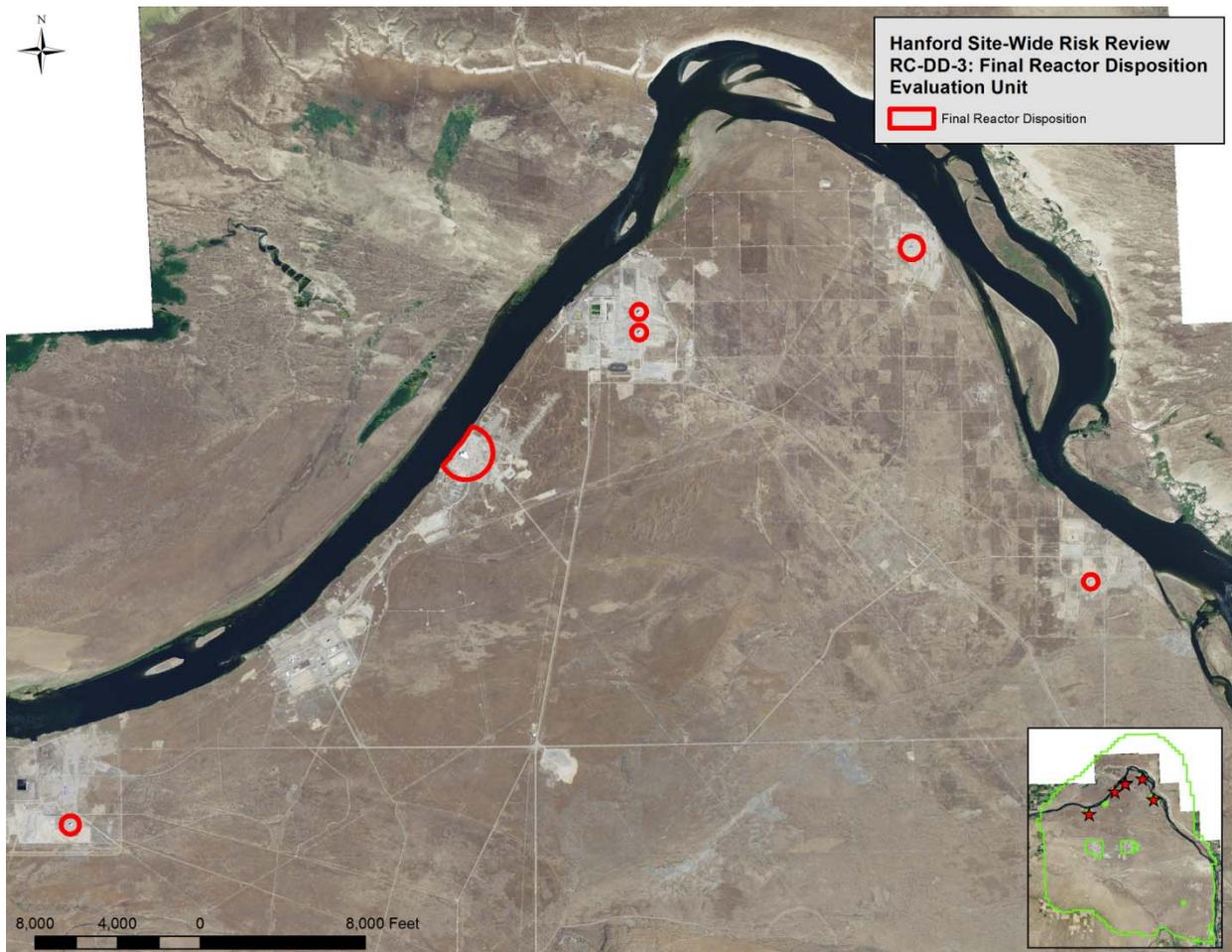


Figure J.79. RC-DD-3 (Final Reactor Disposition) Site Location Map

RC-DD-3: Final Reactor Disposition

³⁴ MSA (Mission Support Alliance) maintains biological resource information for the Hanford Site for the Department of Energy.

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the current Endangered and Threatened Species (Federal and State) distribution data; priority habitats as defined by Washington Department of Fish and Wildlife; available current aerial imagery, locations of Hanford Site waste units and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data tables. The following steps were taken to assess the EU associated with the Final Reactor Disposition.

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. A visual survey was conducted within the EU boundary by experienced shrub-steppe ecologists.
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**. In instances where this buffer extends onto open water, it is truncated at the river shoreline.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2013 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.
6. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

The Final Reactor Disposition EU is comprised of six discrete reactor buildings (105-C, 105-D, 105-DR, 105-F, 105-H, and 105-N) and their immediate vicinities (Figure J.49). Surveys of each of the sites were conducted between July 9 and July 17, 2015. The D-105 and DR-105 sites are very near each other and share a landscape buffer area, so they are generally discussed together throughout this report. The individual sites range in size from 9 acres to 90 acres, though all but 105-N are less than 25 acres in size.

Each site consists of a “cocooned” reactor structure and the disturbed ground surrounding it which is a result of demolition and remediation activities. Much of the ground surface within the EU sites consists of bare gravel or cobble. However, small and scattered patches of sparse vegetation can be found at each site; these are generally characterized by successional shrubs such as gray rabbitbrush (*Ericameria nauseosa*) in the overstory with non-native cheatgrass (*Bromus tectorum*) and Russian thistle (*Salsola tragus*) in the understory (Table J.66). Revegetation efforts have been undertaken in several locations, with varying degrees of success. Revegetated areas containing good cover (approximately 10%) of the climax native shrub big sagebrush (*Artemisia tridentata*) are located in the southwest corner of the 105-C site and in the north end of the 105-F site. Replanting of big sagebrush was also done near the 105-N site, though this effort was more recent and current shrub cover is only approximately 2%.

Bird and bat activity was noted at several sites. An active red-tailed hawk (*Buteo jamaicensis*) nest was located on the 105-C building and an active great horned owl (*Bubo virginianus*) nest was located on the 105-H building during spring 2015 (MSA 2015). Cliff swallows were observed nesting on the 105-D and 105-H buildings. The 105-F building is a known bat roost site (roost boxes are attached to the building and nearby poles) and one bat (unidentified species) was observed flying near and roosting on the building during the visual survey. Entrances to underground bat roosts (with protective structures above ground) are located near the 105-D/DR buildings (primarily in the landscape buffer area, though a portion of one entrance site is within the 105-DR EU section). The 105-H building is also identified as a bat roost site (personal communication and data from MSA)³⁵ See the Field Data Records section for the full lists of plant and animal species recorded during the surveys.

Table J.66. Percent Canopy Cover and Surface Cover Estimated at the Final Reactor Disposition Evaluation Unit

Vegetation/ Surface Cover	Survey Areas (% Cover)															
	C	C	D	DR	DR	DR	F	F	F		H	H	N	N	N	N
	2-	3-	0-	0-	1-	2-	1-	2-	2-	F	0-	2-	1-	3-	3-	3-
	1	1	1	1	1	1	1	1	2	3-1	1	1	1	1a	1b	1c
Bare Ground	-	-	90	90	-	-	-	-	-	100	95	-	-	-	-	-

³⁵ MSA (Mission Support Alliance) maintains biological resource information for the Hanford Site for the Department of Energy.

Introduced Forb	-	35	-	-	-	-	-	-	-	-	2	-	5	10	10	10
Introduced Grass	25	5	-	-	5	-	2	10	1	-	1	20	20	25	20	20
Native Forb	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Native Grass	-	-	-	-	10	-	1	-	-	-	-	-	-	-	-	-
Successional Shrub	30	-	-	-	10	5	-	5	15	-	<1	10	1	2	-	-
Climax Shrub	-	10	-	-	-	2	-	-	-	-	-	-	-	5	-	-

Note: a dash (-) indicates no percent cover data were collected

Landscape Evaluation and Resource Classification:

Revegetated areas at the 105-C, 105-F, and 105-N sites are classified as level 3 biological resources, the highest level found within the EU. And due to their proximity to the ¼-mile river corridor buffer (DOE/RL-96-32 2013), substantial portions of the 105-H and 105-N sites are considered level 3 biological resources (Figure 2, Table J.67), despite having ground cover and vegetation befitting a lower classification. Additionally, bat roosting areas located at 105-F and 105-H and near 105-D/DR are classified as level 3 resources. Overall, 88.0 acres of level 3 resources occur within the Final Reactor Disposition EU, making up 56.5% of the EU (Table J.67).

Disturbed and bare ground (level 0 resources) makes up the second-most significant portion of the EU, with a combined total of 43.7 acres (28.1%). Only the 105-N section does not include any level 0 resources (Figure J.80, Table J.67). Small patches of non-native and successional vegetation (level 1 and 2 resources) occur in small patches within most of the reactor areas, they account for a combined total of 24.0 acres, or 15.4% of the EU.

The amount and proximity of biological resources surrounding the Final Reactor Disposition EU were examined within the adjacent landscape buffer areas, which extend 728-2,592 feet (222-790 m) from the geometric centers of each EU section (Figure J.80). Approximately 42.5% (241.3 ac) of the combined total area (EU plus adjacent landscape buffer for all sections) consists of level 3 resources. The proportion of level 3 resources lost from remediation actions in the EU would be approximately 19.7% (Table J.67). Levels 0, 1, and 2 make up approximately 20%, 11%, and 25% of the total combined area, respectively. The 105-N landscape buffer contains a small amount (~7 ac) of level 4 biological resources in the narrow riparian zone. There are no level 5 resources identified within the combined EU and buffer area.

Assumptions and Uncertainty:

Although all observations for species of concern and current conditions of biological resources were noted during surveys and evaluations conducted in 2015, the presence or absence of species cannot be assumed or predicted for future years. Field reconnaissance and surveys of evaluation units at the time of remediation will need to be conducted to verify resources and evaluate ecological conditions at that time.

Summary of Ecological Review:

- The Final Reactor Disposition EU is comprised of 6 distinct sections spread across 5 different locations. Though similar in the sense of being based on cocooned reactor buildings, each section has unique characteristics which will need to be assessed independently at the time of remediation.
- Approximately 56.5% of the EU consists of level 3 biological resources, based on three criteria:
 - Sections 105-H and 105-N are located within $\frac{1}{4}$ mile of the river shore and thus have significant portions classified as level 3.
 - Sections 105-F and 105-N contain revegetated areas characterized by climax shrub-steppe vegetation that are classified as level 3.
 - Areas within or near the 105-F, 105-H, and 105-D/DR sections contain bat roost sites and are afforded level 3 classification.

A loss of 15.5% of level 3 resources would occur at the landscape level from remediation actions.

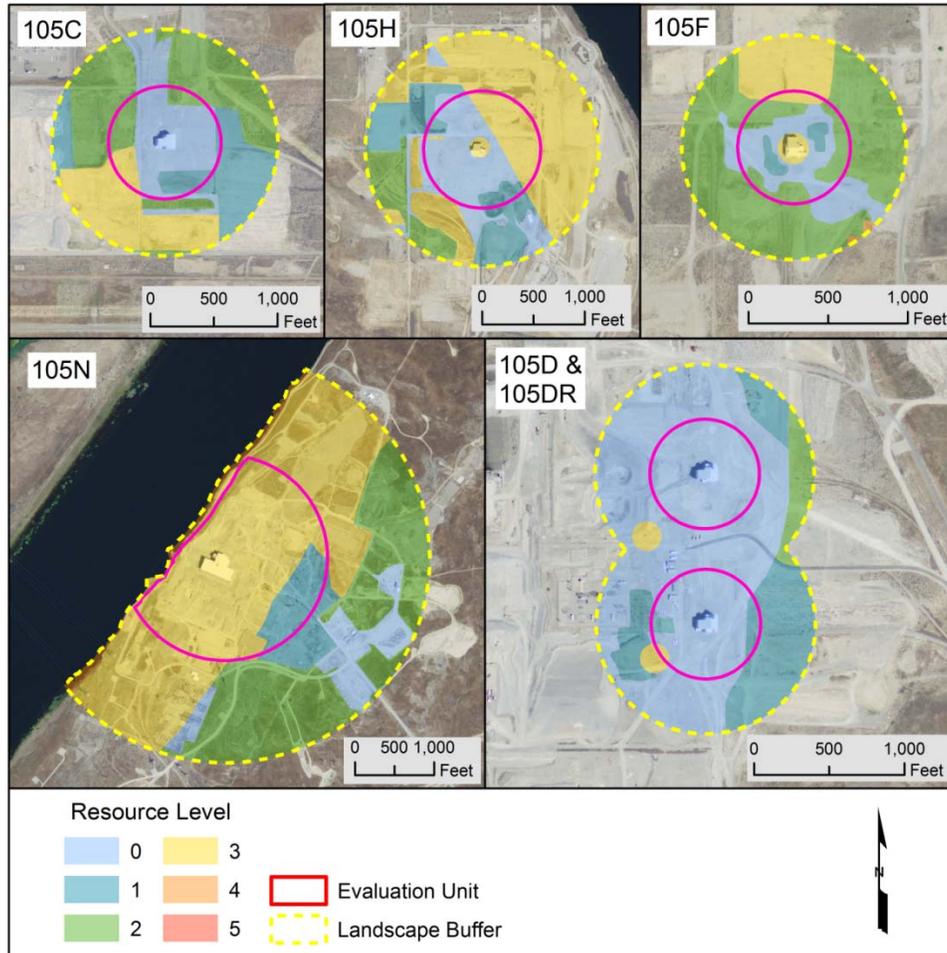


Figure J.80. Biological Resource Level Classifications Based on July 9-17, 2015 Surveys at the Final Reactor Disposition Evaluation Unit (red solid line) and Adjacent Landscape Buffer Area (yellow dashed line).

Table J.67. Area and Proportion of Each Biological Resource Level Within the Final Reactor Disposition Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources.

Reactor Site	Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
Reactor 105C	0	8.9	3.8	12.8	22.41%	31.51%	9.10%
	1	1.7	9.2	10.9	19.18%	16.21%	-2.97%
	2	2.3	19.2	21.5	37.77%	33.71%	-4.07%
	3	1.2	10.6	11.8	20.64%	18.57%	-2.07%
	4	0	0	0	0.00%	0.00%	0.00%
	5	0	0	0	0.00%	0.00%	0.00%
	<i>Total</i>	14.1	42.9	57.0	100.00%	100.00%	
Reactors 105D & 105DR	0	17.9	32.2	50.1	72.81%	74.56%	1.76%
	1	1.1	13.3	14.4	20.93%	19.37%	-1.56%
	2	0	2.9	2.9	4.24%	4.24%	0.00%
	3	0.1	1.3	1.4	2.02%	1.82%	-0.20%
	4	0	0	0	0.00%	0.00%	0.00%
	5	0	0	0	0.00%	0.00%	0.00%
	<i>Total</i>	19.1	49.7	68.8	100.00%	100.00%	
Reactor 105F	0	3.8	2.6	6.4	17.96%	32.48%	14.51%
	1	0.9	0.0	0.9	2.45%	0.00%	-2.45%
	2	3.2	19.3	22.4	62.49%	53.68%	-8.82%
	3	1.2	4.8	6.0	16.64%	13.39%	-3.25%
	4	0	0.2	0.2	0.45%	0.45%	0.00%
	5	0	0	0	0.00%	0.00%	0.00%
	<i>Total</i>	9.0	26.8	35.9	100.00%	100.00%	
Reactor 105H	0	13.0	7.2	20.2	21.52%	32.72%	11.20%
	1	2.1	13.1	15.3	16.29%	14.02%	-2.27%
	2	0	7.9	7.9	8.42%	8.42%	0.00%
	3	8.4	42.0	50.4	53.76%	44.84%	-8.93%
	4	0	0	0	0.00%	0.00%	0.00%
	5	0	0	0	0.00%	0.00%	0.00%
	<i>Total</i>	23.5	70.2	93.7	100.00%	100.00%	

Reactor Site	Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
Reactor 105N	0	0	22.9	22.9	7.35%	36.17%	28.83%
	1	12.6	9.7	22.3	7.15%	3.10%	-4.05%
	2	0.1	87.9	88.0	28.21%	28.19%	-0.03%
	3	77.2	94.5	171.7	55.06%	30.31%	-24.75%
	4	0	6.9	6.9	2.23%	2.23%	0.00%
	5	0	0	0	0.00%	0.00%	0.00%
	Total		89.9	222.0	311.9	100.00%	100.00%
Combined Total	0	43.7	68.7	112.4	19.81%	39.56%	19.74%
	1	18.4	45.4	63.8	11.24%	8.00%	-3.24%
	2	5.6	137.2	142.8	25.17%	24.19%	-0.98%
	3	88.0	153.2	241.3	42.52%	27.00%	-15.52%
	4	0	7.1	7.1	1.25%	1.25%	0.00%
	5	0	0	0	0.00%	0.00%	0.00%
	Total		155.7	411.7	567.3	100.00%	100.00%

1 Resource levels for both the evaluation unit and adjacent landscape boundary were reviewed in the field and via imagery during May-August 2015 and revised to reflect current habitats conditions.

2 Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.

References:

DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 0.

U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act. <http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>

U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington.

http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902

Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. <http://wdfw.wa.gov/conservation/phs/list/>

Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington. <http://wdfw.wa.gov/conservation/endangered/>

Washington Noxious Weed Control Board. 2014. Noxious Weed List. <http://www.nwcb.wa.gov/>

Washington State Department of Natural Resources. 2014. Washington Natural Heritage Program Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

Definitions and Acronyms:

Adjacent Landscape Buffer – a circular area adjacent to and outside the EU boundary with the center of the circle at the centroid of the EU, and with a radius that is 1 times the maximum dimension (width or length—whichever is greatest). This circular buffer area is used to evaluate indirect effects and assess the remediation in relation to the landscape features and resources adjacent to the EU. This circular area is generally at least 3 times the area of the EU.

Biological Resource Levels (from DOE-RL-96-32-01) –

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats.
- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks.
- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub-steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.
- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.
- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.
- Level 0 resources consist of non-native plants and animals (unless otherwise listed at a higher level), non-vegetated areas, and industrial areas.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential

impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

MBTA – Migratory Bird Treaty Act; referring to species listed and protected under the federal Act.

PNNL ECAP (Ecological Compliance and Assessment Project) Database – PNNL performed ecological reviews for individual projects and annually surveyed selected areas and buildings on the Hanford Site for DOE-RL under the DOE's Public Safety and Resource Protection Program until 2011. The data collected during those surveys is archived in the ECAP database, and is used to supplement ecological evaluations as available.

Priority Habitats – Priority habitats are habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type (e.g., shrub-steppe) or dominant plant species (e.g., juniper savannah), a described successional stage (e.g., old-growth forest), or a specific habitat feature (e.g., cliffs).

Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

Field Data Records

Plant Species Identified During Visual Surveys July 9-17 2015, Final Reactor Disposition EU			
Patch ID	Name	Common name	Abundance
C Reactor 0-1	<i>Bromus tectorum</i>	cheatgrass	
C Reactor 0-1	<i>Centaurea diffusa</i>	tumble knapweed	
C Reactor 0-1	<i>Ericameria nauseosa</i>	gray rabbitbrush	
C Reactor 0-1	<i>Poa secunda</i>	Sandberg's bluegrass	
C Reactor 0-1	<i>Salsola tragus</i>	Russian thistle	
C Reactor 2-1	<i>Bromus tectorum</i>	cheatgrass	25
C Reactor 2-1	<i>Chondrilla juncea</i>	Rush skeletonweed	
C Reactor 2-1	<i>Ericameria nauseosa</i>	gray rabbitbrush	30
C Reactor 2-1	<i>Salsola tragus</i>	Russian thistle	
C Reactor 2-1	<i>Sisymbrium altissimum</i>	Jim Hill's tumbled mustard	
C Reactor 2-1	<i>Sporobolus cryptandrus</i>	sand dropseed	
C Reactor 3-1	<i>Artemisia tridentata</i>	big sagebrush	10
C Reactor 3-1	<i>Bromus tectorum</i>	cheatgrass	5
C Reactor 3-1	<i>Lactuca serriola</i>	prickly lettuce	
C Reactor 3-1	<i>Poa secunda</i>	Sandberg's bluegrass	
C Reactor 3-1	<i>Pseudoroegneria spicata</i>	bluebunch wheatgrass	
C Reactor 3-1	<i>Salsola tragus</i>	Russian thistle	35
C Reactor 3-1	<i>Sisymbrium altissimum</i>	Jim Hill's tumbled mustard	
C Reactor 3-1	<i>Sitanion hystrix</i>	bottlebrush grass	
D Reactor 0-1	<i>Ericameria nauseosa</i>	gray rabbitbrush	
D Reactor 0-1	no vegetation	no vegetation	90
D Reactor 0-1	<i>Salsola tragus</i>	Russian thistle	
D Reactor 0-1	<i>Sporobolus cryptandrus</i>	sand dropseed	
DR Reactor 0-1	no vegetation	no vegetation	90
DR Reactor 1-1	<i>Achillea millefolium</i>	yarrow	
DR Reactor 1-1	<i>Artemisia tridentata</i>	big sagebrush	
DR Reactor 1-1	<i>Bromus tectorum</i>	cheatgrass	5
DR Reactor 1-1	<i>Centaurea diffusa</i>	tumble knapweed	
DR Reactor 1-1	<i>Ericameria nauseosa</i>	gray rabbitbrush	10
DR Reactor 1-1	<i>Machaeranthera canescens</i>	hoary aster	
DR Reactor 1-1	<i>Poa bulbosa</i>	bulbous bluegrass	
DR Reactor 1-1	<i>Poa secunda</i>	Sandberg's bluegrass	
DR Reactor 1-1	<i>Salsola tragus</i>	Russian thistle	
DR Reactor 1-1	<i>Sporobolus cryptandrus</i>	sand dropseed	10
DR Reactor 1-1	<i>Tragopogon dubius</i>	Yellow salsify	

Plant Species Continued			
July 9-17 2015, Final Reactor Disposition EU			
Patch ID	Name	Common name	Abundance
DR Reactor 2-1	<i>Achillea millefolium</i>	yarrow	
DR Reactor 2-1	<i>Ambrosia acanthicarpa</i>	bur ragweed	
DR Reactor 2-1	<i>Artemisia tridentata</i>	big sagebrush	2
DR Reactor 2-1	<i>Bromus tectorum</i>	cheatgrass	
DR Reactor 2-1	<i>Centaurea diffusa</i>	tumble knapweed	
DR Reactor 2-1	<i>Ericameria nauseosa</i>	gray rabbitbrush	5
DR Reactor 2-1	<i>Machaeranthera canescens</i>	hoary aster	
DR Reactor 2-1	<i>Salsola tragus</i>	Russian thistle	
DR Reactor 2-1	<i>Sphaeralcea munroana</i>	Munro's globemallow	
DR Reactor 2-1	<i>Sporobolus cryptandrus</i>	sand dropseed	
F Reactor 1-1	<i>Artemisia tridentata</i>	big sagebrush	
F Reactor 1-1	<i>Pseudoroegneria spicata</i>	bluebunch wheatgrass	1
F Reactor 1-1	<i>Bromus tectorum</i>	cheatgrass	2
F Reactor 1-1	<i>Centaurea diffusa</i>	tumble knapweed	
F Reactor 1-1	<i>Ericameria nauseosa</i>	gray rabbitbrush	
F Reactor 1-1	<i>Machaeranthera canescens</i>	hoary aster	
F Reactor 1-1	<i>Poa secunda</i>	Sandberg's bluegrass	
F Reactor 1-1	<i>Salsola tragus</i>	Russian thistle	
F Reactor 2-1	<i>Bromus tectorum</i>	cheatgrass	10
F Reactor 2-1	<i>Ericameria nauseosa</i>	gray rabbitbrush	5
F Reactor 2-1	<i>Salsola tragus</i>	Russian thistle	
F Reactor 2-1	<i>Verbena bracteata</i>	bracted verbena	
F Reactor 2-2	<i>Achillea millefolium</i>	yarrow	
F Reactor 2-2	<i>Artemisia tridentata</i>	big sagebrush	
F Reactor 2-2	<i>Bromus tectorum</i>	cheatgrass	1
F Reactor 2-2	<i>Centaurea diffusa</i>	tumble knapweed	
F Reactor 2-2	<i>Ericameria nauseosa</i>	gray rabbitbrush	15
F Reactor 2-2	<i>Festuca microstachys</i>	small sixweeks	
F Reactor 2-2	<i>Hesperostipa comata</i>	needle-and-thread grass	
F Reactor 2-2	<i>Machaeranthera canescens</i>	hoary aster	
F Reactor 2-2	<i>Poa secunda</i>	Sandberg's bluegrass	
F Reactor 2-2	<i>Sporobolus cryptandrus</i>	sand dropseed	
F Reactor 2-2	<i>Tragopogon dubius</i>	Yellow salsify	
F Reactor 3-1	<i>no vegetation</i>	no vegetation	100

Plant Species Continued			
July 9-17 2015, Final Reactor Disposition EU			
Patch ID	Name	Common name	Abundance
H Reactor 0-1	<i>Bromus tectorum</i>	cheatgrass	1
H Reactor 0-1	<i>Centaurea diffusa</i>	tumble knapweed	
H Reactor 0-1	<i>Ericameria nauseosa</i>	gray rabbitbrush	+
H Reactor 0-1	<i>Poa bulbosa</i>	bulbous bluegrass	
H Reactor 0-1	<i>Salsola tragus</i>	Russian thistle	2
H Reactor 0-1	<i>Sisymbrium altissimum</i>	Jim Hill's tumbled mustard	
H Reactor 0-1	<i>Sporobolus cryptandrus</i>	sand dropseed	
H Reactor 0-1	<i>Verbascum thapsus</i>	common mullein	
H Reactor 2-1	<i>Artemisia tridentata</i>	big sagebrush	
H Reactor 2-1	<i>Bromus tectorum</i>	cheatgrass	20
H Reactor 2-1	<i>Ericameria nauseosa</i>	gray rabbitbrush	10
H Reactor 2-1	<i>Sisymbrium altissimum</i>	Jim Hill's tumbled mustard	
H Reactor 2-1	<i>Sporobolus cryptandrus</i>	sand dropseed	
N Reactor 1-1	<i>Bromus tectorum</i>	cheatgrass	20
N Reactor 1-1	<i>Ericameria nauseosa</i>	gray rabbitbrush	1
N Reactor 1-1	<i>Juniperus communis</i>	common juniper	
N Reactor 1-1	<i>Salsola tragus</i>	Russian thistle	5
N Reactor 3-1a	<i>Artemisia tridentata</i>	big sagebrush	5
N Reactor 3-1a	<i>Bromus tectorum</i>	cheatgrass	25
N Reactor 3-1a	<i>Ericameria nauseosa</i>	gray rabbitbrush	2
N Reactor 3-1a	<i>Salsola tragus</i>	Russian thistle	10
N Reactor 3-1b	<i>Bromus tectorum</i>	cheatgrass	20
N Reactor 3-1b	<i>Salsola tragus</i>	Russian thistle	10
N Reactor 3-1c	<i>Bromus tectorum</i>	cheatgrass	20
N Reactor 3-1c	<i>Ericameria nauseosa</i>	gray rabbitbrush	
N Reactor 3-1c	<i>Salsola tragus</i>	Russian thistle	10

Bird, Mammal and Herpetofauna Species Identified During Visual Surveys July 9-17 2015, Final Reactor Disposition EU			
Patch ID	Name	Common name	Comment
C Reactor 0-1	<i>Petrochelidon pyrrhonota</i>	cliff swallow	
C Reactor 0-1	<i>Sturnus vulgaris</i>	European starling	
C Reactor 0-1	<i>Columba livia</i>	rock pigeon	
C Reactor 0-1		unidentified nest	stick nest, unoccupied, on reactor bldg
C Reactor 3-1	<i>Eremophila alpestris</i>	horned lark	
D Reactor 0-1	<i>Petrochelidon pyrrhonota</i>	cliff swallow	~12 perch/fly near reactor; ~5 nests SW bldg corner
DR Reactor 1-1	<i>Chondestes grammacus</i>	lark sparrow	1 sing just SW of EU
DR Reactor 1-1	<i>Columba livia</i>	rock pigeon	~10 perch bat structure
F Reactor 3-1		unidentified bat	1 bat fly/roost bldg corner
F Reactor 3-1		unidentified nest	stick nest, unoccupied, on reactor bldg
F Reactor 3-1	<i>Petrochelidon pyrrhonota</i>	cliff swallow	old nest
F Reactor 3-1	<i>Pandion haliaetus</i>	osprey	1 soar overhead
F Reactor 2-1	<i>Tyrannus verticalis</i>	Western kingbird	1 perch nest platform
F Reactor 2-2	<i>Sturnella neglecta</i>	Western meadowlark	1 perch shrub
H Reactor 0-1	<i>Petrochelidon pyrrhonota</i>	cliff swallow	20+ active nests E, 50+ inactive nests N, 20+ active nests W, 12+ active nests S
H Reactor 0-1	<i>Sturnella neglecta</i>	Western meadowlark	1 fledged juv perch dirt mound N
H Reactor 0-1	<i>Sayornis saya</i>	Say's phoebe	1 perch fence N

Evaluation Unit: FFTF
ID: RC-DD-4
Group: D&D
Operable Unit Cross-Walk: NA
Related EU: NA
Sites & Facilities: Fast Flux Test Facility (FFTF), ancillary buildings and structures
Key Data Sources Docs: DOE-RL-96-32-01; Mission Support Alliance maps³⁶
Field Survey Date: 06/26/2015
Datasheet prepared by: KDH, 11/12/2015
Datasheet reviewed by:



Figure J.81. RC-DD-4 (FFTF) Site Location Map

RC-DD-4: FFTF

³⁶ MSA (Mission Support Alliance) maintains biological resource information for the Hanford Site for the Department of Energy.

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the current Endangered and Threatened Species (Federal and State) distribution data; priority habitats as defined by Washington Department of Fish and Wildlife; available current aerial imagery, locations of Hanford Site waste units and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data records.

The following steps were taken to assess the EU associated with FFTF:

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. A pedestrian and driving survey was conducted within the EU boundary by experienced shrub-steppe ecologists.
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2013 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.
6. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

Most of the EU is an industrial-type area consisting of roads, parking lots, graveled areas, and buildings. The majority of the EU does not support vegetation except for sparse weeds and remnant ornamental shrubs adjacent to buildings or previous building sites (Table J.68). There is a small patch of habitat located in the southwest corner which is characterized by sparse gray rabbitbrush (*Ericameria nauseosa*) in the overstory with a cheatgrass (*Bromus tectorum*) understory (Table J.68).

Table J.68. Percent Canopy Cover and Surface Cover Estimated at the FFTF Evaluation Unit.

Vegetation/Surface Cover	Survey Areas (% Cover)	
	0-1	3-1
Bare Ground	95	-
Introduced Forb	-	10
Introduced Grass	-	65
Native Forb	-	-
Native Grass	-	2
Successional Shrub	-	5
Climax Shrub	0	1

Note: a dash (-) indicates no percent cover data were collected

Several birds were observed perching or foraging near buildings, though no wildlife species of concern were observed during the survey. See the Field Data Records section for the full lists of plant and animal species recorded during the survey.

Landscape Evaluation and Resource Classification:

The majority (111 acres, 74.4%) of the area within the FFTF EU is classified as level 0 biological resources (Figure J.82, Table J.69).

The remaining 38 acres (25.6%) are classified as level 3 resources (Figure J.82, Table J.69). Included in the level 3 classification is the single area of natural habitat located in the southwest corner of the EU; however, the classification as level 3 comes not from vegetation type or condition, but from the nearby presence of burrowing owl (*Athene cunicularia*) burrows. Between 2006 and 2012 several burrowing owls nests were documented in road culverts located just outside the EU boundary at the southwest corner and the east side of the site (DOE/RL-96-32 2013). The burrowing owl is listed as a State Candidate species of concern by the Washington Department of Fish and Wildlife (WDFW 2014). Under the Hanford Site Biological Resources Management Plan burrowing owl nests are classified as level 3 resources and these established nest sites are given 250-m buffers surrounding them.

The amount and proximity of biological resources surrounding the FFTF EU were examined within the adjacent landscape buffer area, which extends 3,634 feet (1,108 m) from the geometric center of the EU (Figure J.82). The EU is bordered by substantial areas of natural shrub-steppe habitat. Lesser quality habitat (level 2) is located in the south and east portions of the landscape buffer; level 2 resources make up about 23.8% of the combined total area (EU plus adjacent landscape buffer). Higher quality habitats (levels 3 and 4), are located

immediately around the EU as well as to the west and north; level 3 and level 4 resources make up approximately 24.2% and 37.8% of the combined total area, respectively (Figure J.82, Table J.69). The proportion of level 3 or above resources lost from remediation actions in the EU would be approximately 4% at the landscape level (Table J.69).

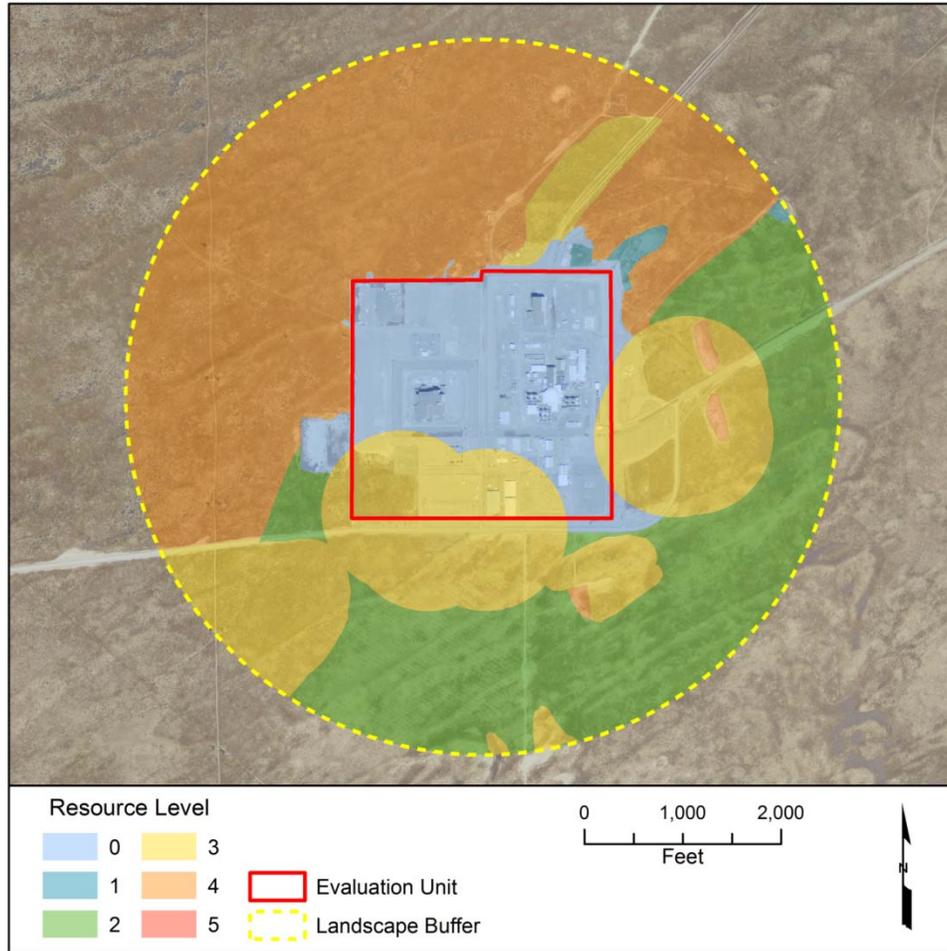


Figure J.82. Biological Resource Level Classifications Based on the June 26, 2015 Survey at the FFTF Evaluation Unit (red solid line) and Adjacent Landscape Buffer Area (yellow dashed line).

Table J.69. Area and Proportion of Each Biological Resource Level Within the FFTF Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources.

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
0	110.9	19.5	130.5	13.70%	17.69%	3.99%
1	0	5.3	5.3	0.56%	0.56%	0.00%
2	0	226.6	226.6	23.79%	23.79%	0.00%
3	38.1	192.1	230.1	24.16%	20.17%	-3.99%
4	0	359.9	359.9	37.79%	37.79%	0.00%
5	0	0	0	0.00%	0.00%	0.00%
Total	149.0	803.5	952.4	100.00%	100.00%	

1 Resource levels for both the evaluation unit and adjacent landscape boundary were reviewed in the field and via imagery during May-August 2015 and revised to reflect current habitats conditions.

2 Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.

Assumptions and Uncertainty:

Although all observations for species of concern and current conditions of biological resources were noted during surveys and evaluations conducted in 2015, the presence or absence of species cannot be assumed or predicted for future years. Field reconnaissance and surveys of evaluation units at the time of remediation will need to be conducted to verify resources and evaluate ecological conditions at that time.

Summary of Ecological Review:

- The majority of the EU (~74%) is classified as resource level 0.
- Remediation actions would result in only an approximate 4% loss of level 3 resources at the landscape scale; this loss is further assuaged by the fact that these level 3 resources are based on buffer designations, not current vegetation conditions.
- Due to the potential of disturbing nesting burrowing owls, remediation actions planned for the south and east portions of the EU will need further assessment prior to undertaking the work.

References:

DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 0.

U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act. <http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>

- U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington.
http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902
- Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. <http://wdfw.wa.gov/conservation/phs/list/>
- Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington.
<http://wdfw.wa.gov/conservation/endangered/>
- Washington Noxious Weed Control Board. 2014. Noxious Weed List. <http://www.nwcb.wa.gov/>
- Washington State Department of Natural Resources. 2014. Washington Natural Heritage Program Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

Definitions and Acronyms:

Adjacent Landscape Buffer – a circular area adjacent to and outside the EU boundary with the center of the circle at the centroid of the EU, and with a radius that is 1 times the maximum dimension (width or length—whichever is greatest). This circular buffer area is used to evaluate indirect effects and assess the remediation in relation to the landscape features and resources adjacent to the EU. This circular area is generally at least 3 times the area of the EU.

Biological Resource Levels (from DOE-RL-96-32-01) –

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats.
- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks.
- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub-steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.
- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.
- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.
- Level 0 resources consist of non-native plants and animals (unless otherwise listed at a higher level), non-vegetated areas, and industrial areas.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

MBTA – Migratory Bird Treaty Act; referring to species listed and protected under the federal Act.

PNNL ECAP (Ecological Compliance and Assessment Project) Database – PNNL performed ecological reviews for individual projects and annually surveyed selected areas and buildings on the Hanford Site for DOE-RL under the DOE's Public Safety and Resource Protection Program until 2011. The data collected during those surveys is archived in the ECAP database, and is used to supplement ecological evaluations as available.

Priority Habitats – Priority habitats are habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type (e.g., shrub-steppe) or dominant plant species (e.g., juniper savannah), a described successional stage (e.g., old-growth forest), or a specific habitat feature (e.g., cliffs).

Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

Field Data Records

Plant Species Identified During Visual Surveys June 26 2015, FFTF EU			
Patch ID	Name	Common name	Abundance
0-1	<i>no vegetation</i>	no vegetation	95
3-1	<i>Achnatherum hymenoides</i>	indian ricegrass	
3-1	<i>Ambrosia acanthicarpa</i>	bur ragweed	
3-1	<i>Amsinckia species</i>		
3-1	<i>Artemisia tridentata</i>	big sagebrush	1
3-1	<i>Balsamorhiza careyana</i>	Carey's balsamroot	
3-1	<i>Bromus tectorum</i>	cheatgrass	65
3-1	<i>Chondrilla juncea</i>	Rush skeletonweed	1
3-1	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	
3-1	<i>Ericameria nauseosa</i>	gray rabbitbrush	5
3-1	<i>Hesperostipa comata</i>	needle-and-thread grass	
3-1	<i>Lactuca serriola</i>	prickly lettuce	
3-1	<i>Machaeranthera canescens</i>	hoary aster	
3-1	<i>Poa secunda</i>	Sandberg's bluegrass	2
3-1	<i>Populus species</i>		
3-1	<i>Purshia tridentata</i>	bitterbrush	
3-1	<i>Salsola tragus</i>	Russian thistle	10
3-1	<i>Sisymbrium altissimum</i>	Jim Hill's tumbled mustard	
3-1	<i>Tragopogon dubius</i>	Yellow salsify	

Bird, Mammal and Herpetofauna Species Identified During Visual Surveys June 26 2015, FFTF EU			
Patch ID	Name	Common name	Comment
0-1	<i>Corvus corax</i>	common raven	1 perch light pole
0-1	<i>Sayornis saya</i>	Say's phoebe	foraging near bldgs SE corner
3-1	<i>Eremophila alpestris</i>	horned lark	1 fly in
3-1		unidentified small mammal	holes
3-1	<i>Canis latrans</i>	coyote	digs
3-1	<i>Thomomys talpoides</i>	northern pocket gopher	mounds

Evaluation Unit: PUREX
 ID: CP-DD-1
 Group: D&D
 Operable Unit Cross-Walk: 200-CP-1
 Related EU: CP-LS-9
 Sites & Facilities: PUREX canyon, tunnels, ancillary building, structures, and associated near-surface contaminated soils
 Key Data Sources Docs: DOE/RL-96-32 2013
 PNNL ECAP database³⁷
 Field Survey Date: 10/7/2014
 Data Sheet Prepared By: JLD, KDH, MAC, KBL, SAM 10/20/2014

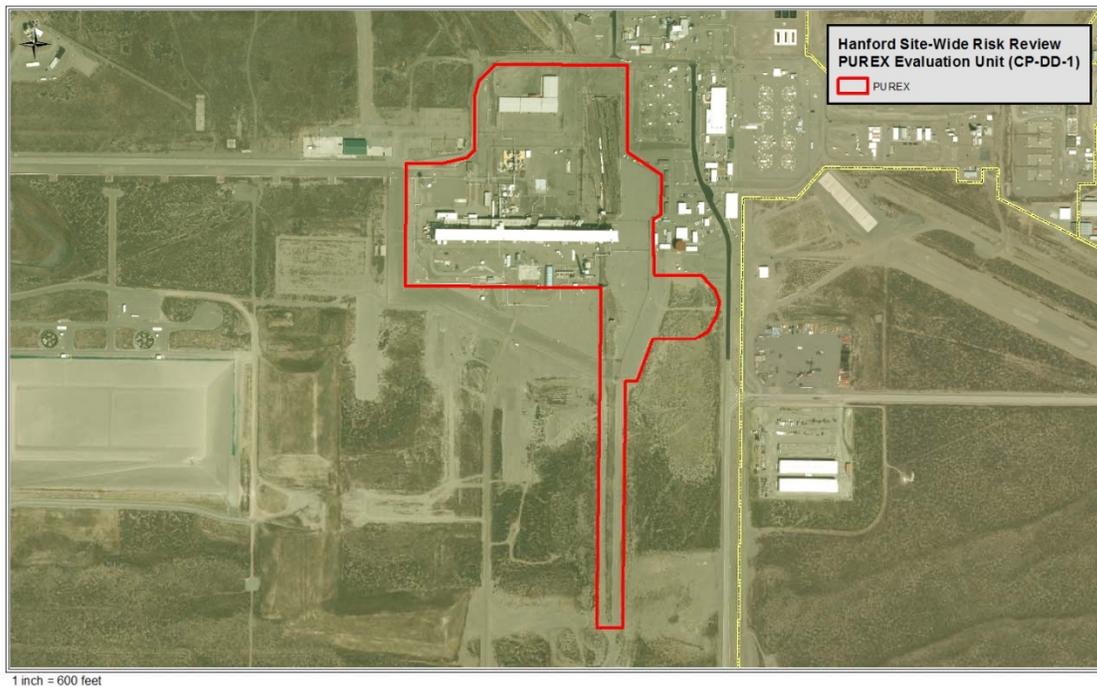
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Figure J.83. Site Map with Evaluation Unit Boundaries

CP-DD-1: PUREX

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the current Endangered and Threatened Species (Federal and State) distribution data; priority habitats as defined by Washington Department of Fish and Wildlife; available current aerial

³⁷ The Ecological Compliance and Assessment Project (ECAP) database is an evolving set of data that is maintained by Pacific Northwest National Laboratory (PNNL) and updated as new ecological assessments are completed.

imagery, locations of Hanford Site waste sites and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data tables.

The following steps were taken to assess the EU associated with PUREX:

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. A visual survey was conducted within the EU boundary by experienced shrub-steppe ecologists. PNNL biologists also reviewed the observations and biological survey data available in the Ecological Compliance and Assessment Project (ECAP) database from the past 5 years for the EU to determine the status and resource level of the habitats within the EU and supplement the evaluation with previous wildlife or plant species observations.
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2012 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.
6. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

The EU associated with the PUREX facilities was surveyed by pedestrian and vehicle reconnaissance and field measurement of remaining habitat on the southeast side of the area

in October 2014. The majority of the EU consists of buildings, disturbed areas, parking lots, and facilities, except for the extension of the unit to the south and a small area just south of the parking lot on the east side of the unit. Field measurements in the southeast habitat (Table J.70) confirmed that the area consisted of level 2 habitat resources. Patches of level 3 resources within the EU are associated with individual occurrences of sensitive plant species; Piper's daisy (*Erigeron piperianus*) had been noted in previous ECAP surveys and an *Erigeron* spp. was noted in the field survey, but could not be verified as Piper's daisy.

Wildlife observations within the level 2 habitat included several side-blotched lizards (*Uta stansburiana*), small mammal burrows and trails, coyote (*Canis latrans*) tracks, and a common raven (*Corvus corax*) flying overhead. No wildlife were observed within the fenced area around PUREX facilities.

Landscape Evaluation and Resource Classification:

The amount of each category of biological resources at the PUREX EU was examined within a circular area radiating approximately 995 m from the geometric center of the unit (equivalent to 768 acres). Within the 44.6 acres of the EU, only 2.2 acres are classified as level 3 habitat, but these consist of fragmented and narrow patches (Table J.71, Figure J.84). Approximately 31% of the total combined area (EU plus adjacent landscape buffer) consists of level 3 or greater resources.

Table J.70. Percent Canopy Cover and Surface Cover Measured at the PUREX Evaluation Unit

Vegetation/Surface Cover	Southeast Side of EU
Bare Ground	19.8
Crust	51.6
Litter	25.8
Introduced Forb	1.0
Introduced Grass	1.0
Native Forb	11.0
Native Grass	8.2
Climax Shrubs	2.4
Successional Shrubs	14.3

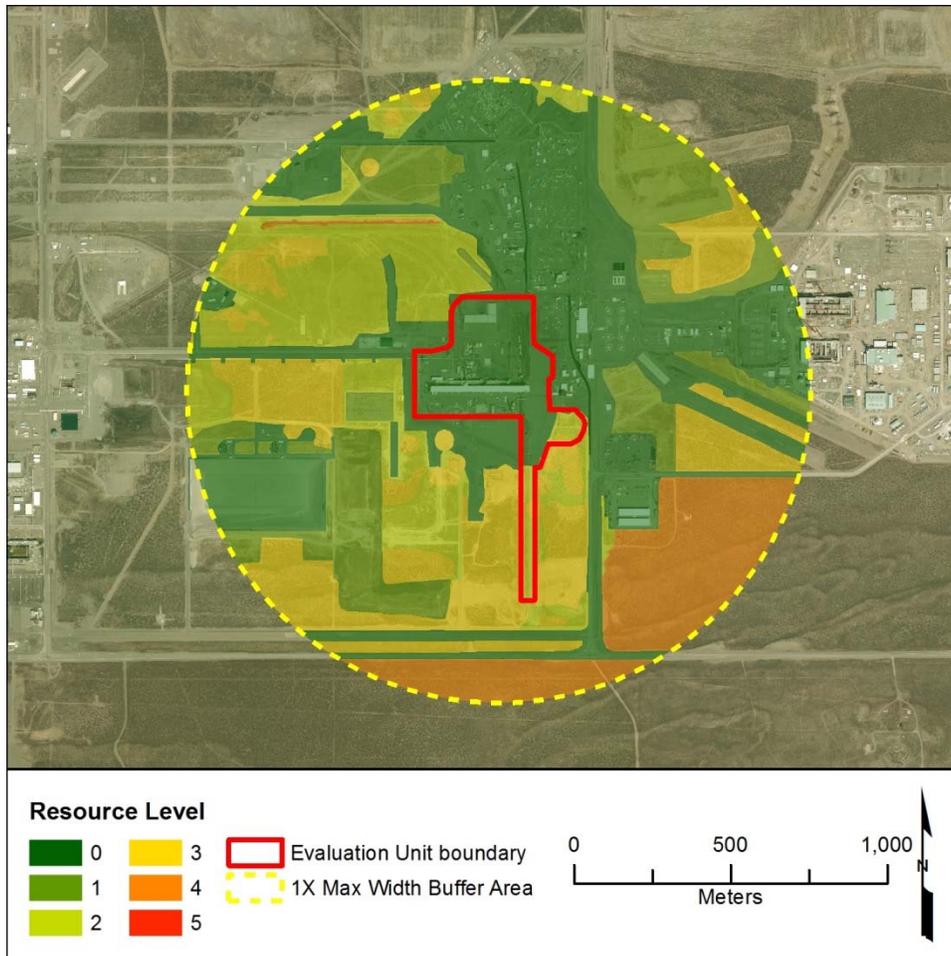


Figure J.84. Biological Resource Level Classifications Based on October 2014 Surveys at the PUREX Evaluation Unit (red solid line) and Adjacent Landscape Buffer Area (yellow dashed line)

Table J.71. Area and Proportion of Each Biological Resource Level Within the Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
0	37.6	269.0	306.6	39.9%	40.8%	0.9%
1	0.0	115.4	115.4	15.0%	15.0%	0.0%
2	4.8	112.6	117.4	15.3%	14.7%	-0.6%
3	2.2	144.3	146.5	19.1%	18.8%	-0.3%
4	0.0	82.0	82.0	10.7%	10.7%	0.0%
5	0.0	0.0	0.0	0.0%	0.0%	0.0%
Total	44.6	723.3	767.9	100.0%	100.0%	

1 Resource levels for both the evaluation unit and adjacent landscape boundary were reviewed in the field and via imagery during October 2014 and revised to reflect current habitats conditions.

2 Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.

Assumptions and Uncertainty:

Due to project time constraints, the field surveys and reconnaissance of this EU were conducted in October. By the time of the survey, the cool-season annual and perennial herbaceous plants that dominate shrub-steppe habitat had completed seasonal growth and senesced making identification and inventory difficult and most likely incomplete. Although no records for plant species of concern have been noted, the absence of species cannot be confirmed by surveys during this time of year.

By October, migratory birds have completed their nesting cycles and many have migrated away from the region. Surveys conducted in the late fall will not reflect migratory bird occupancy and use of habitat within the EU earlier in the season. Their absence cannot be confirmed by surveys in October after the nesting season is over. Further surveys during the nesting season would be required to fully assess the ecological impacts to nesting migratory birds.

Summary of Ecological Review:

- The majority of the EU consists of buildings, disturbed areas, parking lots, and facilities.
- Patches of level 3 resources within the EU are associated with individual occurrences of sensitive plant species, Piper's daisy.
- Removal or loss of individual occurrences of the sensitive plant species, Piper's daisy, would be unlikely to alter population viability for this species.

- Remediation actions would result in only a 0.3% change in level 3 and above biological resources at the landscape scale.
- Because the PUREX facilities are adjacent to and contiguous with other disturbed and industrial areas within the 200-East Area, the loss of habitat that could potentially occur within this EU would not be expected to impact habitat connectivity on the 200 Area plateau.

References:

- DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 0.
- U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act. <http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>
- U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington. http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902
- Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. <http://wdfw.wa.gov/conservation/phs/list/>
- Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington. <http://wdfw.wa.gov/conservation/endangered/>
- Washington Noxious Weed Control Board. 2014. Noxious Weed List. <http://www.nwcb.wa.gov/>
- Washington State Department of Natural Resources. 2014. Washington Natural Heritage Program Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

Definitions and Acronyms:

Adjacent Landscape Buffer – a circular area adjacent to and outside the EU boundary with the center of the circle at the centroid of the EU, and with a radius that is 1 times the maximum dimension (width or length—whichever is greatest). This circular buffer area is used to evaluate indirect effects and assess the remediation in relation to the landscape features and resources adjacent to the EU. This circular area is generally at least 3 times the area of the EU.

Biological Resource Levels (from DOE-RL-96-32-01) –

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats.
- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks.
- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub-steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify

for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.

- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.
- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

MBTA – Migratory Bird Treaty Act; referring to species listed and protected under the federal Act.

PNNL ECAP (Ecological Compliance and Assessment Project) Database – PNNL performed ecological reviews for individual projects and annually surveyed selected areas and buildings on the Hanford Site for DOE-RL under the DOE's Public Safety and Resource Protection Program until 2011. The data collected during those surveys is archived in the ECAP database, and is used to supplement ecological evaluations as available.

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Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

Previous ECAP Survey Data

ECAP Database Query Results for E-006

Observer: *Freeman-Cadoret, Natalie* Date *5/24/2010*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
Piper's daisy	Erigeron piperianus		small plant 20+ flowers
Piper's daisy	Erigeron piperianus		16 flowers on plant
gray rabbitbrush	Chrysothamnus nauseosus	5	
Sandberg's bluegrass	Poa sandbergii	15	
big sagebrush	Artemisia tridentata	10	
buckwheat milkvetch	Astragalus caricinus	1	
yarrow	Achillea millefolium		
bur ragweed	Ambrosia acanthicarpa		
cheatgrass	Bromus tectorum		
green rabbitbrush	Chrysothamnus viscidiflorus		
matted cryptantha	Cryptantha circumscissa		
matted cryptantha	Cryptantha circumscissa		
turpentine springparsley	Cymopterus tubethimms		
western tansymustard	Descurainia pinnata		
threadleaf fleabane	Erigeron filifolius		
Piper's daisy	Erigeron piperianus		
shaggy fleabane	Erigeron pumilus		
storksbill	Erodium cicutarium		
spiny hopsage	Grayia spinosa		
prickly lettuce	Lactuca scariola		
hoary aster	Machaeranthera canescens		
indian ricegrass	Oryzopsis hymenoides		
longleaf phlox	Phlox longifolia		
Russian thistle	Salsola kali		
Jim Hill's tumblemustard	Sisymbrium altissimum		
needle-and-thread grass	Stipa comata		

Mammal

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
black-tailed jackrabbit	Lepus californicus	Present	Old pellets
unknown/identified small mammal	small mammal	Present	

Herpt

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
Unidentified/Unlisted herpt	Unidentified/Unlisted herpt	Present	lizard

Observer: *Simmons, Mary Ann* Date *5/24/2010*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
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ECAP Database Query Results for E-510

Observer: *Hand, Kris* Date *6/18/2009*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
No vegetation present	No vegetation	90	
Russian thistle	Salsola kali	1	
cheatgrass	Bromus tectorum	+	
gray rabbitbrush	Chrysothamnus nauseosus		
hoary aster	Machaeranthera canescens		
sand dropseed	Sporobolus cryptandrus		

Evaluation Unit: PUREX		Observers: HAND, CHAMNESS
Patch ID: 2-02		Date: 10/7/2014
Wildlife Observations Recorded During Pedestrian or Vehicle Surveys		
Species	Observation	
UTST	Common within EU	
CORA	Flying overhead	
Notes		

Evaluation Unit: B Plant
 ID: CP-DD-2
 Group: D&D
 Operable Unit Cross-Walk: 200-CB-1
 Related EU: CP-LS-8
 Sites & Facilities: B Plant Canyon, ancillary buildings (e.g. 224-B), structures, and associated near-surface contaminated soils. Includes the D&D of WESF after the capsules are moved into dry storage.
 Key Data Sources Docs: DOE/RL-96-32 2013; Mission Support Alliance maps³⁸
 Field Survey Date: 06/15/2015
 Datasheet prepared by: MAC, KDH, SAM 10/9/2015
 Datasheet reviewed by:



Figure J.85. CP-DD-2 (B Plant) Site Location Map

³⁸MSA (Mission Support Alliance) maintains biological resource information for the Hanford Site for the Department of Energy

CP-DD-2: B Plant

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the current Endangered and Threatened Species (Federal and State) distribution data; priority habitats as defined by Washington Department of Fish and Wildlife; available current aerial imagery, locations of Hanford Site waste units and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data records.

The following steps were taken to assess the EU associated with B Plant:

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. A visual survey was conducted within the EU boundary by experienced shrub-steppe ecologists.
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2013 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.
6. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Surveys:

Other than a small lawn with a few trees near the B Plant entrance, no vegetation was observed within the B Plant EU boundary (Table J.72, Figure J.86). The EU comprises the canyon building and outlying buildings surrounded by graveled surfaces which are sprayed with herbicides to prevent vegetation growth. Killdeer (*Charadrius vociferous*) and house finches (*Carpodacus mexicanus*) were observed around the buildings and cliff swallows (*Hirundo pyrrhonota*) were nesting on a gantry on the west end of the EU. The field data records at the end of this section provide lists of species observed in the EU.

Table J.72. Percent Canopy Cover and Surface Cover Estimated at the B-Plant Evaluation Unit

No field measurements of vegetation were taken; visual and pedestrian survey of the evaluation unit indicates the EU consists mainly of graveled surfaces, buildings, landscaped lawn, and bare soils (cover =100%).
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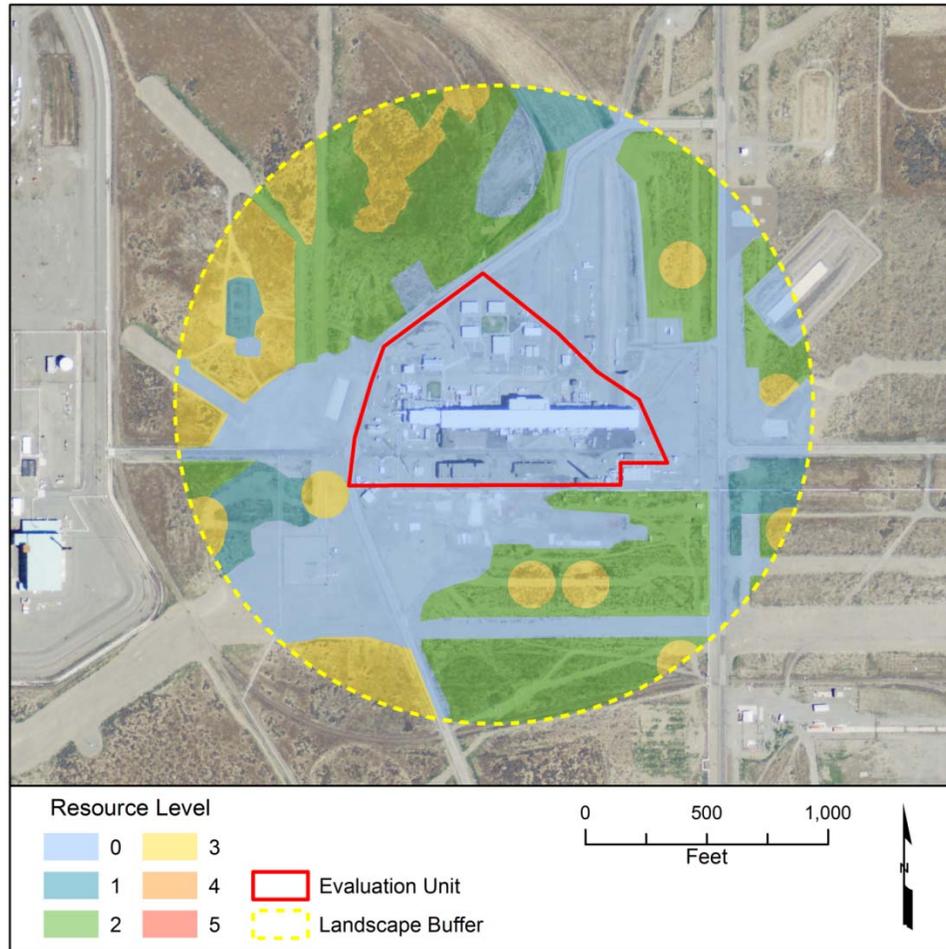


Figure J.86. Biological Resource Level Classifications Based on the June 15, 2015 Survey at the B Plant Evaluation Unit (red solid line) and Adjacent Landscape Buffer Area (yellow dashed line).

Landscape Evaluation and Resource Classification:

Although the buildings, equipment, and utility poles within the EU offer some habitat for birds, 100% of the B Plant EU is classified as 0 (Figure J.86).

The adjacent landscape buffer extends radially 1315 ft (401 m) from the geometric center of the EU (Figure J.86). Much of the buffer area is encompassed by the B Plant Cribs and Trenches EU, and survey data for that EU is discussed in that section of this report. Nearly 58% of the combined B-Plant EU and adjacent buffer area is classified as levels 0 and 1, and another 28% is classified as resource level 2 (Table J.73). Approximately 14% of the combined area contains habitat classified as level 3. Level 3 resources to the northwest of B Plant contain mature sagebrush; scattered circular patches of level 3 resources indicate previous locations for Piper's daisy (*Erigeron piperianus*), a Washington state sensitive species. There is no habitat classified as level 4 or 5 in the adjacent landscape buffer area.

Table J.73. Area and Proportion of Each Biological Resource Level Within the B Plant Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources.

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
0	17.1	49.0	66.0	52.96%	52.96%	0.00%
1	0	6.1	6.1	4.89%	4.89%	0.00%
2	0	35.0	35.0	28.10%	28.10%	0.00%
3	0	17.5	17.5	14.05%	14.05%	0.00%
4	0	0	0	0.00%	0.00%	0.00%
5	0	0	0	0.00%	0.00%	0.00%
Total	17.1	107.6	124.7	100.00%	100.00%	

1 Resource levels for both the evaluation unit and adjacent landscape boundary were reviewed in the field and via imagery during May-August 2015 and revised to reflect current habitats conditions.

2 Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.

Assumptions and Uncertainty:

Although all observations for species of concern and current conditions of biological resources were noted during surveys and evaluations conducted in 2015, the presence or absence of species cannot be assumed or predicted for future years. Field reconnaissance and surveys of evaluation units at the time of remediation will need to be conducted to verify resources and evaluation ecological conditions at that time.

Summary of Ecological Review:

- 100% of the B Plant EU consists of the canyon building and surrounding graveled surfaces and paved areas.
- Individual occurrences of Piper's daisy have been previously documented in the buffer area adjacent to the EU boundary, however, none were observed during the 2015 survey.
- The B-plant EU is not contiguous with any level 3 or level 4 resources in the adjacent landscape buffer; however, level 3 resource patches in the adjacent landscape buffer area to the northwest of B Plant provide mature sagebrush habitat supporting adult and juvenile loggerhead shrikes .

- Loss of the man-made structures within the EU (i.e., the canyon building and power poles used for bird nesting and perching) is not expected to significantly affect any wildlife populations.

References:

- DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 0.
- U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act. <http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>
- U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington. http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902
- Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. <http://wdfw.wa.gov/conservation/phs/list/>
- Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington. <http://wdfw.wa.gov/conservation/endangered/>
- Washington Noxious Weed Control Board. 2014. Noxious Weed List. <http://www.nwcb.wa.gov/>
- Washington State Department of Natural Resources. 2014. Washington Natural Heritage Program Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

Definitions and Acronyms:

Adjacent Landscape Buffer – a circular area adjacent to and outside the EU boundary with the center of the circle at the centroid of the EU, and with a radius that is 1 times the maximum dimension (width or length—whichever is greatest). This circular buffer area is used to evaluate indirect effects and assess the remediation in relation to the landscape features and resources adjacent to the EU. This circular area is generally at least 3 times the area of the EU.

Biological Resource Levels (from DOE-RL-96-32-01) –

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats.
- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks.
- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub-steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake

hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.

- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.
- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.
- Level 0 resources consist of non-native plants and animals (unless otherwise listed at a higher level), non-vegetated areas, and industrial areas.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

MBTA – Migratory Bird Treaty Act; referring to species listed and protected under the federal Act.

PNNL ECAP (Ecological Compliance and Assessment Project) Database – PNNL performed ecological reviews for individual projects and annually surveyed selected areas and buildings on the Hanford Site for DOE-RL under the DOE’s Public Safety and Resource Protection Program until 2011. The data collected during those surveys is archived in the ECAP database, and is used to supplement ecological evaluations as available.

Priority Habitats – Priority habitats are habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type (e.g., shrub-steppe) or dominant plant species (e.g., juniper savannah), a described successional stage (e.g., old-growth forest), or a specific habitat feature (e.g., cliffs).

Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

Field Data Records

Bird, Mammal and Herpetofauna Species June 15 2015, B Plant EU			
Patch ID	Name	Common name	Comment
0	<i>Hirundo pyrrhonota</i>	cliff swallow	30+ active nests on gantry
0	<i>Charadrius vociferus</i>	killdeer	1 on lawn
0	<i>Eremophila alpestris</i>	horned lark	perch on post, singing

Evaluation Unit: U Plant
 ID: CP-DD-3
 Group: D&D
 Operable Unit Cross-Walk: 200-CU-1
 Related EU: CP-LS-3
 Sites & Facilities: U Plant Canyon, ancillary buildings, structures, and associated near-surface contaminated soils.
 Key Data Sources Docs: DOE/RL-96-32 2013; Mission Support Alliance maps³⁹
 Field Survey Date: 05/28/2015
 Datasheet prepared by: MAC, KDH, SAM 10/5/2015
 Datasheet reviewed by:



Figure J.87. CP-DD-3 (U Plant) Site Location Map

CP-DD-3: U Plant

³⁹ MSA (Mission Support Alliance) maintains biological resource information for the Hanford Site for the Department of Energy.

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the current Endangered and Threatened Species (Federal and State) distribution data; priority habitats as defined by Washington Department of Fish and Wildlife; available current aerial imagery, locations of Hanford Site waste units and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data records.

The following steps were taken to assess the EU associated with U Plant:

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. A visual survey was conducted within the EU boundary by experienced shrub-steppe ecologists. .
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2013 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.
6. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

No vegetation occurs within the U Plant EU boundary and no measurements were made (Table J.74). The area contains several buildings surrounded by graveled surfaces that are sprayed with herbicides to prevent vegetation growth (Figure J.88). Common ravens (*Corvus corax*) and rock doves (*Columba livia*) were noted on or near the buildings.

Table J.74. Percent Canopy Cover and Surface Cover Estimated at the U Plant Evaluation Unit

No field measurements of vegetation were taken; visual and pedestrian survey of the evaluation unit indicated that the unit consists mainly of graveled surfaces and buildings, (cover =100%).
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Landscape Evaluation and Resource Classification:

Although the buildings and utility poles within the EU offer some habitat for birds, 100% of the U Plant EU is classified as resource level 0 (Figure J.88, Table J.75).

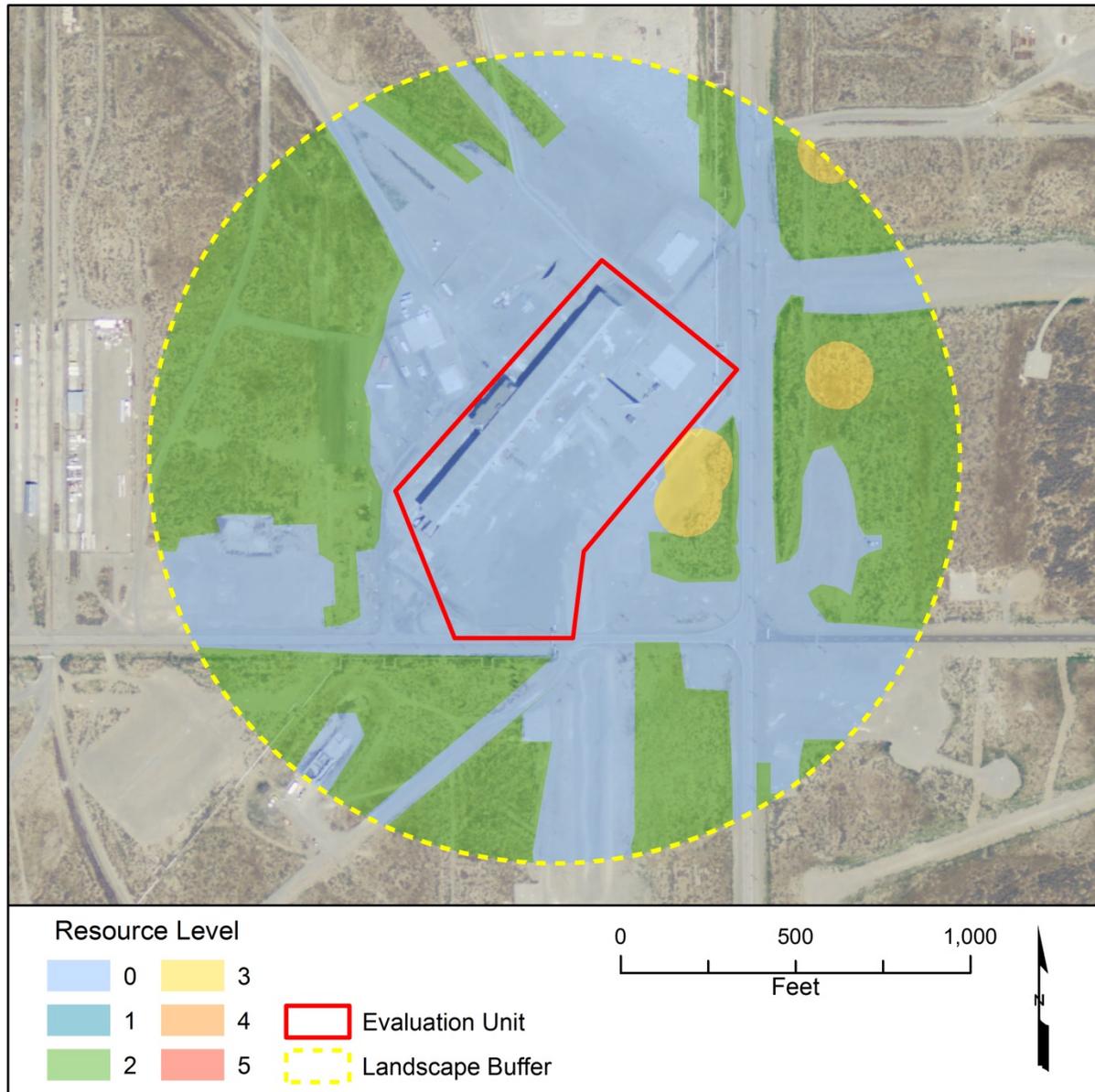


Figure J.88. Biological Resource Level Classifications Based on the May 28, 2015 Survey at the U Plant Evaluation Unit (red solid line) and Adjacent Landscape Buffer Area (yellow dashed line).

The amount and proximity of biological resources surrounding the U Plant EU were examined within the adjacent landscape buffer area, which extends 1159 ft (353 m) from the geometric center of the EU. Nearly 98% of the combined EU and buffer area is level 2 or lower (Table J.75). A little over 2 % of the combined EU is contained in the circular patches of level 3 resources, which are based on previous individual occurrences of the state sensitive Piper’s daisy (*Erigeron piperianus*). No Piper’s daisies were observed during the May 28, 2015 survey.

Table J.75. Area and Proportion of Each Biological Resource Level Within the U Plant Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources.

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
0	12.3	43.0	55.4	57.16%	57.16%	0.00%
1	0	0	0	0.00%	0.00%	0.00%
2	0	39.4	39.4	40.69%	40.69%	0.00%
3	0	2.1	2.1	2.15%	2.15%	0.00%
4	0	0	0	0.00%	0.00%	0.00%
5	0	0	0	0.00%	0.00%	0.00%
Total	12.3	84.5	96.9	100.00%	100.00%	

1 Resource levels for both the evaluation unit and adjacent landscape boundary were reviewed in the field and via imagery during May-August 2015 and revised to reflect current habitats conditions.

2 Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.

Assumptions and Uncertainty:

Although all observations for species of concern and current conditions of biological resources were noted during surveys and evaluations conducted in 2015, the presence or absence of species cannot be assumed or predicted for future years. Field reconnaissance and surveys of evaluation units at the time of remediation will need to be conducted to verify resources and evaluation ecological conditions at that time.

Summary of Ecological Review:

- 100% of the U Plant EU consists of the canyon building and surrounding graveled surfaces and paved areas.
- Individual occurrences of Piper's daisy have been previously documented in the buffer area adjacent to the EU boundary, however, none were observed during the 2015 survey. Loss of individual plants of this species is not likely to affect population viability for the Washington State sensitive species.
- The loss of the remaining habitat within the EU (i.e., the canyon building and power poles) is not expected to cause significant changes in habitat connectivity.
- No level 1, 4 or 5 resources were present within the U Plant EU or it's adjacent landscape buffer area.

References:

- DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 0.
- U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act. <http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>
- U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington. http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902
- Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. <http://wdfw.wa.gov/conservation/phs/list/>
- Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington. <http://wdfw.wa.gov/conservation/endangered/>
- Washington Noxious Weed Control Board. 2014. Noxious Weed List. <http://www.nwcb.wa.gov/>
- Washington State Department of Natural Resources. 2014. Washington Natural Heritage Program Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

Definitions and Acronyms:

Adjacent Landscape Buffer – a circular area adjacent to and outside the EU boundary with the center of the circle at the centroid of the EU, and with a radius that is 1 times the maximum dimension (width or length—whichever is greatest). This circular buffer area is used to evaluate indirect effects and assess the remediation in relation to the landscape features and resources adjacent to the EU. This circular area is generally at least 3 times the area of the EU.

Biological Resource Levels (from DOE-RL-96-32-01) –

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats.
- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks.
- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub-steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.
- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.

- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.
- Level 0 resources consist of non-native plants and animals (unless otherwise listed at a higher level), non-vegetated areas, and industrial areas.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

MBTA – Migratory Bird Treaty Act; referring to species listed and protected under the federal Act.

PNNL ECAP (Ecological Compliance and Assessment Project) Database – PNNL performed ecological reviews for individual projects and annually surveyed selected areas and buildings on the Hanford Site for DOE-RL under the DOE’s Public Safety and Resource Protection Program until 2011. The data collected during those surveys is archived in the ECAP database, and is used to supplement ecological evaluations as available.

Priority Habitats – Priority habitats are habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type (e.g., shrub-steppe) or dominant plant species (e.g., juniper savannah), a described successional stage (e.g., old-growth forest), or a specific habitat feature (e.g., cliffs).

Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

Field Data Records

Bird, Mammal and Herpetofauna Species Continued May 28 2015, U Plant EU			
Patch ID	Name	Common name	Comment
0	<i>Columba livia</i>	rock dove	on canyon building
0	<i>Corvus corax</i>	common raven	on power pole

Evaluation Unit: REDOX
 ID: CP-DD-4
 Group: Legacy Source
 Operable Unit Cross-Walk: 200-CR-1
 Related EU: CP-LS-4
 Sites & Facilities: REDOX Canyon (S Plant), ancillary buildings, except 222-S laboratory, structures, and associated near-surface contaminated soils.
 Key Data Sources Docs: DOE/RL-96-32 2013; Mission Support Alliance maps⁴⁰
 Field Survey Date: 05/27/2015
 Datasheet prepared by: MAC, KDH, SAM 10/13/2015
 Datasheet reviewed by:



Figure J.89. CP-DD-4 (REDOX) Site Location Map

⁴⁰MSA (Mission Support Alliance) maintains biological resource information for the Hanford Site for the Department of Energy.

CP-DD-4: REDOX

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the current Endangered and Threatened Species (Federal and State) distribution data; priority habitats as defined by Washington Department of Fish and Wildlife; available current aerial imagery, locations of Hanford Site waste units and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data records.

The following steps were taken to assess the EU associated with REDOX:

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. A pedestrian survey was conducted within the EU boundary by experienced shrub-steppe ecologists.
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2013 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.
6. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

On May 27, 2015 a pedestrian survey was performed in the REDOX EU, a complex of buildings surrounded by bare graveled surfaces kept free of vegetation through regular use of herbicides. No vegetation occurs within the 6 acre EU (Table J.76, Figure J.90). Two species of birds were observed within the EU and are listed in the field data records provided at the end of this section.

Table J.76. Percent Canopy Cover and Surface Cover Estimated at the REDOX Evaluation Unit

Vegetation/Surface Cover	Inside EU (%)
Bare	100

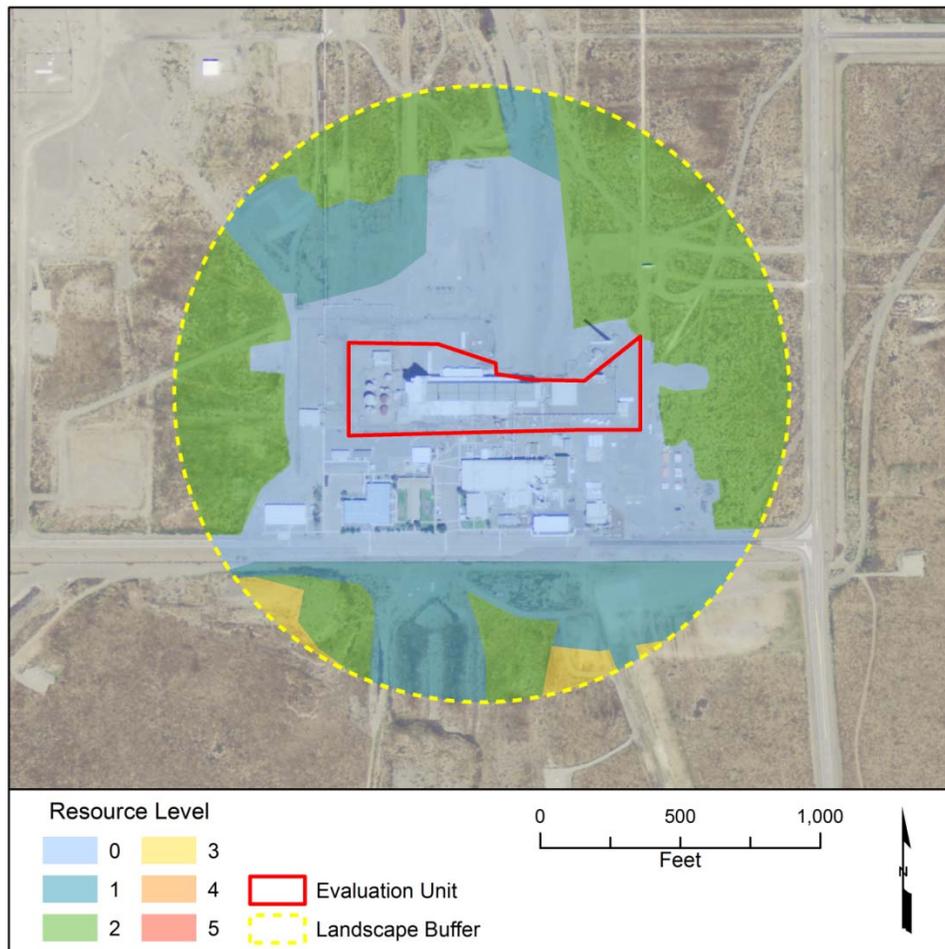


Figure J.90. Biological Resource Level Classifications Based on May 27, 2015 Surveys at the REDOX Evaluation Unit (red solid line) and Adjacent Landscape Buffer Area (yellow dashed line).

Landscape Evaluation and Resource Classification:

Within the EU boundary 100% of the area is classified as level 0 (Figure J.90, Table J.77). The amount and proximity of biological resources surrounding the REDOX EU were examined within the adjacent landscape buffer area, which extends 1099 ft (335 m) from the geometric center of the EU. Approximately 98% of the buffer area is classified as level 2 or lower (Table J.77). The remainder of the buffer area is classified as level 3 resources that occur along the southern edge of the buffer area where it extends into the higher level resources south of the 200-West Area fence.

All of the 222-S Laboratory EU is encompassed within the buffer area, as are parts of the REDOX Cribs and Trenches EU. Additional details on the resources within those EUs are available in those sections of this report.

Table J.77. Area and Proportion of Each Biological Resource Level Within the REDOX Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources.

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
0	6.2	31.5	37.8	43.35%	43.35%	0.00%
1	0	16.3	16.3	18.68%	18.68%	0.00%
2	0	31.6	31.6	36.25%	36.25%	0.00%
3	0	1.5	1.5	1.72%	1.72%	0.00%
4	0	0	0	0.00%	0.00%	0.00%
5	0	0	0	0.00%	0.00%	0.00%
Total	6.2	80.9	87.1	100.00%	100.00%	

1 Resource levels for both the evaluation unit and adjacent landscape boundary were reviewed in the field and via imagery during May-August 2015 and revised to reflect current habitats conditions.

2 Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.

Assumptions and Uncertainty:

Although all observations for species of concern and current conditions of biological resources were noted during surveys and evaluations conducted in 2015, the presence or absence of species cannot be assumed or predicted for future years. Field reconnaissance and surveys of evaluation units at the time of remediation will need to be conducted to verify resources and evaluate ecological conditions at that time.

Summary of Ecological Review:

- 100% of the EU is classified as a level 0 resource.
- Resources in the adjacent landscape buffer area on the south side of the 200-West fence are contiguous with an extensive area of higher level biological resources and Washington State element occurrences. These resources are not expected to be impacted by cleanup activities at REDOX.

References:

DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 0.

U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act. <http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>

U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington. http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902

Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. <http://wdfw.wa.gov/conservation/phs/list/>

Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington. <http://wdfw.wa.gov/conservation/endangered/>

Washington Noxious Weed Control Board. 2014. Noxious Weed List. <http://www.nwcb.wa.gov/>

Washington State Department of Natural Resources. 2014. Washington Natural Heritage Program Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

Definitions and Acronyms:

Adjacent Landscape Buffer – a circular area adjacent to and outside the EU boundary with the center of the circle at the centroid of the EU, and with a radius that is 1 times the maximum dimension (width or length—whichever is greatest). This circular buffer area is used to evaluate indirect effects and assess the remediation in relation to the landscape features and resources adjacent to the EU. This circular area is generally at least 3 times the area of the EU.

Biological Resource Levels (from DOE-RL-96-32-01) –

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats.
- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks.
- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub-steppe—such as shrub stands that are less mature, have lower shrub density or canopy

cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.

- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.
- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.
- Level 0 resources consist of non-native plants and animals (unless otherwise listed at a higher level), non-vegetated areas, and industrial areas.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

MBTA – Migratory Bird Treaty Act; referring to species listed and protected under the federal Act.

PNNL ECAP (Ecological Compliance and Assessment Project) Database – PNNL performed ecological reviews for individual projects and annually surveyed selected areas and buildings on the Hanford Site for DOE-RL under the DOE’s Public Safety and Resource Protection Program until 2011. The data collected during those surveys is archived in the ECAP database, and is used to supplement ecological evaluations as available.

Priority Habitats – Priority habitats are habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type (e.g., shrub-steppe) or dominant plant species (e.g., juniper savannah), a described successional stage (e.g., old-growth forest), or a specific habitat feature (e.g., cliffs).

Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

Field Data Records

Bird, Mammal and Herpetofauna Species May 27 2015, REDOX EU			
Patch ID	Name	Common name	Comment
0	<i>Sayornis saya</i>	Say's phoebe	
0	<i>Sturnus vulgaris</i>	European starling	

Evaluation Unit: PFP
 ID: CP-DD-5
 Group: D&D
 Operable Unit Cross-Walk: 200-WA-1
 Related EU: CP-LS-2
 Sites & Facilities: Plutonium Finishing Plant (PFP), ancillary buildings, structures, and associated near-surface contaminated soils.
 Key Data Sources Docs: DOE/RL-96-32 2013; Mission Support Alliance maps⁴¹
 Field Survey Date: 05/28/2015
 Datasheet prepared by: MAC, KDH, SAM 10/13/2015
 Datasheet reviewed by:

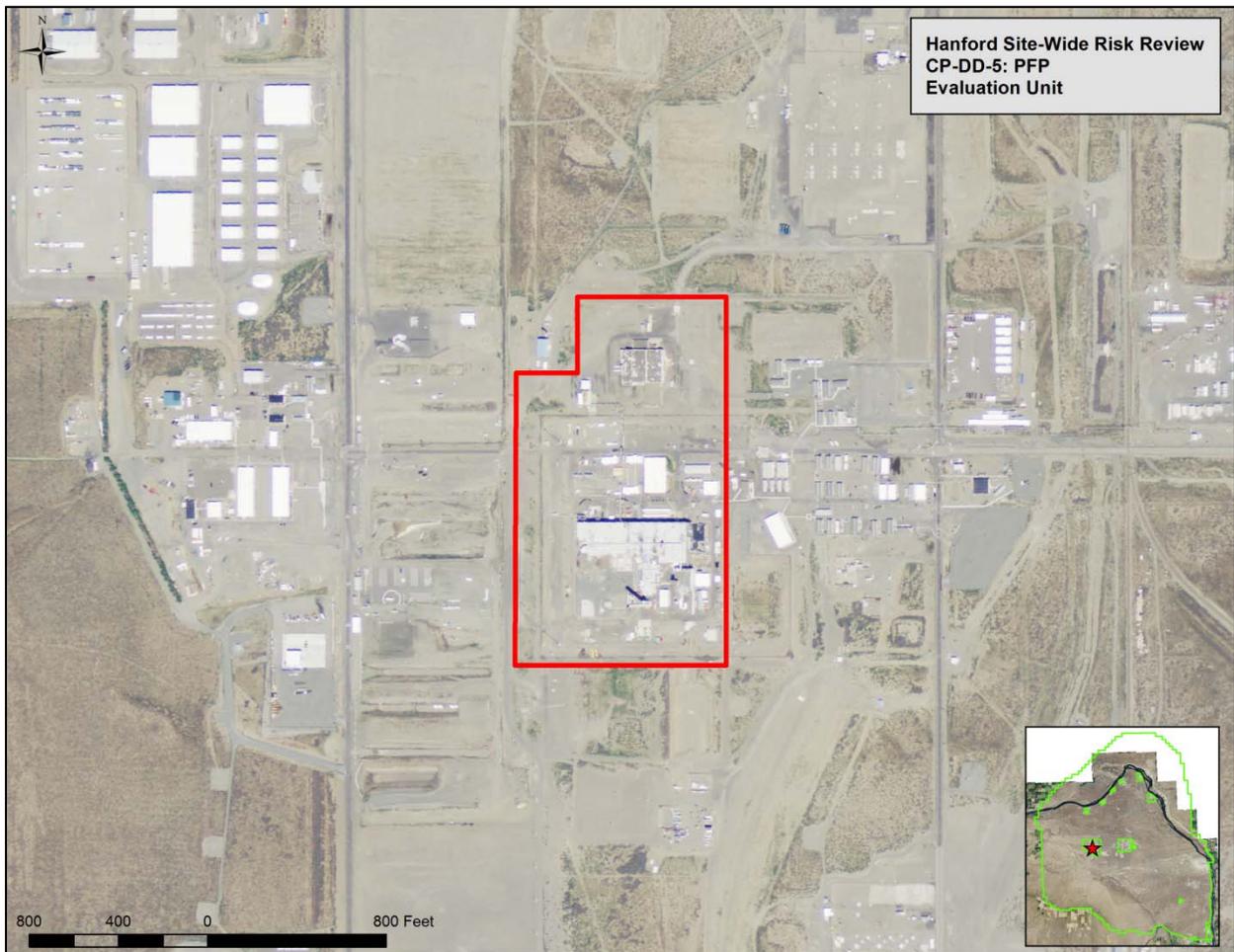


Figure J.91. CP-DD-5 (PFP) Site Location Map

CP-DD-5: PFP

⁴¹MSA (Mission Support Alliance) maintains biological resource information for the Hanford Site for the Department of Energy

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the current Endangered and Threatened Species (Federal and State) distribution data; priority habitats as defined by Washington Department of Fish and Wildlife; available current aerial imagery, locations of Hanford Site waste units and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data records.

The following steps were taken to assess the EU associated with PFP:

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. A visual survey of the EU was conducted by experienced shrub-steppe ecologists.
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2013 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.
6. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

On May 28, 2015, a visual survey was conducted of the PFP EU; observations were made from the perimeter of the fenced area. Demolition and clean-up activities prevented access to the area within the EU. Over 99% of the EU is bare ground; less than 1% of the EU contains Russian thistle (*Salsola tragus*) and/or cheatgrass (*Bromus tectorum*) on the north edge and a sliver of the level 2 habitat on the south edge (Table J.78). One bird was observed during the June survey (see the field data record at the end of this section).

Table J.78. Percent Canopy Cover and Surface Cover Estimated at the PFP Evaluation Unit

Vegetation/Surface Cover	Visual Survey
Bare Ground	99
Introduced forb	0.5
Introduced grass	0.5

Landscape Evaluation and Resource Classification:

Over 99% of the PFP EU is classified as level 0 habitat, with less than 1/10th acre each of level 1 and level 2 habitat where the EU boundary intersects adjacent vegetated areas (Table J.79, Figure J.92).

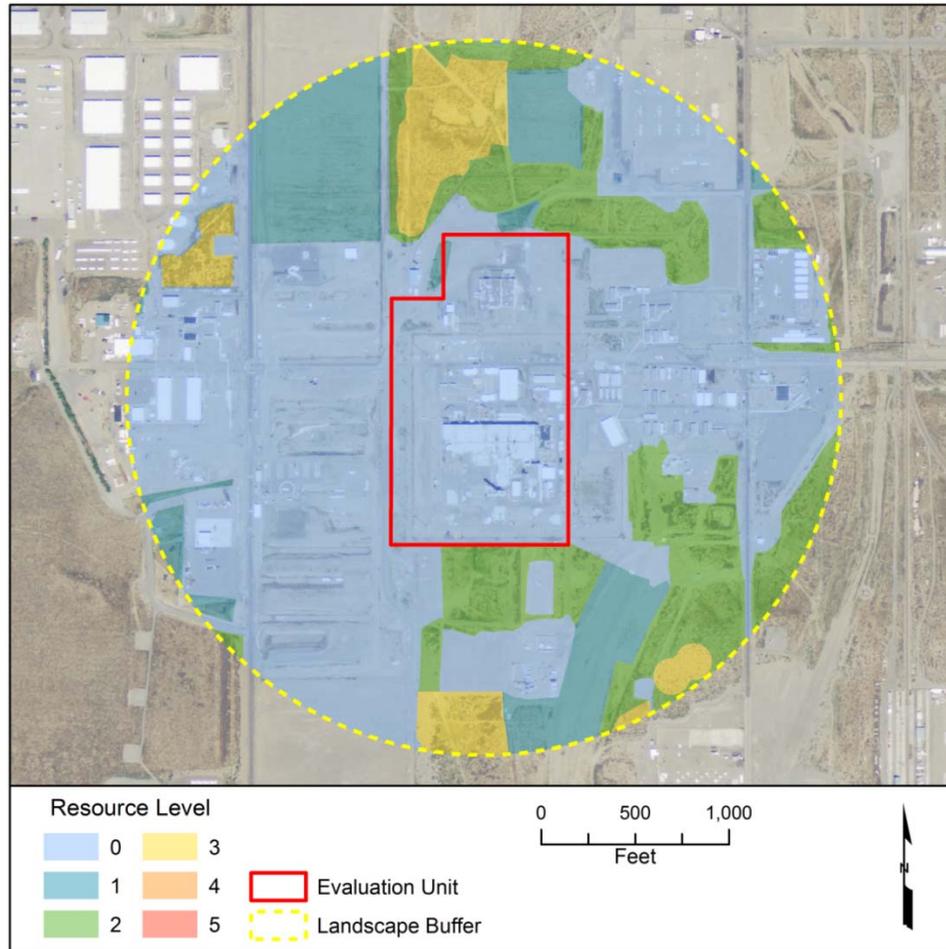


Figure J.92. Biological Resource Level Classifications Based on May 28, 2015 Survey at the PFP Evaluation Unit (red solid line) and Adjacent Landscape Buffer Area (yellow dashed line).

The amount and proximity of biological resources surrounding the PFP EU were examined within the adjacent landscape buffer area, which extends 1904 ft (580 m) from the geometric center of the EU (Figure J.92). Nearly 62% of the adjacent landscape buffer area is characterized as resource level 0 (Table J.79) and nearly 93% is level 2 or lower. To the north and south of the EU are isolated patches of levels 1, 2 and 3 resources that are not contiguous with areas outside the 200-West Area. Circular patches of level 3 resources are based on locations of state sensitive Piper’s daisy (*Erigeron piperianus*) observed in previous years. None were noted during the May 2015 survey.

Table J.79. Area and Proportion of Each Biological Resource Level Within the PFP Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources.

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
0	33.5	140.8	174.3	66.65%	66.73%	0.08%
1	0.1	29.3	29.5	11.28%	11.20%	-0.08%
2	0.1	41.5	41.5	15.87%	15.87%	0.00%
3	0	16.2	16.2	6.20%	6.20%	0.00%
4	0	0	0	0.00%	0.00%	0.00%
5	0	0	0	0.00%	0.00%	0.00%
Total	33.7	227.8	261.5	100.00%	100.00%	

¹ Resource levels for both the evaluation unit and adjacent landscape boundary were reviewed in the field and via imagery during May-August 2015 and revised to reflect current habitats conditions.

² Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.

Assumptions and Uncertainty:

Although all observations for species of concern and current conditions of biological resources were noted during surveys and evaluations conducted in 2015, the presence or absence of species cannot be assumed or predicted for future years. Field reconnaissance and surveys of evaluation units at the time of remediation will need to be conducted to verify resources and evaluation ecological conditions at that time.

Summary of Ecological Review:

- The PFP building complex is already undergoing demolition and the disturbance associated with ongoing construction/demolition activities appear to limit wildlife use of the area. Previous surveys observed nesting birds on various man-made structures within the EU; however, many of these structures have been removed. There is essentially no vegetation in the EU, and therefore virtually no change in resource levels within the EU as cleanup activities continue.
- Level 3 resources within the adjacent landscape buffer area are either isolated or represent previous locations of Piper's daisy, a state sensitive species. Loss of individual Piper's daisies is not expected to affect population viability. Loss of the other patches of level 3 is also not expected to impact connectivity with habitats outside the 200-West Area.

References:

- DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 0.
- U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act. <http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>
- U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington. http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902
- Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. <http://wdfw.wa.gov/conservation/phs/list/>
- Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington. <http://wdfw.wa.gov/conservation/endangered/>
- Washington Noxious Weed Control Board. 2014. Noxious Weed List. <http://www.nwcb.wa.gov/>
- Washington State Department of Natural Resources. 2014. Washington Natural Heritage Program Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

Definitions and Acronyms:

Adjacent Landscape Buffer – a circular area adjacent to and outside the EU boundary with the center of the circle at the centroid of the EU, and with a radius that is 1 times the maximum dimension (width or length—whichever is greatest). This circular buffer area is used to evaluate indirect effects and assess the remediation in relation to the landscape features and resources adjacent to the EU. This circular area is generally at least 3 times the area of the EU.

Biological Resource Levels (from DOE-RL-96-32-01) –

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats.
- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks.
- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.

- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.
- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.
- Level 0 resources consist of non-native plants and animals (unless otherwise listed at a higher level), non-vegetated areas, and industrial areas.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

MBTA – Migratory Bird Treaty Act; referring to species listed and protected under the federal Act.

PNNL ECAP (Ecological Compliance and Assessment Project) Database – PNNL performed ecological reviews for individual projects and annually surveyed selected areas and buildings on the Hanford Site for DOE-RL under the DOE’s Public Safety and Resource Protection Program until 2011. The data collected during those surveys is archived in the ECAP database, and is used to supplement ecological evaluations as available.

Priority Habitats – Priority habitats are habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type (e.g., shrub-steppe) or dominant plant species (e.g., juniper savannah), a described successional stage (e.g., old-growth forest), or a specific habitat feature (e.g., cliffs).

Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

Field Data Records

Bird, Mammal and Herpetofauna Species			
May 28 2015, PFP EU			
Patch ID	Name	Common name	Comment
0	<i>Sturnella neglecta</i>	western meadowlark	singing on fence

Evaluation Unit: PUREX
 ID: CP-DD-1
 Group: D&D
 Operable Unit Cross-Walk: 200-CP-1
 Related EU: CP-LS-9
 Sites & Facilities: PUREX canyon, tunnels, ancillary building, structures, and associated near-surface contaminated soils
 Key Data Sources Docs: DOE/RL-96-32 2013
 PNNL ECAP database⁴²
 Field Survey Date: 10/7/2014
 Data Sheet Prepared By: JLD, KDH, MAC, KBL, SAM 10/20/2014

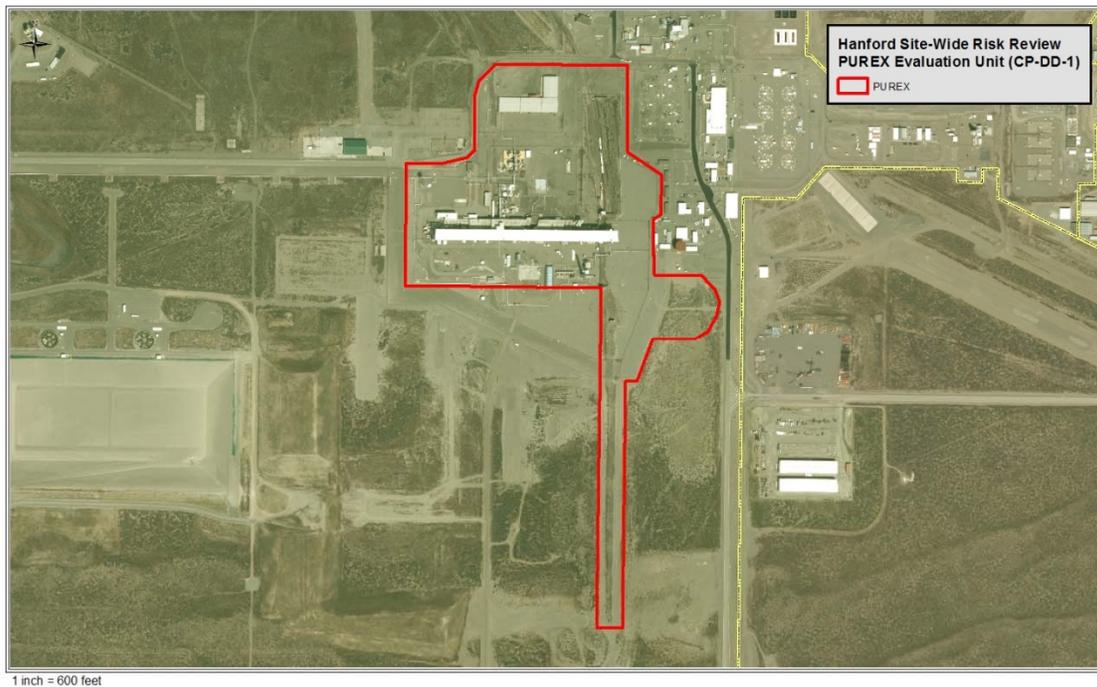
DRAFT

Figure J.93. Site Map with Evaluation Unit Boundaries

CP-DD-1: PUREX

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the current Endangered and Threatened Species (Federal and State) distribution data; priority habitats as defined by Washington Department of Fish and Wildlife; available current aerial

⁴² The Ecological Compliance and Assessment Project (ECAP) database is an evolving set of data that is maintained by Pacific Northwest National Laboratory (PNNL) and updated as new ecological assessments are completed.

imagery, locations of Hanford Site waste sites and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data tables.

The following steps were taken to assess the EU associated with PUREX:

7. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
8. A visual survey was conducted within the EU boundary by experienced shrub-steppe ecologists. PNNL biologists also reviewed the observations and biological survey data available in the Ecological Compliance and Assessment Project (ECAP) database from the past 5 years for the EU to determine the status and resource level of the habitats within the EU and supplement the evaluation with previous wildlife or plant species observations.
9. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
10. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2012 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
11. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.
12. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

The EU associated with the PUREX facilities was surveyed by pedestrian and vehicle reconnaissance and field measurement of remaining habitat on the southeast side of the area

in October 2014. The majority of the EU consists of buildings, disturbed areas, parking lots, and facilities, except for the extension of the unit to the south and a small area just south of the parking lot on the east side of the unit. Field measurements in the southeast habitat (Table J.70) confirmed that the area consisted of level 2 habitat resources. Patches of level 3 resources within the EU are associated with individual occurrences of sensitive plant species; Piper's daisy (*Erigeron piperianus*) had been noted in previous ECAP surveys and an *Erigeron* spp. was noted in the field survey, but could not be verified as Piper's daisy.

Wildlife observations within the level 2 habitat included several side-blotched lizards (*Uta stansburiana*), small mammal burrows and trails, coyote (*Canis latrans*) tracks, and a common raven (*Corvus corax*) flying overhead. No wildlife were observed within the fenced area around PUREX facilities.

Landscape Evaluation and Resource Classification:

The amount of each category of biological resources at the PUREX EU was examined within a circular area radiating approximately 995 m from the geometric center of the unit (equivalent to 768 acres). Within the 44.6 acres of the EU, only 2.2 acres are classified as level 3 habitat, but these consist of fragmented and narrow patches (Table J.71, Figure J.84). Approximately 31% of the total combined area (EU plus adjacent landscape buffer) consists of level 3 or greater resources.

Table J.80. Percent Canopy Cover and Surface Cover Measured at the PUREX Evaluation Unit

Vegetation/Surface Cover	Southeast Side of EU
Bare Ground	19.8
Crust	51.6
Litter	25.8
Introduced Forb	1.0
Introduced Grass	1.0
Native Forb	11.0
Native Grass	8.2
Climax Shrubs	2.4
Successional Shrubs	14.3

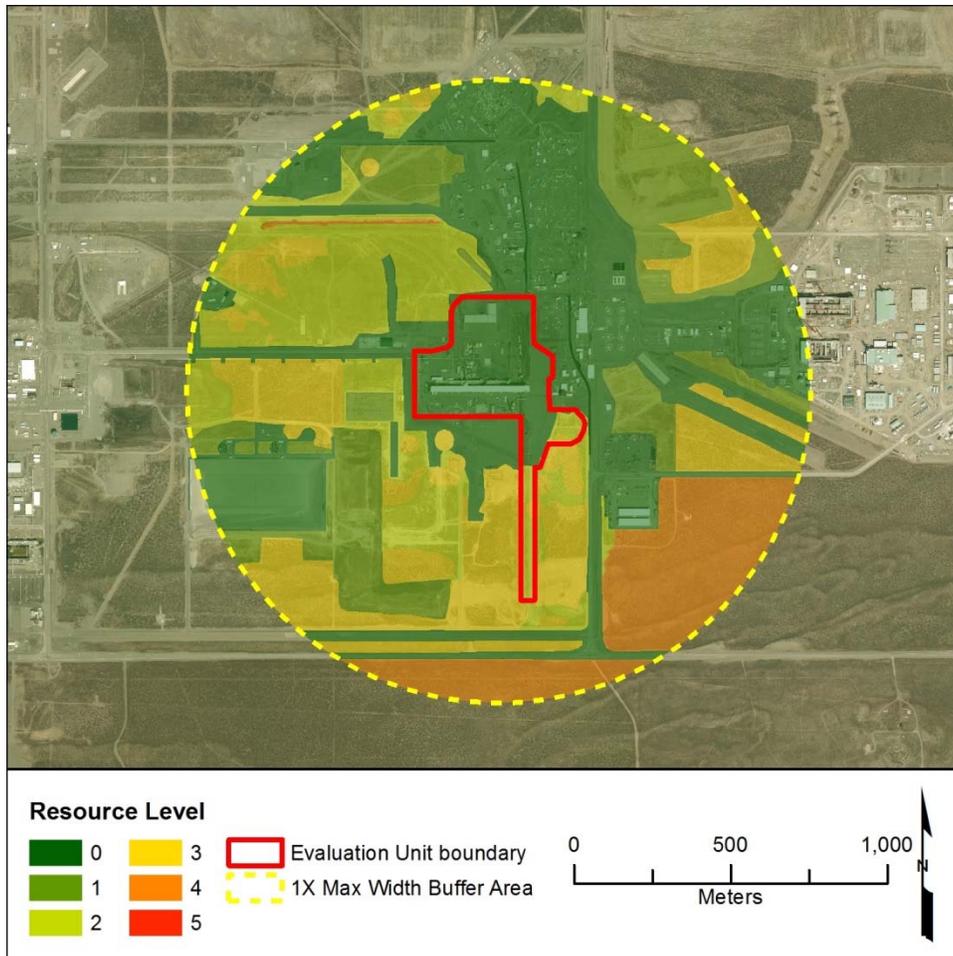


Figure J.94. Biological Resource Level Classifications Based on October 2014 Surveys at the PUREX Evaluation Unit (red solid line) and Adjacent Landscape Buffer Area (yellow dashed line)

Table J.81. Area and Proportion of Each Biological Resource Level Within the Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
0	37.6	269.0	306.6	39.9%	40.8%	0.9%
1	0.0	115.4	115.4	15.0%	15.0%	0.0%
2	4.8	112.6	117.4	15.3%	14.7%	-0.6%
3	2.2	144.3	146.5	19.1%	18.8%	-0.3%
4	0.0	82.0	82.0	10.7%	10.7%	0.0%
5	0.0	0.0	0.0	0.0%	0.0%	0.0%
Total	44.6	723.3	767.9	100.0%	100.0%	

1 Resource levels for both the evaluation unit and adjacent landscape boundary were reviewed in the field and via imagery during October 2014 and revised to reflect current habitats conditions.

2 Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.

Assumptions and Uncertainty:

Due to project time constraints, the field surveys and reconnaissance of this EU were conducted in October. By the time of the survey, the cool-season annual and perennial herbaceous plants that dominate shrub-steppe habitat had completed seasonal growth and senesced making identification and inventory difficult and most likely incomplete. Although no records for plant species of concern have been noted, the absence of species cannot be confirmed by surveys during this time of year.

By October, migratory birds have completed their nesting cycles and many have migrated away from the region. Surveys conducted in the late fall will not reflect migratory bird occupancy and use of habitat within the EU earlier in the season. Their absence cannot be confirmed by surveys in October after the nesting season is over. Further surveys during the nesting season would be required to fully assess the ecological impacts to nesting migratory birds.

Summary of Ecological Review:

- The majority of the EU consists of buildings, disturbed areas, parking lots, and facilities.
- Patches of level 3 resources within the EU are associated with individual occurrences of sensitive plant species, Piper's daisy.
- Removal or loss of individual occurrences of the sensitive plant species, Piper's daisy, would be unlikely to alter population viability for this species.

- Remediation actions would result in only a 0.3% change in level 3 and above biological resources at the landscape scale.
- Because the PUREX facilities are adjacent to and contiguous with other disturbed and industrial areas within the 200-East Area, the loss of habitat that could potentially occur within this EU would not be expected to impact habitat connectivity on the 200 Area plateau.

References:

- DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 0.
- U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act. <http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>
- U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington. http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902
- Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. <http://wdfw.wa.gov/conservation/phs/list/>
- Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington. <http://wdfw.wa.gov/conservation/endangered/>
- Washington Noxious Weed Control Board. 2014. Noxious Weed List. <http://www.nwcb.wa.gov/>
- Washington State Department of Natural Resources. 2014. Washington Natural Heritage Program Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

Definitions and Acronyms:

Adjacent Landscape Buffer – a circular area adjacent to and outside the EU boundary with the center of the circle at the centroid of the EU, and with a radius that is 1 times the maximum dimension (width or length—whichever is greatest). This circular buffer area is used to evaluate indirect effects and assess the remediation in relation to the landscape features and resources adjacent to the EU. This circular area is generally at least 3 times the area of the EU.

Biological Resource Levels (from DOE-RL-96-32-01) –

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats.
- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks.
- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub-steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify

for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.

- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.
- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

MBTA – Migratory Bird Treaty Act; referring to species listed and protected under the federal Act.

PNNL ECAP (Ecological Compliance and Assessment Project) Database – PNNL performed ecological reviews for individual projects and annually surveyed selected areas and buildings on the Hanford Site for DOE-RL under the DOE's Public Safety and Resource Protection Program until 2011. The data collected during those surveys is archived in the ECAP database, and is used to supplement ecological evaluations as available.

Priority Habitats – Priority habitats are habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type (e.g., shrub-steppe) or dominant plant species (e.g., juniper savannah), a described successional stage (e.g., old-growth forest), or a specific habitat feature (e.g., cliffs).

Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

Previous ECAP Survey Data

ECAP Database Query Results for E-006

Observer:	<i>Freeman-Cadoret, Natalie</i>	Date	<i>5/24/2010</i>
Plant			
<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
Piper's daisy	<i>Erigeron piperianus</i>		small plant 20+ flowers
Piper's daisy	<i>Erigeron piperianus</i>		16 flowers on plant
gray rabbitbrush	<i>Chrysothamnus nauseosus</i>	5	
Sandberg's bluegrass	<i>Poa sandbergii</i>	15	
big sagebrush	<i>Artemisia tridentata</i>	10	
buckwheat milkvetch	<i>Astragalus caricinus</i>	1	
yarrow	<i>Achillea millefolium</i>		
bur ragweed	<i>Ambrosia acanthicarpa</i>		
cheatgrass	<i>Bromus tectorum</i>		
green rabbitbrush	<i>Chrysothamnus viscidiflorus</i>		
matted cryptantha	<i>Cryptantha circumscissa</i>		
matted cryptantha	<i>Cryptantha circumscissa</i>		
turpentine springparsley	<i>Cymopterus tubethimms</i>		
western tansymustard	<i>Descurainia pinnata</i>		
threadleaf fleabane	<i>Erigeron filifolius</i>		
Piper's daisy	<i>Erigeron piperianus</i>		
shaggy fleabane	<i>Erigeron pumilus</i>		
storksbill	<i>Erodium cicutarium</i>		
spiny hopsage	<i>Grayia spinosa</i>		
prickly lettuce	<i>Lactuca scariola</i>		
hoary aster	<i>Machaeranthera canescens</i>		
indian ricegrass	<i>Oryzopsis hymenoides</i>		
longleaf phlox	<i>Phlox longifolia</i>		
Russian thistle	<i>Salsola kali</i>		
Jim Hill's tumblemustard	<i>Sisymbrium altissimum</i>		
needle-and-thread grass	<i>Stipa comata</i>		
Mammal			
<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
black-tailed jackrabbit	<i>Lepus californicus</i>	Present	Old pellets
unknown/identified small mammal	small mammal	Present	
Herpt			
<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
Unidentified/Unlisted herpt	Unidentified/Unlisted herpt	Present	lizard

Observer: *Simmons, Mary Ann* Date *5/24/2010*

Plant			
<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>

 ECAP Database Query Results for E-510

 Observer: *Hand, Kris* Date *6/18/2009*
Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
No vegetation present	No vegetation	90	
Russian thistle	Salsola kali	1	
cheatgrass	Bromus tectorum	+	
gray rabbitbrush	Chrysothamnus nauseosus		
hoary aster	Machaeranthera canescens		
sand dropseed	Sporobolus cryptandrus		

Shrub Canopy Measured by Line-Intercept Methods on 50m Transect										
EU	Survey Area	Species	Transsect distance (total)	Start	Stop	Dif				
PUREX	2-02	CHNA	50	0.8	1.6	0.8				
PUREX	2-02	ARTR	50	8.1	8.2	0.1				
PUREX	2-02	CHNA	50	8.1	8.7	0.6				
PUREX	2-02	ARTR	50	10.4	11.1	0.7				
PUREX	2-02	ARTR	50	11.7	12.1	0.4				
PUREX	2-02	CHNA	50	12.2	13.0	0.8				
PUREX	2-02	CHNA	50	14.3	15.1	0.8				
PUREX	2-02	CHNA	50	15.2	15.4	0.2				
PUREX	2-02	CHNA	50	16.6	17.3	0.7				
PUREX	2-02	CHNA	50	18.0	19.4	1.4				
PUREX	2-02	CHNA	50	21.8	22.0	0.1				
PUREX	2-02	CHNA	50	33.6	33.9	0.3				
PUREX	2-02	CHNA	50	38.9	39.3	0.4				
PUREX	2-02	CHNA	50	41.2	41.6	0.4				
PUREX	2-02	CHNA	50	45.0	45.7	0.7				
Notes: Saw Erigeron species southwest of transect within Evaluation Unit. Lizard and small mammal burrows present. Saw lizards within Evaluation U well.										

Evaluation Unit: PUREX		Observers: HAND, CHAMNESS	
Patch ID: 2-02		Date: 10/7/2014	
Wildlife Observations Recorded During Pedestrian or Vehicle Surveys			
Species	Observation		
UTST	Common within EU		
CORA	Flying overhead		
Notes			

Evaluation Unit: K Basin Sludge
 ID: RC-OP-1
 Group: Operations
 Operable Unit Cross-Walk: 100-KR-2
 Related EU: RC-LS-2
 RC-DD-2
 RC-GW-3
 Sites & Facilities: KE/KW fuel basin
 Key Data Sources Docs: BHI-01172, Rev 2
 CHPRC-DD-50769 Rev 1a (OUO)
 DD-49394, Rev 2
 DD-49580, Rev 1
 DD-49581, Rev 1
 DD-53484, Rev 0
 DD-53838, Rev 0
 DD-54878, Rev 0
 DOE/RL-2005-26, Rev 1
 DOE/RL-2010-43, Rev 0
 DOE/RL-96-17, Rev 6
 HNF-24274, Rev 6
 HNF-40475, Rev 4
 HNF-41051, Rev 6
 HNF-5356, Rev 15
 HNF-SD-SNF-TI-015, Rev 14, Vol 2
 HNF-SD-SNF-TI-015, Rev 14A, Vol 2
 HNF-SD-WM-SAR-062, Rev 15Ca (OUO)
 KBC-36585, Rev 1A
 KBC-39764a (OUO)
 KBC-43475, Rev 2
 KBC-43809, Rev 0
 KBC-46856, Rev 1
 PRC-STP-00012, Rev 0
 PRC-STP-00109, Rev 0
 PRC-STP-00467, Rev 2 (Interim)
 PRC-STP-00473, Rev 2
 PRC-STP-00497, Rev 0
 PRC-STP-00615, Rev 0
 PRC-STP-00687, Rev 1
 PRC-STP-00697, Rev 3
 PRC-STP-00718, Rev 0
 PRC-STP-00720, Rev 1
 PRC-STP-00731, Rev 2
 PRC-STP-00834, Rev 0
 SNF-8163, Rev 5

SNF-10823, Rev 1 - 1E
 SGW-40938, Rev 0
 PRC-STP-00702, Rev 3
 ALARA 4QTR13 Presentation

Field Survey Date:

10/16/2014



Figure J.95. Site Map with Evaluation Unit Boundaries

RC-OP-1: K Basin Sludge

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the current Endangered and Threatened Species (Federal and State) distribution data; priority habitats as defined by Washington Department of Fish and Wildlife; available current aerial imagery, locations of Hanford Unit waste sites and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data tables.

The following steps were taken to assess the EU associated with the K Basin Sludge facilities (in conjunction with the KE and KW Reactors EU):

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. A visual survey was conducted within the EU boundary by experienced shrub-steppe ecologists. Because the unit consists of unvegetated industrial and graveled surfaces and buildings, no field measurements of vegetation were taken. PNNL biologists also reviewed the observations and biological survey data available in the Ecological Compliance and Assessment Project (ECAP) database from the past 5 years for the EU to determine the status and resource level of the habitats within the EU and supplement the evaluation with previous wildlife or plant species observations.
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2012 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.
6. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

The K Basin Sludge EU, along with the KE and KW Reactors EU, and the adjacent habitat were evaluated by vehicle and pedestrian surveys on October 16, 2014. The EU consists entirely of built structures and graveled and concrete surfaces and no field measurements of vegetation were made. Some sparse Russian thistle (*Salsola tragus*) was noted around the periphery of parking areas and graveled slopes (Table J.82). No wildlife was observed at the K basins during the October survey. Data collected during an ECAP survey of 100-K Area buildings is included at the end of this summary and notes various bird species using the reactors buildings at that

time. Much of the infrastructure around the reactors has been removed since that survey was completed, and the available nesting/perching areas that were used by birds likely no longer exist.

Table J.82. Percent Canopy Cover and Surface Cover Visually Estimated at the K Basin Sludge Evaluation Unit

Vegetation/Surface Cover	Survey Location
Bare Ground	95%
Introduced Forb	5%

Landscape Evaluation and Resource Classification:

The amount and proximity of biological resources to the K Basins in the EU was examined within two adjacent landscape buffer areas; each landscape buffer area is defined by a circle radiating approximately 146 m from the geometric center of the KE and KW Reactor buildings (equivalent to 27.8 acres for the two buffer zones combined) (Figure J.96). Most of the EU the adjacent landscape buffer areas consist of level 0 biological resources—94.2% of the combined total area (Table J.83, Figure J.96 and Figure J.97). The adjacent landscape buffer area includes a small area designated as resource level 4. The level 4 area is a species resource and is considered a level 4 resource because it intersects a designated buffer zone for a bald eagle (*Haliaeetus leucocephalus*) roosting area at the river's edge close to the northwest corner of the 100-K Area.

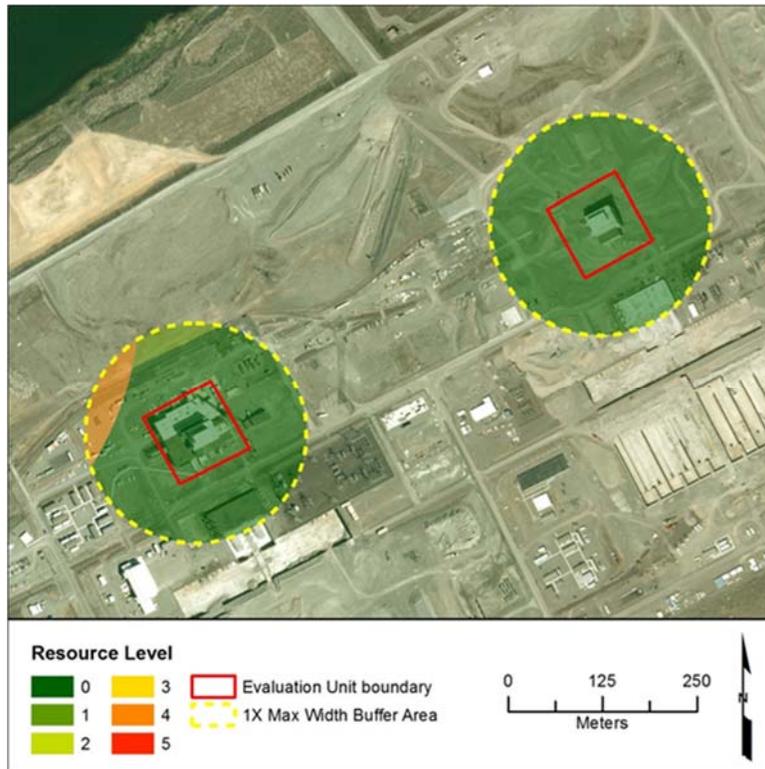


Figure J.96. Biological Resource Level Classifications Based on October 2014 Surveys for the K Basin Sludge Evaluation Unit (red solid line) and Adjacent Landscape Buffer (yellow dashed line)



Figure J.97. Condition of Landscape around the 100-K East Reactor in October 2014

Table J.83. Area and Proportion of Each Biological Resource Level Within the Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
0	5.2	25.9	31.1	94.2%	94.2%	0.0%
1	0.0	0.7	0.7	2.1%	2.1%	0.0%
2	0.0	0.0	0.0	0.0%	0.0%	0.0%
3	0.0	0.0	0.0	0.0%	0.0%	0.0%
4	0.0	1.2	1.2	3.6%	3.6%	0.0%
5	0.0	0.0	0.0	0.0%	0.0%	0.0%
Total	5.2	27.8	33.0	100.0%	100.0%	

1 Resource levels for the evaluation unit were reviewed in the field and via imagery during October 2014 and revised to reflect current habitats conditions.

2 Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.

Assumptions and Uncertainty:

Due to project time constraints, the field surveys and reconnaissance of this EU were conducted in October. By the time of the survey, the cool-season annual and perennial herbaceous plants that dominate shrub-steppe habitat had completed seasonal growth and senesced making identification and inventory difficult and most likely incomplete. Although no records for plant species of concern have been noted, the absence of species cannot be confirmed by surveys during this time of year.

By October, migratory birds have completed their nesting cycles, and most have migrated out of the region. Surveys conducted in late fall will not reflect their occupancy and use of habitat within the EU earlier in the season. Their absence cannot be confirmed by surveys October after the nesting season is over. Further surveys during the nesting season would be required to fully assess the ecological impacts to nesting migratory birds.

Summary of Ecological Review:

- Deconstruction and decommissioning of the KE/KW reactors (with basins) would not be expected to result in loss of any additional habitat at the EU. All habitat resources are level 0.
- Previous surveys noted nesting birds associated with the KE and KW Reactor buildings; however it is not evident that the infrastructure and building features that supported nesting are still in existence.

- Remediation actions taken for this EU are not expected to impact habitat connectivity within the adjacent landscape.
- A portion of the adjacent landscape buffer area for the KW reactor is relatively near (within 400 meters) an active bald eagle roost site. Noise and construction activities associated with deconstruction and decommissioning could potentially influence eagle use of the roost.

References:

- DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 0.
- U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act. <http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>
- U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington. http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902
- Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. <http://wdfw.wa.gov/conservation/phs/list/>
- Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington. <http://wdfw.wa.gov/conservation/endangered/>
- Washington Noxious Weed Control Board. 2014. Noxious Weed List. <http://www.nwcb.wa.gov/>
- Washington State Department of Natural Resources. 2014. Washington Natural Heritage Program Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

Definitions and Acronyms:

Adjacent Landscape Buffer – a circular area adjacent to and outside the EU boundary with the center of the circle at the centroid of the EU, and with a radius that is 1 times the maximum dimension (width or length—whichever is greatest). This circular buffer area is used to evaluate indirect effects and assess the remediation in relation to the landscape features and resources adjacent to the EU. This circular area is generally at least 3 times the area of the EU.

Biological Resource Levels (from DOE-RL-96-32-01) –

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats.
- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks.
- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub-

steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.

- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.
- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

MBTA – Migratory Bird Treaty Act; referring to species listed and protected under the federal Act.

PNNL ECAP (Ecological Compliance and Assessment Project) Database – PNNL performed ecological reviews for individual projects and annually surveyed selected areas and buildings on the Hanford Site for DOE-RL under the DOE’s Public Safety and Resource Protection Program until 2011. The data collected during those surveys is archived in the ECAP database, and is used to supplement ecological evaluations as available.

Priority Habitats – Priority habitats are habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type (e.g., shrub-steppe) or dominant plant species (e.g., juniper savannah), a described successional stage (e.g., old-growth forest), or a specific habitat feature (e.g., cliffs).

Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

Excerpt from ECAP Survey 2010-100-073; 105 KE includes the east reactor building and 105 KW includes the west reactor building

BLANKET BIOLOGICAL REVIEW OF 100-K AREA MAINTENANCE AND OPERATION ACTIVITIES; 100-K AREA; ECR #2010-100-073

Survey Results:

Most of the area within the 100-K boundary fence is highly disturbed with substrate consisting primarily of compacted gravel. Vegetation consists primarily of widely scattered weedy species, with most of the area having essentially no vegetation. An exception is 116-KW-3 (an approximately 2.6 hectare area in the northwest corner of the site) which has been remediated and is characterized by Sandberg's bluegrass (*Poa secunda*), and bluebunch wheatgrass (*Pseudoroegneria spicata*).

The following migratory bird activity was observed. Nest sites active at the time of the survey are underlined.

- **105KE** -Two common ravens (*Corvus corax*) searching within the exposed north side.
 - One inactive common raven nest on a catwalk on the west side.
 - One active Say's phoebe (*Sayornis saya*) nest inside a propped-open door at the southeast corner.

- **105KW** -One active house finch (*Carpodacus mexicanus*) nest behind the light above Door 607 on the north side.
 - A pair of house finches perched on the west side.
 - One inactive western kingbird (*Tyrannus verticalis*) nest on a pipe bracket on the northeast corner.

Evaluation Unit: CWC
 ID: CP-OP-1
 Group: Operations
 Operable Unit Cross-Walk: NA
 Related EU: NA
 Sites & Facilities: Central Waste Complex (CWC) operations, closure, and D&D
 Key Data Sources Docs: DOE/RL-96-32 2013
 PNNL ECAP Database⁴³
 Field Survey Date: 7/16/2014
 Data Sheet prepared by: JLD 10/6/2014

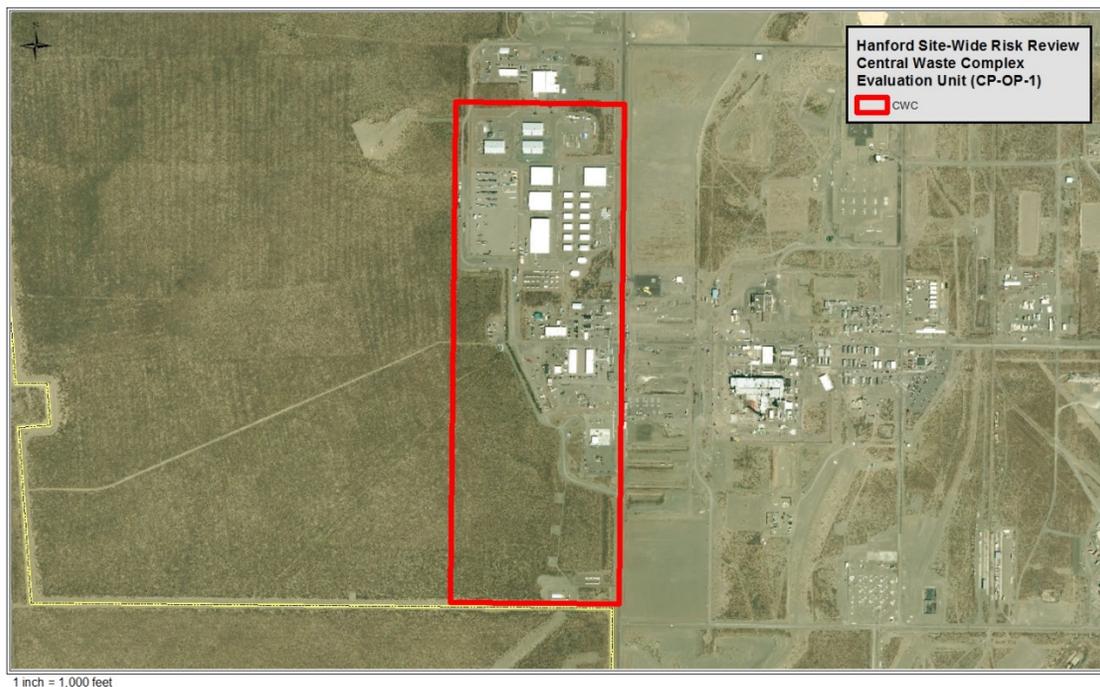
DRAFT

Figure J.98. Site Map with Evaluation Unit Boundaries

CP-OP-1: CWC

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the current Endangered and Threatened Species (Federal and State) distribution data; priority habitats as defined by Washington Department of Fish and Wildlife; available current aerial imagery, locations of Hanford Site waste sites and infrastructure spatial data; and available

⁴³ The Ecological Compliance and Assessment Project (ECAP) database is an evolving set of data that is maintained by Pacific Northwest National Laboratory (PNNL) and updated as new ecological assessments are completed.

information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data tables.

The following steps were taken to assess the EU associated with the CWC:

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. A visual survey was conducted within the EU boundary by experienced shrub-steppe ecologists. Because the unit consists of disturbed and revegetated areas and graveled surfaces, no field measurements of vegetation were taken. PNNL biologists also reviewed the observations and biological survey data available in the Ecological Compliance and Assessment Project (ECAP) database from the past 5 years for the EU to determine the status and resource level of the habitats within the EU and supplement the evaluation with previous wildlife or plant species observations.
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2012 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.
6. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

PNNL biologists conducted a reconnaissance and pedestrian survey of the EU. Much of the unit consists of buildings and parking areas with some scattered shrubs bordering the graveled areas. Some small patches of remnant shrub-steppe vegetation occur in between buildings, and

canopy cover was visually evaluated, but not physically measured in the field; therefore, no data sheet is included in this summary. The patches between buildings contain some scattered big sagebrush (*Artemisia tridentata*) with mixed native and alien grass understory. Cheatgrass (*Bromus tectorum*) cover ranged from 30% to 50%. The canopy cover of dominant vegetation in the revegetated area that occurs to the west and south of the buildings and parking areas was primarily crested wheatgrass (*Agropyron cristatum*) along with sparse shrubs (*Artemisia tridentata* and *Atriplex canescens*) (Table J.84).

No wildlife were observed within the unit during the July reconnaissance, however, PNNL ECAP surveys done in 2010 noted the following wildlife or wildlife signs: side-blotched lizard (*Uta stansburiana*), coyote (*Canis latrans*), mountain cottontail (*Sylvilagus nutalli*), and old scat from black-tailed jackrabbit (*Lepus californicus*).

Table J.84. Percent Canopy Cover of Vegetation Estimated Visually at the CWC Evaluation Unit

Vegetation/Surface Cover	West Revegetation	Scattered Habitat Between Buildings
BARE	10	NM
CRUST	NM	NM
LITTER	10	NM
Introduced Forb	10	10
Introduced Grass	25	35
Native Forb	2	1
Native Grass	-	5
Climax Shrubs	1	5
Successional Shrubs	<1	<1
Non-native Shrub	1	-

NM = Not measured or estimated

Landscape Evaluation and Resource Classification:

The CWC EU includes levels 0, 1, 2, and 3 resources as classified in the existing resource level map (DOE/RL-96-32 2013). However, two locations classified as level 3 resources in the existing resource map have become degraded and were reclassified as level 2 for this assessment. Central and western portions of the EU have been converted into industrial areas and were reclassified as level 0 resources. The majority of the CWC site is characterized by level 0 (i.e., industrial sites, paved and compacted gravel areas) and level 2 resources (i.e., small patches with sparse climax or successional shrub overstory and non-native understory) (Table J.85;

Figure J.99). Much of the area on the west side of the EU was reclassified as level 2 because it had burned previously, and was revegetated with non-native and native species.

Table J.85. Area and Proportion of Each Biological Resource Level Within the Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
0	93.6	491.9	585.5	33.4%	37.3%	3.9%
1	3.5	145.1	148.6	8.5%	8.3%	-0.2%
2	65.5	925.2	990.7	56.5%	52.7%	-3.7%
3	0.0	30.2	30.2	1.7%	1.7%	0.0%
4	0.0	0.0	0.0	0.0%	0.0%	0.0%
5	0.0	0.0	0.0	0.0%	0.0%	0.0%
Total	162.6	1592.4	1755.0	100.0%	100.0%	

1 Resource levels for both the evaluation unit and adjacent landscape boundary were reviewed in the field and via imagery during July 2014 and revised to reflect current habitats conditions.

2 Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.

The amount and proximity of biological resources to the CWC EU was evaluated within the adjacent landscape buffer area radiating 1504 m from the geometric center of the site (equivalent to 1755 acres). Small patches of level 3 resources (ranging from 1.9 to 11.5 acres) are located to the east and southeast of the EU, including several point occurrences of sensitive species (Figure J.99).

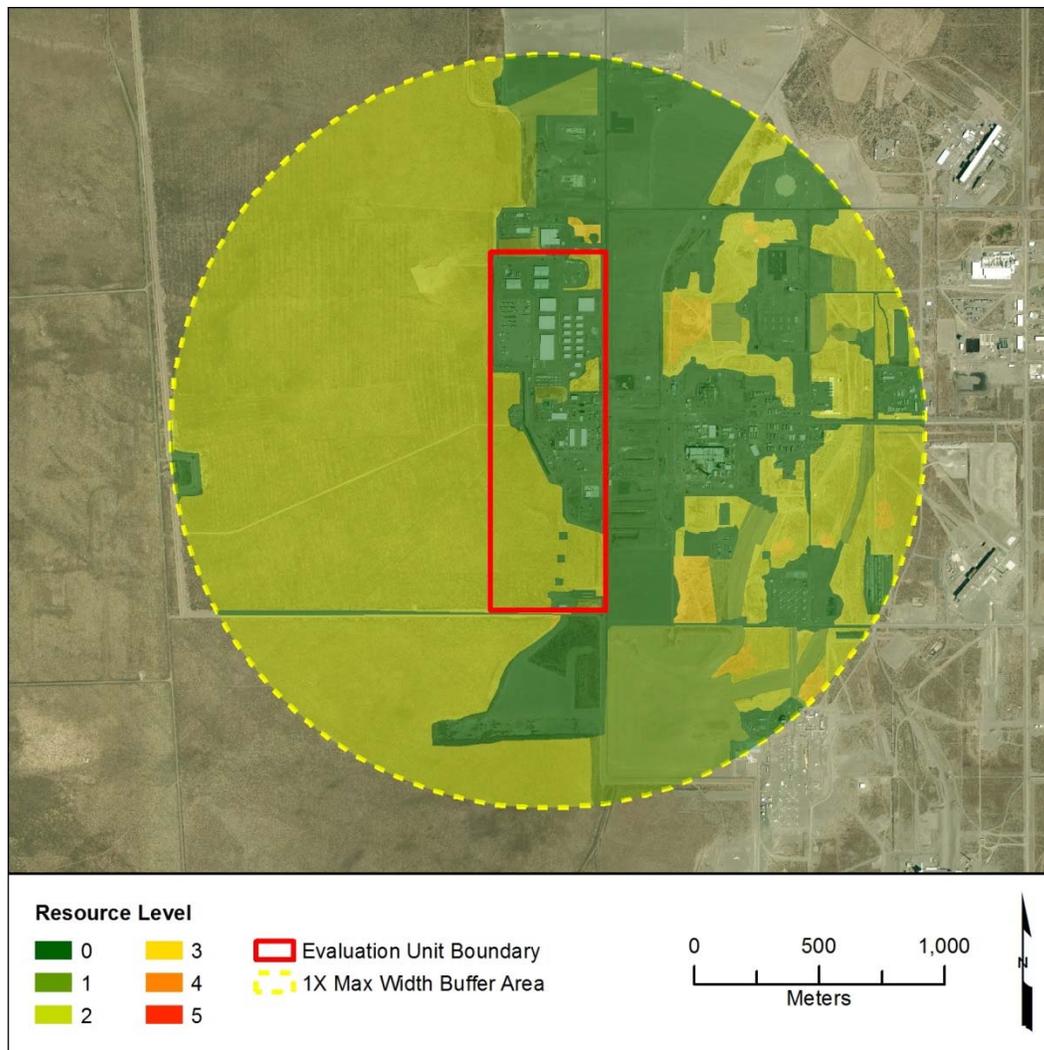


Figure J.99. Map of Biological Resource Level Classifications at the Central Waste Complex Evaluation Unit (red boundary) and Adjacent Landscape Buffer Area (yellow dashed line boundary) Based on July 2014 Survey

Assumptions and Uncertainty:

Due to project time constraints, the field surveys and reconnaissance of this EU were conducted in mid-July. By the time of the survey, the cool-season annual and perennial herbaceous plants that dominate shrub-steppe habitat had completed seasonal growth and senesced making identification and inventory difficult and most likely incomplete. Although no records for plant species of concern have been noted, the absence of species cannot be confirmed by surveys during this time of year.

By mid-July, most migratory birds have completed their nesting cycles, and surveys may not reflect their occupancy and use of habitat within the EU earlier in the season. Their absence cannot be confirmed by surveys in July after the nesting season is over. Further surveys during the nesting season would be required to fully assess the ecological impacts to nesting migratory birds.

Summary of Ecological Review:

- No level 3 or higher quality habitat patches occur within the CWC EU (Table J.85; Figure J.99).
- Cleanup activities would result in no net change in the amount of level 3 or higher resources within a 1.5 km radius.
- The CWC EU is adjacent and contiguous to multiple industrial sites—no significant change in habitat connectivity would be expected if habitat resources within the EU are lost.

References:

- DOE/RL-96-32. 2013. Hanford Unit Biological Resources Management Plan, Revision 1.
- PNNL. 2009. 300 Area Buildings Survey for 2009, Ecological Compliance and Assessment Project Database. Data collected by PNNL for DOE/RL under the Public Safety and Resource Protection Program.
- U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington.
http://ecos.fws.gov/tess_public/pub/statelistingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902
- U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act.
<http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>
- Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. Available at:
<http://wdfw.wa.gov/conservation/phs/list/>
- Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington.
<http://wdfw.wa.gov/conservation/endangered/>
- Washington Noxious Weed Control Board. 2014. Noxious Weed List. Available on line at
<http://www.nwcb.wa.gov/>
- Washington State Department of Natural Resources. 2014. Washington Natural Heritage Program Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

Definitions and Acronyms:

Adjacent Landscape Buffer – a circular area adjacent to and outside the EU boundary with the center of the circle at the centroid of the EU, and with a radius that is 1 times the maximum dimension (width or length—whichever is greatest). This circular buffer area is used to evaluate indirect effects and assess the remediation in relation to the landscape features and resources adjacent to the EU. This circular area is generally at least 3 times the area of the EU.

Biological Resource Levels (from DOE-RL-96-32-01) –

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats.
- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks.
- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub-steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.
- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.
- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

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Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

Previous PNNL ECAP Field Survey Data Collected within the CWC EU:

ECAP Database Query Results for W-125

Observer: *Freeman-Cadoret, Natalie* Date *6/21/2010*
Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
cheatgrass	<i>Bromus tectorum</i>	50	
big sagebrush	<i>Artemisia tridentata</i>	5	
fiddleneck	<i>Amsinckia lycopsoides</i>	20	
Russian thistle	<i>Salsola kali</i>	10	
crested wheatgrass	<i>Agropyron cristatum</i>		
bur ragweed	<i>Ambrosia acanthicarpa</i>		
green rabbitbrush	<i>Chrysothamnus viscidiflorus</i>		
flixweed	<i>Descurainia sophia</i>		
hoary aster	<i>Machaeranthera canescens</i>		
flattop broomrape	<i>Orobancha corymbosa</i>		
indian ricegrass	<i>Oryzopsis hymenoides</i>		
Sandberg's bluegrass	<i>Poa sandbergii</i>		
Jim Hill's tumbleweed	<i>Sisymbrium altissimum</i>		

Mammal

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
black-tailed jackrabbit	<i>Lepus californicus</i>	Present	Pellets
unknown/identified small mammal	small mammal	Present	

Observer: *Simmons, Mary Ann* Date *6/21/2010*
Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
cheatgrass	<i>Bromus tectorum</i>	40	
Russian thistle	<i>Salsola kali</i>	20	
big sagebrush	<i>Artemisia tridentata</i>	1	
bur ragweed	<i>Ambrosia acanthicarpa</i>		
gray rabbitbrush	<i>Chrysothamnus naseosus</i>		
green rabbitbrush	<i>Chrysothamnus viscidiflorus</i>		
western tansymustard	<i>Descurainia pinnata</i>		
prickly lettuce	<i>Lactuca scariola</i>		
hoary aster	<i>Machaeranthera canescens</i>		
flattop broomrape	<i>Orobancha corymbosa</i>		
indian ricegrass	<i>Oryzopsis hymenoides</i>		
Sandberg's bluegrass	<i>Poa sandbergii</i>		
Jim Hill's tumbleweed	<i>Sisymbrium altissimum</i>		

Mammal

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
northern pocket gopher	<i>Thomomys talpoides</i>	Present	Mounds

Monday, October 13, 2014

Page 1 of 2

ECAP Database Query Results for W-080a

Observer: *Freeman-Cadoret, Natalie* Date *6/21/2010*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
cheatgrass	<i>Bromus tectorum</i>	30	
big sagobrush	<i>Artemisia tridentata</i>	25	
gray rabbitbrush	<i>Chrysothamnus nauseosus</i>	1	
green rabbitbrush	<i>Chrysothamnus viscidiflorus</i>	1	
crested wheatgrass	<i>Agropyron cristatum</i>		
bur ragweed	<i>Ambrosia acanthicarpa</i>		
turpentine springparsley	<i>Cymoptaris tarobithimus</i>		
flixweed	<i>Descurainia sophia</i>		
slender sixweeks	<i>Festuca octiflora</i>		
hoary aster	<i>Machaeranthera canescens</i>		
flattop broomrape	<i>Orobanche corymbosa</i>		
indian ricegrass	<i>Oryzopsis hymenoides</i>		
Sandberg's bluegrass	<i>Poa sandbergii</i>		
pine bluegrass	<i>Poa scabrella</i>		
Russian thistle	<i>Salsola kali</i>		
Jim Hill's tumbled mustard	<i>Sisymbrium altissimum</i>		
stiff wirelettuce	<i>Stephanomeria paniculata</i>		

Mammal

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
black-tailed jackrabbit	<i>Lepus californicus</i>	Present	Pellets
unknown/unidentified small mammal	small mammal	Present	

Herpt

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
side-blotched lizard	<i>Uta stansburiana</i>	Present	

Observer: *Simmons, Mary Ann* Date *6/21/2010*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
big sagobrush	<i>Artemisia tridentata</i>	5	
cheatgrass	<i>Bromus tectorum</i>	40	
crested wheatgrass	<i>Agropyron cristatum</i>		
bur ragweed	<i>Ambrosia acanthicarpa</i>		
gray rabbitbrush	<i>Chrysothamnus nauseosus</i>		
green rabbitbrush	<i>Chrysothamnus viscidiflorus</i>		
turpentine springparsley	<i>Cymoptaris tarobithimus</i>		
western tansymustard	<i>Descurainia pinnata</i>		
prickly lettuce	<i>Lactuca scariola</i>		

ECAP Database Query Results for W-126

Observer: *Hand, Kris* Date *7/28/2010*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
cheatgrass	<i>Bromus tectorum</i>	50	
Russian thistle	<i>Salsola kali</i>	10	
Jim Hill's tumbleweed	<i>Sisymbrium altissimum</i>	10	
crested wheatgrass	<i>Agropyron cristatum</i>		
bur ragweed	<i>Ambrosia acanthicarpa</i>		
green rabbitbrush	<i>Chrysothamnus viscidiflorus</i>		
prickly lettuce	<i>Lactuca scariola</i>		
hoary aster	<i>Machaeranthera canescens</i>		

Mammal

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
mountain cottontail	<i>Sylvilagus nutalli</i>	Present	Poop

Bird

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
No birds observed	No birds		

ECAP Database Query Results for W-080d

Observer: *Hand, Kris* Date *7/28/2010*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
big sagebrush	Artemisia tridentata	25	Well pad now w/in poly
Russian thistle	Salsola kali	30	
flaxweed	Descurainia sophia	1	
cheatgrass	Bromus tectorum		
green rabbitbrush	Chrysothamnus viscidiflorus		

Mammal

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
coyote	Canis latrans	Present	Tracks
mountain cottontail	Sylvilagus montali	Present	Poop

Herpt

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
side-blotched lizard	Uta stansburiana	Present	Critter

Bird

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
No birds observed	No birds		

Evaluation Unit: T Plant
 ID: CP-OP-2
 Group: Operations
 Operable Unit Cross-Walk: NA
 Related EU: NA
 Sites & Facilities: T Plant Canyon, ancillary buildings, structures. Evaluate through operations, then will be preserved as a historical site or undergo D&D.
 Key Data Sources Docs: DOE-RL-96-32-01; Mission Support Alliance maps⁴⁴
 Field Survey Date: 05/27/2015
 Datasheet prepared by: MAC, KDH, SAM 11/11/2015
 Datasheet reviewed by:



Figure J.100. CP-OP-2 (T Plant) Site Location Map

⁴⁴MSA (Mission Support Alliance) maintains biological resource information for the Hanford Site for the Department of Energy.

CP-OP-2: T Plant

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the current Endangered and Threatened Species (Federal and State) distribution data; priority habitats as defined by Washington Department of Fish and Wildlife; available current aerial imagery, locations of Hanford Site waste units and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data records.

The following steps were taken to assess the EU associated with T Plant:

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. A pedestrian survey was conducted within the EU boundary by experienced shrub-steppe ecologists. PNNL biologists also reviewed the observations and biological survey data available in the Ecological Compliance and Assessment Project (ECAP) database from 2009 and 2010 for the EU to supplement the evaluation with previous observations of animal species.
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2013 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.

6. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

The T Plant EU comprises the T Plant buildings and a small lawn with a few trees, all surrounded by graveled surfaces. The southeast and northeast corners of the EU contain patches of successional vegetation dominated by gray rabbitbrush (*Ericameria nauseosa*) and Sandberg's bluegrass (*Poa secunda*) (Table J.86). In these 2 areas, the plant community is stable and there has been little intrusion by introduced species. The circular patch of resource level 3 in the southeast corner is the location of a state sensitive species observed several years ago; this species was not noted during the May survey (Figure J.101). Habitat in the southwest and northern most portions of the EU have a higher percent cover by introduced species and less cover of native species (Table J.86).

Field data records at the end of this section provide a list of plants observed in during the survey in 2015 and wildlife observations for areas within the EU from the ECAP data in 2009 and 2010.

Table J.86. Percent Canopy Cover and Surface Cover Estimated at the T Plant Evaluation Unit

Vegetation/Surface Cover	Survey Area 2 SE and NE (%)	Survey Area 2 SW (%)
Bare Ground	-	-
Introduced Forb	8	20
Introduced Grass	2	5
Native Forb	-	-
Native Grass	30	10
Successional Shrubs	35	25
Climax Shrubs	-	-

Note: a dash (-) indicates no percent cover data were collected

Landscape Evaluation and Resource Classification:

The T Plant EU is primarily an industrial landscape covered by buildings and graveled areas surrounded by native habitats that were likely disturbed during construction of the original facility. Approximately 72% of the EU is classified as resource level 0 or level 1 (Table J.87). About 25% of the EU contains successional vegetation that is primarily classified as level 2 resources.

The amount and proximity of biological resources surrounding the T Plant EU were examined within the adjacent landscape buffer area, which extends 1848 ft (563 m) from the geometric center of the EU (Figure J.101). The buffer area encompasses parts of nearby waste sites and a

waste treatment system as well as good quality level 3 habitat primarily in the northeast quadrant (Figure J.101). Altogether, over 73% of the combined EU and adjacent landscape buffer area is classified as resource level 2 or below. Level 3 resources comprise nearly 27% of the combined area and contain plant communities dominated by big sagebrush. The buffer area northwest of the EU contains several climax communities, including big sagebrush/Sandberg's bluegrass, native grass steppe, and big sagebrush/spiny hopsage (*Grayia spinosa*) with mixed understory grasses. No resources classified as level 4 or 5 fall within the combined EU and buffer area.

Table J.87. Area and Proportion of Each Biological Resource Level Within the T Plant Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources.

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
0	28.0	37.5	65.5	26.59%	31.75%	5.16%
1	1.2	17.4	18.7	7.59%	7.06%	-0.53%
2	10.4	85.8	96.1	39.02%	34.84%	-4.18%
3	1.1	64.9	66.0	26.80%	26.35%	-0.45%
4	0	0	0	0.00%	0.00%	0.00%
5	0	0	0	0.00%	0.00%	0.00%
Total	40.7	205.6	246.3	100.00%	100.00%	

1 Resource levels for both the evaluation unit and adjacent landscape boundary were reviewed in the field and via imagery during May-August 2015 and revised to reflect current habitats conditions.

2 Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.

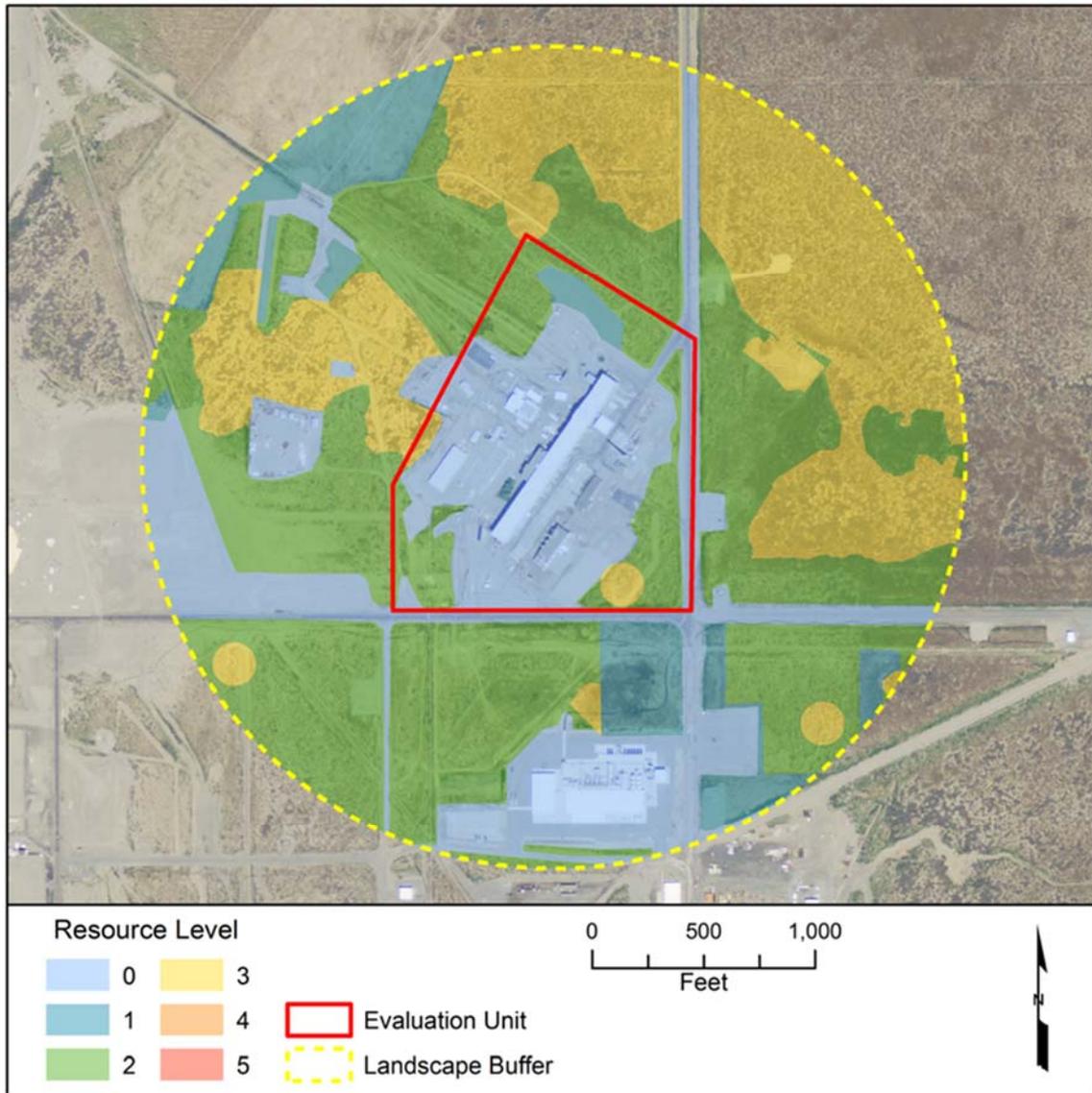


Figure J.101. Biological Resource Level Classifications Based on the May 27, 2015 Survey at the T Plant Evaluation Unit (red solid line) and Adjacent Landscape Buffer Area (yellow dashed line).

Assumptions and Uncertainty:

Although all observations for species of concern and current conditions of biological resources were noted during surveys and evaluations conducted in 2015, the presence or absence of species cannot be assumed or predicted for future years. Field reconnaissance and surveys of evaluation units at the time of remediation will need to be conducted to verify resources and evaluation ecological conditions at that time.

Summary of Ecological Review:

- 97% of the EU and 72% of the combined EU and adjacent landscape buffer area are classified as resource level 2 or below.
- Loss of all habitat within the EU during cleanup activities is not expected to impact connectivity of biological resources outside the 200-West Area.
- Level 3 habitats constitute 27% of the resources within the combined EU and buffer area. Level 3 resources on the west side of the buffer area are isolated from similar nearby habitat, but connect with larger patches of similar habitat. on the east and north
- Level 3 resources are separated from similar or higher quality habitat outside the EU by a roads inside and outside the 200-West Area perimeter.
- Circular patches of level 3 resources within the EU and buffer area are locations of a state sensitive plant species, Piper's daisy (*Erigeron piperianus*), observed in previous years. This species was not observed during the 2015 survey but is considered likely to occur in the area. Loss of individual Piper's daisies is not expected to affect population viability.

References:

DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 0.

U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act. <http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>

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- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.
- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.
- Level 0 resources consist of non-native plants and animals (unless otherwise listed at a higher level), non-vegetated areas, and industrial areas.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

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Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

Field Data Records

Plant Species Identified During Visual Surveys May 27 and October 20 2015, T Plant EU			
Patch ID	Name	Common name	Abundance
2 SE and NE	<i>Ericameria nauseosa</i>	gray rabbitbrush	35
2 SE and NE	<i>Poa secunda</i>	Sandberg's bluegrass	30
2 SE and NE	<i>Bromus tectorum</i>	cheatgrass	2
2 SE and NE	<i>Salsola tragus</i>	Russian thistle	8
2 SW	<i>Ericameria nauseosa</i>	gray rabbitbrush	25
2 SW	<i>Salsola tragus</i>	Russian thistle	20
2 SW	<i>Poa secunda</i>	Sandberg's bluegrass	10
2 SW	<i>Bromus tectorum</i>	cheatgrass	5

ECAP Database Query Bird and Other Animal Results for Areas within the T Plant EU					
Observer	Date	Patch ID	Name	Common name	Comments
MAC	6/12/2009	W-507	<i>Chordeiles minor</i>	common nighthawk	2 on light posts
MAC	6/23/2009	W-051b		unidentified small mammal	holes
MAC	6/23/2009	W-051b	<i>Thomomys talpoides</i>	northern pocket gopher	mounds
MAC	6/23/2009	W-051b	<i>Lepus californicus</i>	black-tailed jackrabbit	scat
MAC	6/23/2009	W-051b	<i>Hirundo pyrrhonota</i>	cliff swallow	1 flew over
KDH	6/23/2009	W-051b	<i>Sturnella neglecta</i>	western meadowlark	1 flushed from Chna
MAC	5/13/2010	W-051b	<i>Zonotrichia leucophrys</i>	white-crowned sparrow	1 flitting
MAC	5/13/2010	W-051b	<i>Thomomys talpoides</i>	northern pocket gopher	mound
MAC	5/13/2010	W-051b	<i>Lepus californicus</i>	black-tailed jackrabbit	ran away
MAC	5/13/2010	W-051b	<i>Sturnella neglecta</i>	western meadowlark	sing powerline across road
MAS	5/13/2010	W-051b		unidentified small mammal	holes
MAS	5/13/2010	W-051b		unidentified lizard	lizard
NFC	7/20/2010	W-051c	<i>Uta stansburiana</i>	side-blotched lizard	
NFC	7/20/2010	W-051c	<i>Canis latrans</i>	coyote	tracks
NFC	7/20/2010	W-051c	<i>Sylvilagus nuttalli</i>	mountain cottontail	scat
MAS	7/20/2010	W-051c	<i>Tyrannus verticalis</i>	western kingbird	foraging
MAS	7/20/2010	W-051c	<i>Canis latrans</i>	coyote	tracks
MAS	7/20/2010	W-051c		Unidentified rabbit	scat
MAS	7/20/2010	W-051c		unidentified small mammal	tracks and holes

Evaluation Unit: WESF
 ID: CP-OP-3
 Group: Operations
 Operable Unit Cross-Walk: NA
 Related EU: CP-DD-2
 Sites & Facilities: Waste Encapsulation and Storage Facility (WESF) – Evaluate for the storage and removal of Cs/SR capsules. D&D included with B Plant EU.
 Key Data Sources Docs: DOE/RL-96-32 2013
 PNNL ECAP Database⁴⁵
 Field Survey Date: 10/8/2014
 Data Sheet Prepared By: JLD, MAC, KDH, KBL, SAM; 10/08/2014

DRAFT

Figure J.102. Site Map with Evaluation Unit Boundaries

CP-OP-3: WESF

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the current Endangered and Threatened Species (Federal and State) distribution data; priority habitats as defined by Washington Department of Fish and Wildlife; available current aerial

⁴⁵ The Ecological Compliance and Assessment Project (ECAP) database is an evolving set of data that is maintained by Pacific Northwest National Laboratory (PNNL) and updated as new ecological assessments are completed.

imagery, locations of Hanford Site waste sites and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data tables.

The following steps were taken to assess the EU associated with WESF:

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. A visual survey was conducted within the EU boundary by experienced shrub-steppe ecologists. Because the unit consists of unvegetated industrial and graveled surfaces and buildings, no field measurements of vegetation were taken. PNNL biologists also reviewed the observations and biological survey data available in the ECAP database from the past 5 years for the EU to determine the status and resource level of the habitats within the EU and supplement the evaluation with previous wildlife or plant species observations.
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2012 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.
6. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

A visual survey of the EU for WESF confirmed that the EU consists entirely of built structures and paved, graveled, or landscaped surfaces. No wildlife were observed. No field data sheets

were generated. PNNL ECAP surveys conducted in 2009 for the WESF area indicated the following wildlife around the buildings: American robin (*Turdus migratorius*), lark sparrow (*Chondestes grammacus*), killdeer (*Charadrius vociferous*), barn swallow (*Hirundo rustica*), and mourning dove (*Zenaida macroura*).

Table J.88. Percent Canopy Cover and Surface Cover Observed at WESF

Vegetation/Surface Cover	Survey Area
Bare Ground/Building	100%

Landscape Evaluation and Resource Classification:

The amount and proximity of the biological resources to the EU were examined within the adjacent landscape buffer area radiating approximately 64 m from the geometric center of the EU (equivalent to 3.2 acres). The WESF EU and surrounding adjacent landscape buffer area consist entirely of level 0 resources; that is, paved, graveled surfaces and buildings with some landscaping around them.

Table J.89. Area and Proportion of Each Biological Resource Level Within the WESF Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
0	0.5	2.7	3.2	100%	100%	0%
1	0.0	0.0	0.0	0%	0%	0%
2	0.0	0.0	0.0	0%	0%	0%
3	0.0	0.0	0.0	0%	0%	0%
4	0.0	0.0	0.0	0%	0%	0%
5	0.0	0.0	0.0	0%	0%	0%
Total	0.5	2.7	3.2	100%	100%	0%

1 Resource levels for both the evaluation unit and adjacent landscape boundary were reviewed in the field and via imagery during October 2014 and revised to reflect current habitats conditions.

2 Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.

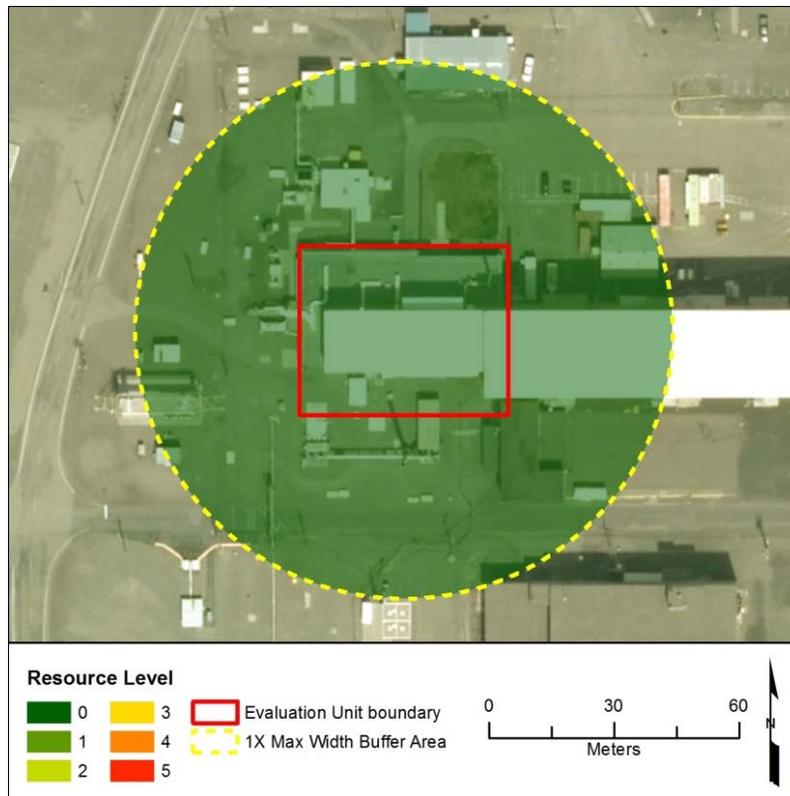


Figure J.103. Biological Resource Level Classifications Based on October 2014 Surveys at the WESF Evaluation Unit (red solid line) and Adjacent Landscape Buffer Area (yellow dashed line).

Assumptions and Uncertainty:

Due to project time constraints, the field surveys and reconnaissance of this EU were conducted in October. By the time of the survey, the cool-season annual and perennial herbaceous plants that dominate shrub-steppe habitat had completed seasonal growth and senesced making identification and inventory difficult and most likely incomplete. Although no records for plant species of concern have been noted, the absence of species cannot be confirmed by surveys during this time of year.

By October, migratory birds have completed their nesting cycles, and most have migrated out of the region. Surveys conducted in late fall will not reflect their occupancy and use of habitat within the EU earlier in the season. Their absence cannot be confirmed by surveys October after the nesting season is over. Further surveys during the nesting season would be required to fully assess the ecological impacts to nesting migratory birds.

Summary of Ecological Review:

- No species of concern were observed either within the EU or in the immediate vicinity.
- The EU for WESF and adjacent landscape buffer consist of 0 level resources; that is, paved and graveled surfaces, buildings, infrastructure, and minor amounts of landscaping.

- Remediation of the WESF EU would not have any negative impacts on habitat connectivity.

References

- DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 0.
- U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act. <http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>
- U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington. http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902
- Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. <http://wdfw.wa.gov/conservation/phs/list/>
- Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington. <http://wdfw.wa.gov/conservation/endangered/>
- Washington Noxious Weed Control Board. 2014. Noxious Weed List. <http://www.nwcb.wa.gov/>
- Washington State Department of Natural Resources. 2014. Washington Natural Heritage Program Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

Definitions and Acronyms:

Adjacent Landscape Buffer – a circular area adjacent to and outside the EU boundary with the center of the circle at the centroid of the EU, and with a radius that is 1 times the maximum dimension (width or length—whichever is greatest). This circular buffer area is used to evaluate indirect effects and assess the remediation in relation to the landscape features and resources adjacent to the EU. This circular area is generally at least 3 times the area of the EU.

Biological Resource Levels (from DOE-RL-96-32-01) –

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats.
- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks.
- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake

hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.

- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.
- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

MBTA – Migratory Bird Treaty Act; referring to species listed and protected under the federal Act.

PNNL ECAP (Ecological Compliance and Assessment Project) Database – PNNL performed ecological reviews for individual projects and annually surveyed selected areas and buildings on the Hanford Site for DOE-RL under the DOE's Public Safety and Resource Protection Program until 2011. The data collected during those surveys is archived in the ECAP database, and is used to supplement ecological evaluations as available.

Priority Habitats – Priority habitats are habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type (e.g., shrub-steppe) or dominant plant species (e.g., juniper savannah), a described successional stage (e.g., old-growth forest), or a specific habitat feature (e.g., cliffs).

Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being threatened endangered, sensitive, or candidate, as well as those listed by the USFWS as species of concern within the ecoregion.

Previous ECAP Survey Data for the WESF EU

ECAP Database Query Results for E-501

Observer: *Chamness, Mickie* Date *6/26/2009*

Plant

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
Russian thistle	Salsola kali	+	Mostly gravel

Bird

<u>Common Name</u>	<u>Latin Name</u>	<u>Abundance</u>	<u>Comments</u>
American robin	Turdus migratorius	1	S powerline
lark sparrow	Chondestes grammacus	1	N power line by railroad
killdeer	Charadrius vociferus	2	N parking lot
barn swallow	Hirundo rustica	2	Foraging
mourning dove	Zenaidura macroura	1	Flew over

Evaluation Unit: WRAP
ID: CP-OP-4
Group: Operations
Operable Unit Cross-Walk: NA
Related EU: NA
Sites & Facilities: Waste Repackaging and Processing (WRAP) facility operations, closure, and D&D.
Key Data Sources Docs: DOE-RL-96-32-01; MSA Biological Resources Data
Field Survey Date: 05/27/2015
Datasheet prepared by: MAC, KDH, SAM 10/30/2015
Datasheet reviewed by:



Figure J.104. CP-OP-4 (WRAP) Site Location Map

CP-OP-4: WRAP

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the current Endangered and Threatened Species (Federal and State) distribution data; priority habitats as defined by Washington Department of Fish and Wildlife; available current aerial imagery, locations of Hanford Site waste units and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data tables.

The following steps were taken to assess the EU associated with WRAP:

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. A pedestrian survey was conducted within the EU boundary by experienced shrub-steppe ecologists.
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2013 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.
6. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

Much of the WRAP EU is covered by buildings and the surrounding bare ground and roads. On the west side of the EU, a patch of vegetation is dominated by big sagebrush (*Artemisia tridentata*) with an understory dominated by cheatgrass (*Bromus tectorum*) and Russian thistle (*Salsola tragus*). On the east side of the EU, the resource level 3 patch is dominated by gray rabbitbrush (*Ericameria nauseosa*), a successional shrub, with sparse big sagebrush and an understory containing native grasses (5% canopy cover) and Russian thistle (60% canopy cover) (Table J.90). Birds were observed around the buildings during the May survey and evidence of use by coyotes (*Canis latrans*) and rabbits was observed in October. Field data records at the end of this section list the plant and animals species observed.

Table J.90. Percent Canopy Cover and Surface Cover Estimated at the WRAP Evaluation Unit

Vegetation/Surface Cover	Survey Area 3-1
Bare Ground	-
Introduced forb	60
Introduced grass	5
Native forb	-
Native grass	5
Successional shrub	5
Climax shrub	0

Note: a dash (-) indicates no percent cover data were recorded

Landscape Evaluation and Resource Classification:

Approximately 72% of the WRAP EU (Figure J.105, Table J.91) contains a building complex surrounded by roads, storage areas and parking lots that are classified as a level 0 resources. No level 1 resources occur within the EU. A small isolated patch (2.1 acres,, ~10% of the EU) of level 3 habitat is located on the east side of the EU, and a similar sized patch of level 2 habitat on the west side is separated by a relatively narrow road from level 2 habitat outside the EU.

The amount and proximity of biological resources surrounding the WRAP EU were examined within the adjacent landscape buffer area, which extends 1700 ft (518 m) from the geometric center of the EU (Figure J.105). Almost 68% of the combined area of the EU and adjacent landscape buffer is composed of level 0 and level 1 habitats, and only 2% consists of isolated patches of level 3 resources. Level 2 habitats to the west of the EU comprise 30% of the combined acreage, and portions of that area have been revegetated with a mix of native and non-native species after fire.

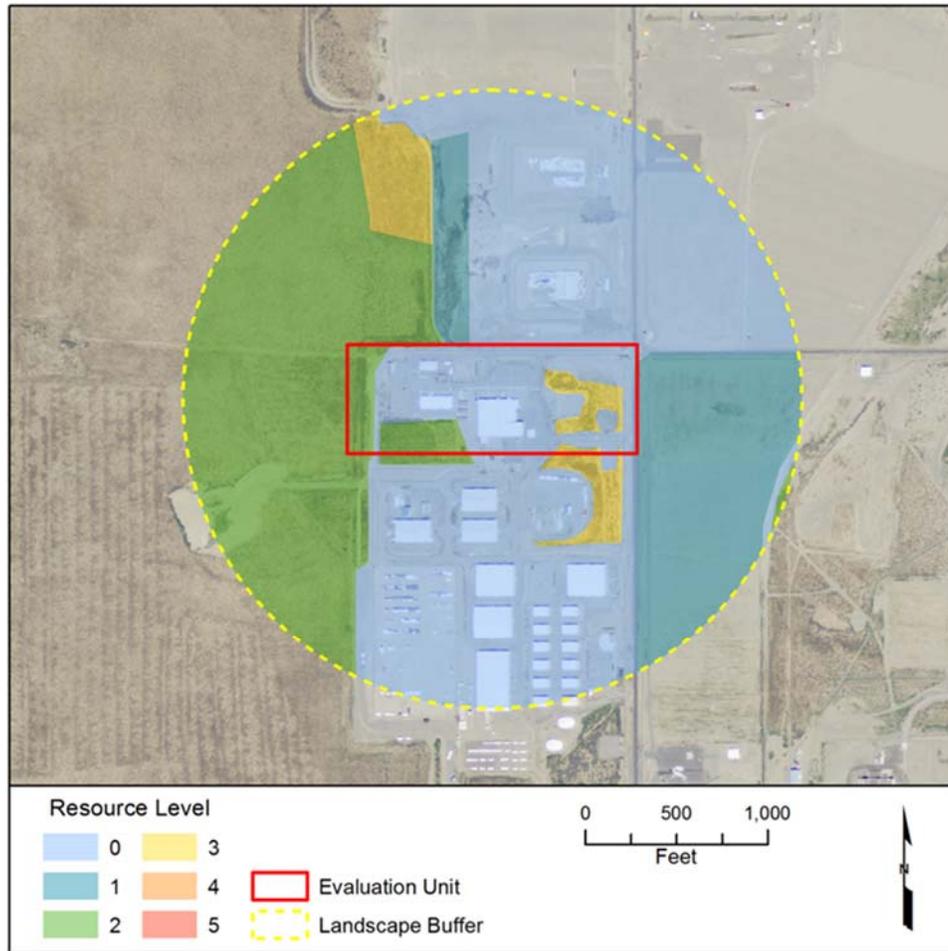


Figure J.105. Biological Resource Level Classifications Based on the May 27, 2015 Survey at the WRAP Evaluation Unit (red solid line) and Adjacent Landscape Buffer Area (yellow dashed line).

Table J.91. Area and Proportion of Each Biological Resource Level Within the WRAP Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources.

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
0	15.7	91.5	107.2	51.43%	54.40%	2.97%
1	0.0	31.7	31.8	15.24%	15.22%	-0.02%
2	4.1	55.5	59.6	28.61%	26.62%	-1.99%
3	2.0	7.8	9.8	4.72%	3.76%	-0.96%
4	0	0	0	0.00%	0.00%	0.00%
5	0	0	0	0.00%	0.00%	0.00%
Total	21.8	186.6	208.4	100.00%	100.00%	

¹ Resource levels for both the evaluation unit and adjacent landscape boundary were reviewed in the field and via imagery during May-August 2015 and revised to reflect current habitats conditions.

² Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.

Assumptions and Uncertainty:

Although all observations for species of concern and current conditions of biological resources were noted during surveys and evaluations conducted in 2015, the presence or absence of species cannot be assumed or predicted for future years. Field reconnaissance and surveys of evaluation units at the time of remediation will need to be conducted to verify resources and evaluate ecological conditions at that time.

Summary of Ecological Review:

- The WRAP EU is composed primarily of buildings, graveled lots, and disturbed areas (~72%)
- A small patch (~2 acres) of level 3 habitat would be lost during remediation activities
- Loss of level 2 and level 3 habitat in this EU would not be expected to impact wildlife populations or habitat connectivity

References:

- DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 0.
- U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act. <http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>
- U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington.

http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902

Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. <http://wdfw.wa.gov/conservation/phs/list/>

Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington. <http://wdfw.wa.gov/conservation/endangered/>

Washington Noxious Weed Control Board. 2014. Noxious Weed List. <http://www.nwcb.wa.gov/>

Washington State Department of Natural Resources. 2014. Washington Natural Heritage Program Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

Definitions and Acronyms:

Adjacent Landscape Buffer – a circular area adjacent to and outside the EU boundary with the center of the circle at the centroid of the EU, and with a radius that is 1 times the maximum dimension (width or length—whichever is greatest). This circular buffer area is used to evaluate indirect effects and assess the remediation in relation to the landscape features and resources adjacent to the EU. This circular area is generally at least 3 times the area of the EU.

Biological Resource Levels (from DOE-RL-96-32-01) –

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats.
- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks.
- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub-steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.
- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.
- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

MBTA – Migratory Bird Treaty Act; referring to species listed and protected under the federal Act.

PNNL ECAP (Ecological Compliance and Assessment Project) Database – PNNL performed ecological reviews for individual projects and annually surveyed selected areas and buildings on the Hanford Site for DOE-RL under the DOE’s Public Safety and Resource Protection Program until 2011. The data collected during those surveys is archived in the ECAP database, and is used to supplement ecological evaluations as available.

Priority Habitats – Priority habitats are habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type (e.g., shrub-steppe) or dominant plant species (e.g., juniper savannah), a described successional stage (e.g., old-growth forest), or a specific habitat feature (e.g., cliffs).

Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

Field Data Records

ECAP Database Query Vegetation Results for Areas within the within the WRAP EU					
Observer	Date	Patch ID	Name	Common name	Abundance
MAC	6/10/2009	W-125	<i>Agoseris heterophylla</i>	annual mountain dandelion	
MAC	6/10/2009	W-125	<i>Agropyron cristatum</i>	crested wheatgrass	
MAC	6/10/2009	W-125	<i>Agropyron spicatum</i>	bluebunch wheatgrass	seeded in
MAC	6/10/2009	W-125	<i>Ambrosia acanthicarpa</i>	bur ragweed	
MAC	6/10/2009	W-125	<i>Artemisia tridentata</i>	big sagebrush	5
MAC	6/10/2009	W-125	<i>Bromus tectorum</i>	cheatgrass	20
MAC	6/10/2009	W-125	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	
MAC	6/10/2009	W-125	<i>Cymopterus terebinthus</i>	turpentine springparsley	
MAC	6/10/2009	W-125	<i>Descurainia sophia</i>	flixweed	
MAC	6/10/2009	W-125	<i>Lactuca serriola</i>	prickly lettuce	
MAC	6/10/2009	W-125	<i>Machaeranthera canescens</i>	hoary aster	
MAC	6/10/2009	W-125	<i>Poa sandbergii</i>	Sandberg's bluegrass	
MAC	6/10/2009	W-125	<i>Salsola kali</i>	Russian thistle	10
MAC	6/10/2009	W-125	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	
MAC	6/10/2009	W-125	<i>Stephanomeria paniculata</i>	stiff wirelettuce	
MAS	6/21/2010	W-125	<i>Ambrosia acanthicarpa</i>	bur ragweed	
MAS	6/21/2010	W-125	<i>Artemisia tridentata</i>	big sagebrush	1
MAS	6/21/2010	W-125	<i>Bromus tectorum</i>	cheatgrass	40
MAS	6/21/2010	W-125	<i>Chrysothamnus nauseosus</i>	gray rabbitbrush	
MAS	6/21/2010	W-125	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	
MAS	6/21/2010	W-125	<i>Descurainia pinnata</i>	western tansymustard	
MAS	6/21/2010	W-125	<i>Lactuca serriola</i>	prickly lettuce	
MAS	6/21/2010	W-125	<i>Machaeranthera canescens</i>	hoary aster	
MAS	6/21/2010	W-125	<i>Orobancha corymbosa</i>	flattop broomrape	
MAS	6/21/2010	W-125	<i>Oryzopsis hymenoides</i>	indian ricegrass	
MAS	6/21/2010	W-125	<i>Poa sandbergii</i>	Sandberg's bluegrass	
MAS	6/21/2010	W-125	<i>Salsola kali</i>	Russian thistle	20
MAS	6/21/2010	W-125	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	
NFC	6/10/2009	W-125	<i>Agropyron cristatum</i>	crested wheatgrass	
NFC	6/10/2009	W-125	<i>Ambrosia acanthicarpa</i>	bur ragweed	
NFC	6/10/2009	W-125	<i>Artemisia tridentata</i>	big sagebrush	
NFC	6/10/2009	W-125	<i>Balsamorhiza careyana</i>	Carey's balsamroot	
NFC	6/10/2009	W-125	<i>Bromus tectorum</i>	cheatgrass	
NFC	6/10/2009	W-125	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	
NFC	6/10/2009	W-125	<i>Descurainia sophia</i>	flixweed	
NFC	6/10/2009	W-125	<i>Draba verna</i>	spring whitlowgrass	
NFC	6/10/2009	W-125	<i>Festuca bromoides</i>	barren sixweeks	
NFC	6/10/2009	W-125	<i>Holosteum umbellatum</i>	jagged chickweed	
NFC	6/10/2009	W-125	<i>Lactuca serriola</i>	prickly lettuce	
NFC	6/10/2009	W-125	<i>Machaeranthera canescens</i>	hoary aster	
NFC	6/10/2009	W-125	<i>Poa sandbergii</i>	Sandberg's bluegrass	
NFC	6/10/2009	W-125	<i>Salsola kali</i>	Russian thistle	
NFC	6/10/2009	W-125	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	
NFC	6/21/2010	W-125	<i>Agropyron cristatum</i>	crested wheatgrass	
NFC	6/21/2010	W-125	<i>Ambrosia acanthicarpa</i>	bur ragweed	
NFC	6/21/2010	W-125	<i>Amsinckia lycopsoides</i>	fiddleneck	20
NFC	6/21/2010	W-125	<i>Artemisia tridentata</i>	big sagebrush	5
NFC	6/21/2010	W-125	<i>Bromus tectorum</i>	cheatgrass	50
NFC	6/21/2010	W-125	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	
NFC	6/21/2010	W-125	<i>Descurainia sophia</i>	flixweed	
NFC	6/21/2010	W-125	<i>Machaeranthera canescens</i>	hoary aster	
NFC	6/21/2010	W-125	<i>Orobancha corymbosa</i>	flattop broomrape	
NFC	6/21/2010	W-125	<i>Oryzopsis hymenoides</i>	indian ricegrass	
NFC	6/21/2010	W-125	<i>Poa sandbergii</i>	Sandberg's bluegrass	
NFC	6/21/2010	W-125	<i>Salsola kali</i>	Russian thistle	10
NFC	6/21/2010	W-125	<i>Sisymbrium altissimum</i>	Jim Hill's tumbledustard	

Bird, Mammal and Herpetofauna Species May 27 and October 29, 2015, WRAP EU			
Patch ID	Name	Common name	Comment
0-1	<i>Sturnus vulgaris</i>	European starling	nests on buildings
0-1	<i>Tyrannus verticalis</i>	western kingbird	pair hanging around
0-1	<i>Carpodacus mexicanus</i>	house finch	nesting on connex
3-1	<i>Canis latrans</i>	coyote	tracks
3-1		unidentified rabbit	scat not identified to genus

ECAP Database Query Bird and Other Animal Results for Areas within the WRAP EU					
Observer	Date	Patch ID	Name	Common name	Comments
MAC	6/10/2009	W-125		unidentified small mammal	holes, scat
MAC	6/10/2009	W-125	<i>Canis latrans</i>	coyote	tracks
MAC	6/10/2009	W-125		unidentified lizard	tracks
MAC	6/10/2009	W-125	<i>Thomomys talpoides</i>	northern pocket gopher	mounds
NFC	6/21/2010	W-125		unidentified small mammal	tracks
NFC	6/21/2010	W-125	<i>Lepus californicus</i>	black-tailed jackrabbit	scat
MAS	6/21/2010	W-125	<i>Thomomys talpoides</i>	northern pocket gopher	mounds
MAS	6/21/2010	W-125		unidentified small mammal	holes

Evaluation Unit: CSB
 ID: CP-OP-5
 Group: Operations
 Operable Unit Cross-Walk: NA
 Related EU: NA
 Sites & Facilities: Canister Storage Building (CSB) operations and closure (including adjacent spent fuel dry storage pad).
 Key Data Sources Docs: DOE/RL-96-32 2013; Mission Support Alliance maps⁴⁶
 Field Survey Date: 06/15/2015
 Datasheet prepared by: MAC, KDH, SAM 10/20/2015
 Datasheet reviewed by:

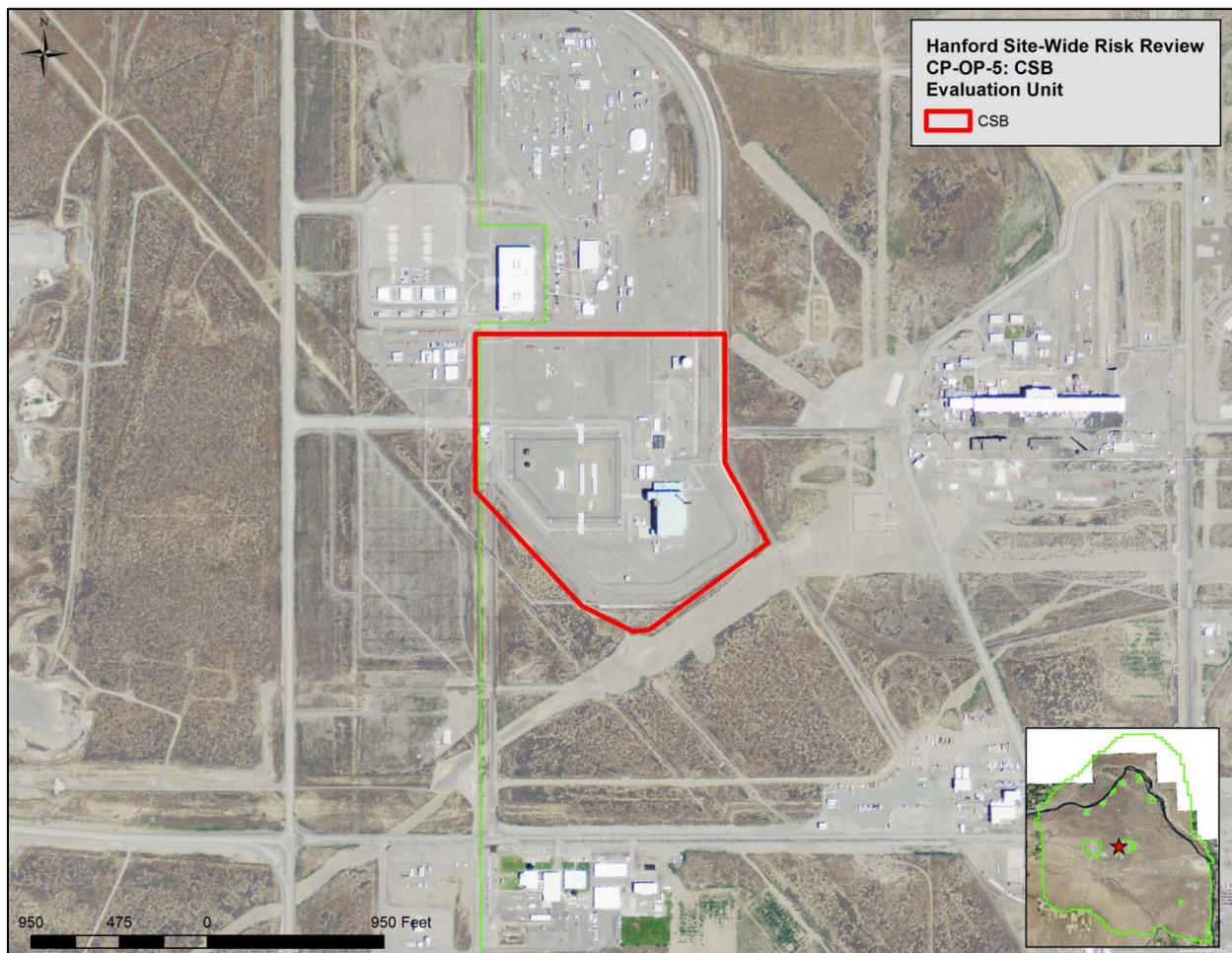


Figure J.106. CP-OP-5 (CSB) Site Location Map

CP-OP-5: CSB

⁴⁶ MSA (Mission Support Alliance) maintains biological resource information for the Hanford Site for the Department of Energy.

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the current Endangered and Threatened Species (Federal and State) distribution data; priority habitats as defined by Washington Department of Fish and Wildlife; available current aerial imagery, locations of Hanford Site waste units and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data records.

The following steps were taken to assess the EU associated with CSB:

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. A pedestrian survey was conducted around the edge of the EU boundary by experienced shrub-steppe ecologists. PNNL biologists also reviewed the observations and biological survey data available in the Ecological Compliance and Assessment Project (ECAP) database from 2009 and 2010 for the EU to determine the status and resource level of the habitats within the EU and supplement the evaluation with previous wildlife or plant species observations.
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2013 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.

6. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

Access into the CSB EU is restricted, requiring ecologists to observe vegetation from the EU perimeter. Over 95% of the EU is covered by a complex of buildings surrounded by bare ground. Nearly 5% of the area encompassed within the CSB EU is dominated by gray rabbitbrush (*Ericameria canescens*) and an understory dominated by exotic annuals—cheatgrass (*Bromus tectorum*), and Russian thistle (*Salsola tragus*) (See Table J.92).

Table J.92. Percent Canopy Cover and Surface Cover Estimated at the CSB Evaluation Unit

Vegetation/Surface Cover	Survey Area 2 (%)
Bare Ground	-
Introduced Forb	10
Introduced Grass	25
Native Forb	-
Native Grass	-
Successional Shrubs	2
Climax Shrubs	-

Note: a dash (-) indicates no percent cover data were collected

Birds and animals were not readily observable from outside the EU and none were recorded during the June survey. Historical surveys done by PNNL biologists noted the presence of black-tailed jackrabbits (*Lepus californicus*), a Washington state candidate species (personal communication).

Landscape Evaluation and Resource Classification:

The CSB EU contains primarily level 0 habitat (96% of the EU) comprising several buildings surrounded by bare ground (Figure J.107, Table J.93). On the south side of the EU, outside the facility fence but included within the EU, lies 1.7 acres (~4%) containing small patches of level 2 resources.

The amount and proximity of biological resources surrounding the CSB EU were examined within the adjacent landscape buffer area, which extends 1939 ft (591 m) from the geometric center of the EU. Approximately 73% of the combined EU and buffer area is classified as level 2 or lower with fragmented resources primarily to the north and east. Nearly 27% of the combined area is classified as level 3 and level 4 habitat (Table J.93). There is no level 5 habitat within the combined EU and buffer area.

Assumptions and Uncertainty:

Although all observations for species of concern and current conditions of biological resources were noted during surveys and evaluations conducted in 2015, the presence or absence of species cannot be assumed or predicted for future years. Field reconnaissance and surveys of evaluation units at the time of remediation will need to be conducted to verify resources and evaluate ecological conditions at that time.

Summary of Ecological Review:

- 95% of the EU consists of level 0 habitat; level 2 habitat in the EU is located on the south and southwest margin of the EU.
- Loss of level 2 habitats associated with remediation actions within the EU will not alter connectivity of habitat.
- In 2009 the presence of black-tailed jackrabbits, a Washington state candidate species was noted in habitats within the buffer area.

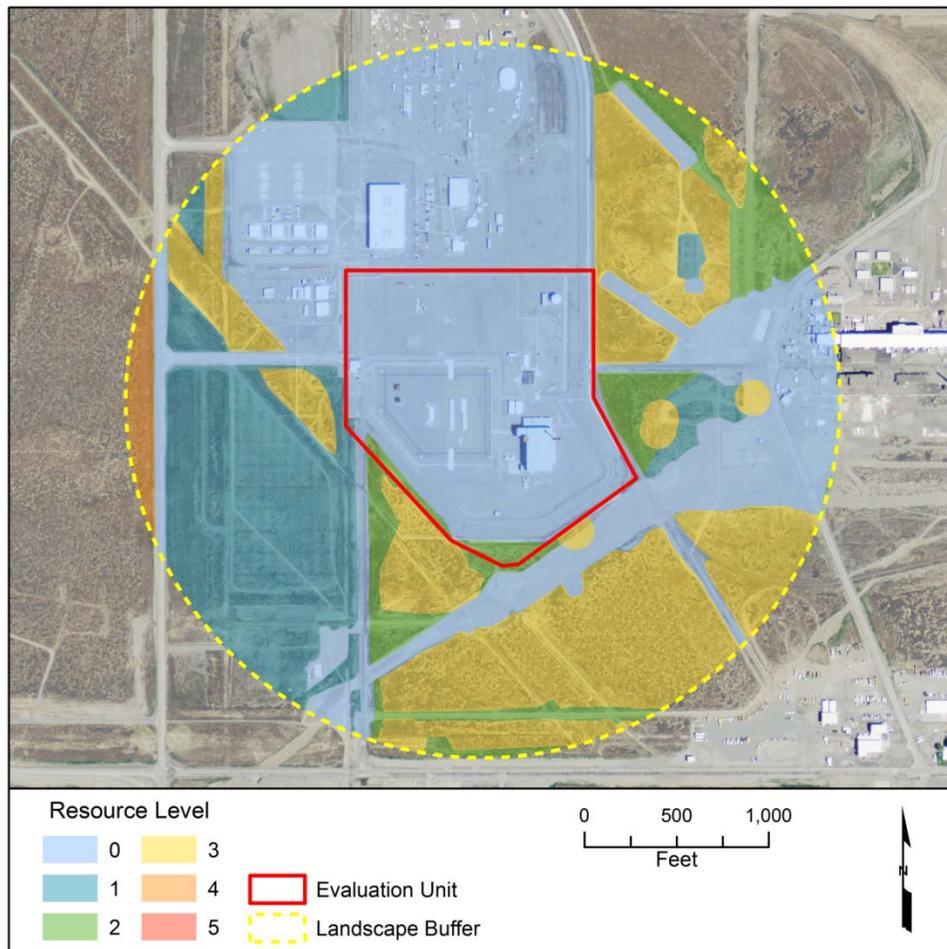


Figure J.107. Biological Resource Level Classifications Based on the June 15, 2015 Survey at the CSB Evaluation Unit (red solid line) and Adjacent Landscape Buffer Area (yellow dashed line).

Table J.93. Area and Proportion of Each Biological Resource Level Within the CSB Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources.

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
0	41.5	95.4	136.9	50.49%	51.16%	0.67%
1	0.1	42.3	42.4	15.63%	15.59%	-0.05%
2	1.7	17.4	19.1	7.03%	6.40%	-0.63%
3	0	69.1	69.1	25.48%	25.48%	0.00%
4	0	3.7	3.7	1.36%	1.36%	0.00%
5	0	0	0	0.00%	0.00%	0.00%
Total	43.4	227.8	271.2	100.00%	100.00%	

1 Resource levels for both the evaluation unit and adjacent landscape boundary were reviewed in the field and via imagery during May-August 2015 and revised to reflect current habitats conditions.

2 Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.

References:

DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 0.

U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act. <http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>

U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington. http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902

Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. <http://wdfw.wa.gov/conservation/phs/list/>

Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington. <http://wdfw.wa.gov/conservation/endangered/>

Washington Noxious Weed Control Board. 2014. Noxious Weed List. <http://www.nwcb.wa.gov/>

Washington State Department of Natural Resources. 2014. Washington Natural Heritage Program Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

Definitions and Acronyms:

Adjacent Landscape Buffer – a circular area adjacent to and outside the EU boundary with the center of the circle at the centroid of the EU, and with a radius that is 1 times the maximum

dimension (width or length—whichever is greatest). This circular buffer area is used to evaluate indirect effects and assess the remediation in relation to the landscape features and resources adjacent to the EU. This circular area is generally at least 3 times the area of the EU.

Biological Resource Levels (from DOE-RL-96-32-01) –

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats.
- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks.
- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub-steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.
- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.
- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.
- Level 0 resources consist of non-native plants and animals (unless otherwise listed at a higher level), non-vegetated areas, and industrial areas.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

MBTA – Migratory Bird Treaty Act; referring to species listed and protected under the federal Act.

PNNL ECAP (Ecological Compliance and Assessment Project) Database – PNNL performed ecological reviews for individual projects and annually surveyed selected areas and buildings on the Hanford Site for DOE-RL under the DOE’s Public Safety and Resource Protection Program until 2011. The data collected during those surveys is archived in the ECAP database, and is used to supplement ecological evaluations as available.

Priority Habitats – Priority habitats are habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type (e.g., shrub-steppe) or dominant plant species (e.g., juniper savannah), a described successional stage (e.g., old-growth forest), or a specific habitat feature (e.g., cliffs).

Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being

threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

Evaluation Unit: ERDF
 ID: CP-OP-6
 Group: Operations
 Operable Unit Cross-Walk: NA
 Related EU: NA
 Sites & Facilities: Environmental Restoration Disposal Facility operations and closure
 Key Data Sources Docs: DOE/RL-96-32 2013
 Field Survey Date: 10/13/2014
 Data Sheet Prepared By: KDH, JLD, MAC, KBL, SAM; 10/22/2014

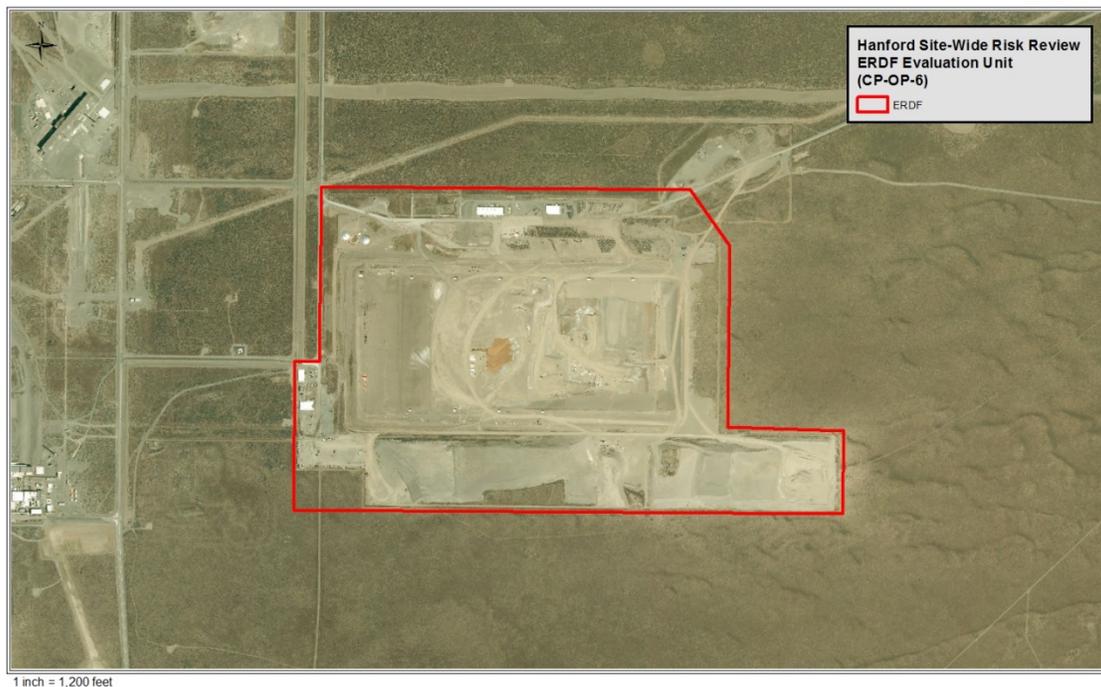
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Figure J.108. Site Map of the ERDF Evaluation Unit Boundary

CP-OP-6: ERDF

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the current Endangered and Threatened Species (Federal and State) distribution data; priority habitats as defined by Washington Department of Fish and Wildlife; available current aerial imagery, locations of Hanford Unit waste sites and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods

and ecological survey results are provided at the end of this summary along with field data tables.

The following steps were taken to assess the EU associated with the Environmental Restoration Disposal Facility:

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. A vehicle and field survey was conducted within the EU boundary by experienced shrub-steppe ecologists. Field measurements of vegetation were taken in selected habitats. No PNNL Ecological Compliance and Assessment Project (ECAP) data were available for this area.
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2012 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.
6. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

The EU associated with the ERDF facilities was surveyed in October 2014 by pedestrian and vehicle reconnaissance of disturbed areas and field measurement or visual survey of natural habitat areas. The majority of the EU consists of disturbed landfill cells, roads/ramps, buildings, parking lots, and associated facilities. Small areas of natural habitat remain along the EU perimeter. Based on visual surveys the natural habitat along the northern boundary (survey areas 4-01a and 4-01b, Table J.94) was classified as a composite of levels 1-3 and the natural habitat along the eastern boundary (survey area 3-09a, Table J.94) was classified as primarily

level 2 to reflect current vegetation conditions (Figure J.109). Two sanitation tile/drain fields are located within the EU: 1) part of the level 1 habitat resource in the northwest corner which was visually surveyed and 2) an area along the central southern boundary which could not be accessed during the field survey. Field measurements conducted in the natural habitat area located at the southwest corner (survey area 3-09b, Table J.94) of the EU confirmed the habitat to be resource level 3 (Figure J.109) with mature big sagebrush (*Artemisia tridentata*) in the overstory.

Wildlife observations included a side-blotched lizard (*Uta stansburiana*) and harvester ants in habitats near the northern boundary, signs of small mammals in habitats near the northern boundary and in the southwest corner, and a white-crowned sparrow (*Zonotrichia leucophrys*) in habitats near the eastern boundary.

Table J.94. Percent Canopy Cover and Surface Cover Measured at the ERDF Evaluation Unit

Vegetation/Surface Cover	Survey Area 3-09a (%)	Survey Area 3-09b (%)	Survey Area 4-01a (%)	Survey Area 4-01b (%)
Bare Ground	-	33.4	-	-
Crust	-	8.3	-	-
Litter	-	44.0	-	-
Introduced Forb	15	3.8	35	10
Introduced Grass	20	5.2	10	15
Native Forb	-	23.0	-	3
Native Grass	3	22.9	2	-
Climax Shrubs	1	1.5	-	-
Successional Shrubs	-	-	-	1

Landscape Evaluation and Resource Classification:

The amount of each category of biological resources at and near the ERDF EU was examined within a circular area radiating 2,123 m from the geometric center of the unit (equivalent to 3,499 acres). The majority of the area within the 424.2 acres of the EU is classified as level 0 (365.4 ac), with only 31.4 acres classified as level 3 or higher biological resources, whereas the adjacent landscape buffer contains substantial level 3 and higher resources (2,468 ac out of 3,075.1 ac). Overall, approximately 71.5 percent of the total combined area currently consists of level 3 or higher biological resources (Figure J.109, Table J.95).

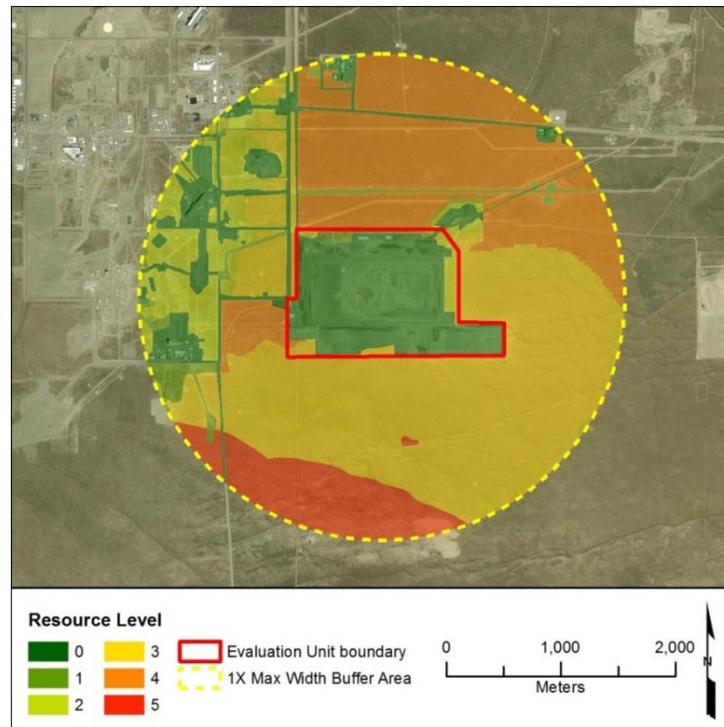


Figure J.109. Map of Biological Resource Level Classifications Based on October 2014 Surveys for the ERDF Evaluation Unit (red solid line) and Adjacent Landscape Buffer (yellow dashed line)

Table J.95. Area and Proportion of Each Biological Resource Level Within the Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
0	365.4	267.0	632.4	18.1%	19.8%	1.7%
1	9.7	81.0	90.7	2.6%	2.3%	-0.3%
2	17.7	259.0	276.7	7.9%	7.4%	-0.5%
3	29.8	1323.5	1353.3	38.7%	37.8%	-0.9%
4	1.6	882.8	884.5	25.3%	25.2%	0.1%
5	0.0	261.7	261.7	7.5%	7.5%	0.0%
Total	424.2	3075.0	3499.3	100.0%	100.0%	

1 Resource levels for the evaluation unit were reviewed in the field and via imagery during October 2014 and revised to reflect current habitats conditions.

2 Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation

activities and the resource level of the evaluation unit is level 0.

Assumptions and Uncertainty:

Due to project time constraints, the field surveys and reconnaissance of this EU were conducted in mid-October. By the time of the survey, the cool-season annual and perennial herbaceous plants that dominate shrub-steppe habitat had completed seasonal growth and senesced making identification and inventory difficult, and most likely incomplete. Although no records for plant species of concern have been noted, the absence of such species cannot be confirmed by surveys during this time of year.

By mid-October, most migratory birds have completed their nesting cycles, and surveys may not reflect their occupancy and use of habitat within the EU earlier in the season. Their absence cannot be confirmed by surveys in October after the nesting season is over. Further surveys during the nesting season would be required to fully assess the ecological impacts to nesting migratory birds.

Summary of Ecological Review:

- The majority of the area within the 424.2 acres of the ERDF EU is classified as level 0 (365.4 ac), with only 31.4 acres classified as level 3 or higher biological resources.
- Remediation actions undertaken within the ERDF EU boundary would result in no more than an approximate 1% (31.4 ac) reduction of level 3 or higher biological resources within a 2.1 km radius.
- Areas of habitat within the ERDF EU are located near its perimeter and are contiguous with surrounding habitats located in the adjacent landscape buffer; the removal of the small amount of habitat within the EU would not be expected to significantly affect habitat connectivity.
- Future plans to expand ERDF by adding new landfill cells have the potential to significantly affect those level 3 or higher biological resources immediately adjacent to the EU.

References

- DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 0.
- U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act. <http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>
- U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington. http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902
- Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. <http://wdfw.wa.gov/conservation/phs/list/>
- Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington. <http://wdfw.wa.gov/conservation/endangered/>
- Washington Noxious Weed Control Board. 2014. Noxious Weed List. <http://www.nwcb.wa.gov/>

Washington State Department of Natural Resources. 2014. Washington Natural Heritage Program Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

Definitions and Acronyms:

Adjacent Landscape Buffer – a circular area adjacent to and outside the EU boundary with the center of the circle at the centroid of the EU, and with a radius that is 1 times the maximum dimension (width or length—whichever is greatest). This circular buffer area is used to evaluate indirect effects and assess the remediation in relation to the landscape features and resources adjacent to the EU. This circular area is generally at least 3 times the area of the EU.

Biological Resource Levels (from DOE-RL-96-32-01) –

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats.
- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks.
- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub-steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.
- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.
- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

MBTA – Migratory Bird Treaty Act; referring to species listed and protected under the federal Act.

PNNL ECAP (Ecological Compliance and Assessment Project) Database – PNNL performed ecological reviews for individual projects and annually surveyed selected areas and buildings on the Hanford Site for DOE-RL under the DOE's Public Safety and Resource Protection Program until 2011. The data collected during those surveys is archived in the ECAP database, and is used to supplement ecological evaluations as available.

Priority Habitats – Priority habitats are habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type (e.g., shrub-steppe) or dominant plant species (e.g., juniper savannah), a described successional stage (e.g., old-growth forest), or a specific habitat feature (e.g., cliffs).

Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

Evaluation Unit: ERDF		Observers: MAC, KDH
Patch ID: 3-09 A		Date: 10/13/14
Wildlife Observations Recorded During Pedestrian or Vehicle Surveys		
Species	Observation	
Small mammal	Holes and tracks	
Wcsp	bird perched in shrub	
Notes		

Evaluation Unit: ERDF		Observers: MAC, KDH
Patch ID: 3-09 B		Date: 10/13/14
Wildlife Observations Recorded During Pedestrian or Vehicle Surveys		
Species	Observation	
Small mammal	Holes and tracks	
Notes		

Evaluation Unit: ERDF		Observers: MAC, KDH
Patch ID: 4-01 A		Date: 10/13/14
Wildlife Observations Recorded During Pedestrian or Vehicle Surveys		
Species	Observation	
Small mammal	Holes and tracks	
Utst	1 lizard just north of fence	
Notes		

Evaluation Unit: ERDF		Observers: MAC, KDH
Patch ID: 4-01 B		Date: 10/13/14
Wildlife Observations Recorded During Pedestrian or Vehicle Surveys		
Species	Observation	
Small mammal	Holes and tracks	
Harvester ants		
Notes		

Evaluation Unit: IDF
ID: CP-OP-7
Group: Operations
Operable Unit Cross-Walk: NA
Related EU: NA
Sites & Facilities: Integrated Disposal Facility operations and closure.
Key Data Sources Docs: DOE-RL-96-32-01; MSA Biological Resources Data⁴⁷
Field Survey Date: 06/08/2015
Datasheet prepared by: MAC, KDH, SAM 10/25/2015
Datasheet reviewed by:



Figure J.110. CP-OP-7 (IDF) Site Location Map

CP-OP-7: IDF

⁴⁷ MSA (Mission Support Alliance) maintains biological resource information for the Hanford Site for the Department of Energy.

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the current Endangered and Threatened Species (Federal and State) distribution data; priority habitats as defined by Washington Department of Fish and Wildlife; available current aerial imagery, locations of Hanford Site waste units and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data tables.

The following steps were taken to assess the EU associated with IDF:

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. A visual survey was conducted within the EU boundary by experienced shrub-steppe ecologists.
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2013 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.
6. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

On June 8, 2015 PNNL ecologists performed a driving survey around the IDF EU. The IDF is a large flat pit kept free of vegetation. The area around the top of the pit was heavily disturbed during construction of the IDF and mostly kept free of vegetation. A band of introduced weedy species including Russian thistle (*Salsola tragus*), cheatgrass (*Bromus tectorum*) and Jim Hill mustard (*Sisymbrium altissimum*) surrounds the pit and extends toward less disturbed habitat beyond the EU boundary. Small patches of shrub-steppe are included at the margin of the EU (Figure J.111). The EU boundary on the west extends 33 ft (10 m) into degraded shrub-steppe habitat that includes introduced and native grasses (*Agropyron cristatum* and *Poa secunda*, respectively) as well as some of weedy species. Because nearly all of the IDF evaluation unit is composed of bare ground with no vegetation or very small amounts of introduced species (Table J.96), no estimates of percent cover were taken for the narrow bands of level 2 and level 3 habitat at the EU boundary.

Table J.96. Percent Canopy Cover and Surface Cover Estimated at the IDF Evaluation Unit

Vegetation/Surface Cover	Survey Areas 0 and 1 (%)
Bare Ground	96
Introduced forb	2
Introduced grass	1

A mourning dove (*Zenaida macroura*) was observed in the area (see field data records at the end of this section for species lists).

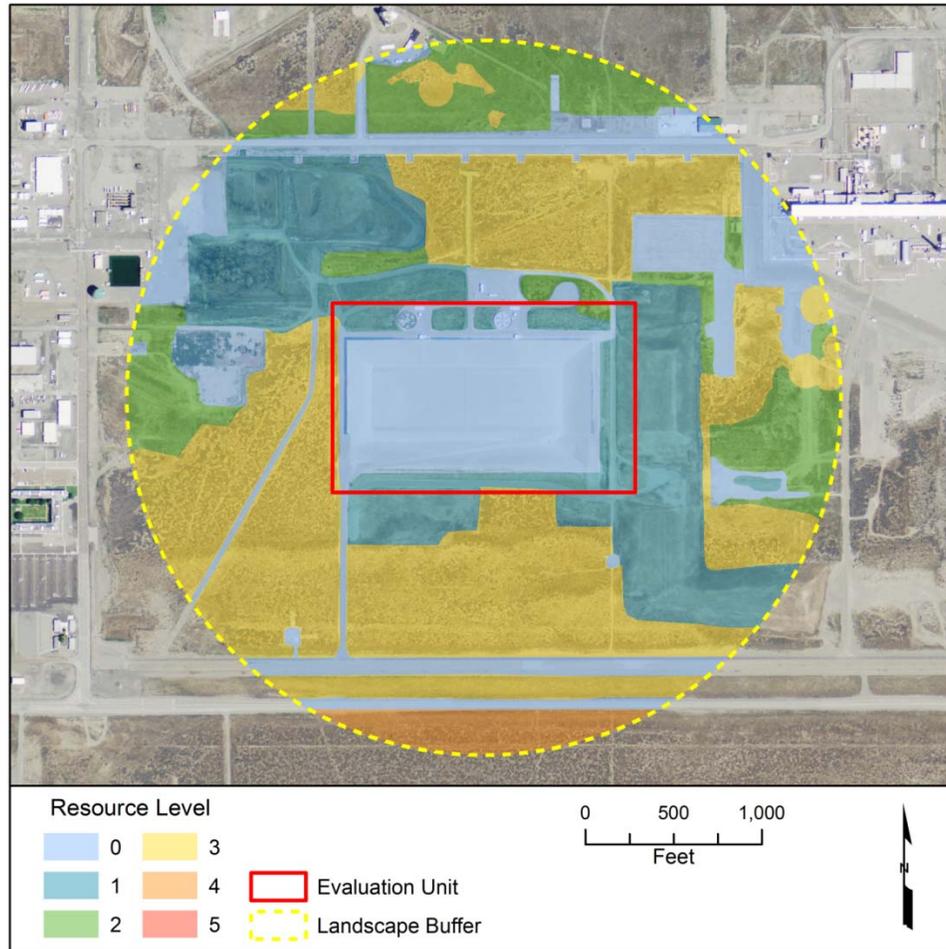


Figure J.111. Biological Resource Level Classifications Based on the June 8, 2015 Survey at the IDF Evaluation Unit (red solid line) and Adjacent Landscape Buffer Area (yellow dashed line).

Landscape Evaluation and Resource Classification:

Nearly 70% of the IDF EU is classified as a level 0 resource, and level 0 and level 1 resources together comprise 97% of the land area within the EU. Level 2 and 3 habitat resources represent only 3% of the land area within the EU (Table J.97). Much of the level 1 habitat is covered by Russian thistle and is likely sprayed with herbicides. The 1.1 acre habitat classified as level 3 habitat has been disturbed previously during construction activities and although it has been revegetated, the habitat is of much lower quality than contiguous areas of level 3 habitat outside the IDF EU boundary.

Table J.97. Area and Proportion of Each Biological Resource Level Within the IDF Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources.

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
0	29.6	47.6	77.3	26.10%	30.39%	4.29%
1	11.3	53.4	64.6	21.84%	18.03%	-3.81%
2	0.3	35.5	35.8	12.10%	11.98%	-0.12%
3	1.1	109.3	110.4	37.28%	36.91%	-0.37%
4	0	8.0	8.0	2.69%	2.69%	0.00%
5	0	0	0	0.00%	0.00%	0.00%
Total	42.3	253.7	296.0	100.00%	100.00%	

1 Resource levels for both the evaluation unit and adjacent landscape boundary were reviewed in the field and via imagery during May-August 2015 and revised to reflect current habitats conditions.

2 Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.

The amount and proximity of biological resources surrounding the IDF EU were examined within the adjacent landscape buffer area, which extends 2026 ft (618 m) from the geometric center of the EU (Figure J.111). The buffer area occurs within the 200E Miscellaneous Waste Sites, BC Control Zone and PUREX Cribs, Ponds, and Trenches EUs and the summaries for these EUs provide more details on observed species and canopy cover.

The northwest and southeast portions of the buffer area consist of level 1 habitat that is contiguous with the level 0 and 1 habitats in the EU. Slightly more than 37% of the adjacent landscape buffer area is classified as level 3 habitat and dominated by climax shrubs (*Artemisia tridentata*) with a mixture of cheatgrass, native grasses such as Sandberg's bluegrass (*Poa secunda*) and introduced and native forbs in the understory.

Assumptions and Uncertainty:

Although all observations for species of concern and current conditions of biological resources were noted during surveys and evaluations conducted in 2015, the presence or absence of species cannot be assumed or predicted for future years. Field reconnaissance and surveys of evaluation units at the time of remediation will need to be conducted to verify resources and evaluation ecological conditions at that time.

Summary of Ecological Review:

- Approximately 97% of the EU consists of level 1 and level 0 resources.

- Level 3 habitats south of the EU within the adjacent landscape buffer area are contiguous with mature shrub-steppe level 4 extending south of the 200-East Area.
- Because over 41 acres of the 42.3 acres in the EU are classified as level 2 or lower, loss of habitat during cleanup activities is not expected to significantly impact habitat connectivity outside the 200-East Area.

References:

- DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 0.
- U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act. <http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>
- U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington. http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902
- Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. <http://wdfw.wa.gov/conservation/phs/list/>
- Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington. <http://wdfw.wa.gov/conservation/endangered/>
- Washington Noxious Weed Control Board. 2014. Noxious Weed List. <http://www.nwcb.wa.gov/>
- Washington State Department of Natural Resources. 2014. Washington Natural Heritage Program Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

Definitions and Acronyms:

Adjacent Landscape Buffer – a circular area adjacent to and outside the EU boundary with the center of the circle at the centroid of the EU, and with a radius that is 1 times the maximum dimension (width or length—whichever is greatest). This circular buffer area is used to evaluate indirect effects and assess the remediation in relation to the landscape features and resources adjacent to the EU. This circular area is generally at least 3 times the area of the EU.

Biological Resource Levels (from DOE-RL-96-32-01) –

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats.
- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks.
- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub-steppe—such as shrub stands that are less mature, have lower shrub density or canopy

cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.

- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.
- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.
- Level 0 resources consist of non-native plants and animals (unless otherwise listed at a higher level), non-vegetated areas, and industrial areas.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

MBTA – Migratory Bird Treaty Act; referring to species listed and protected under the federal Act.

PNNL ECAP (Ecological Compliance and Assessment Project) Database – PNNL performed ecological reviews for individual projects and annually surveyed selected areas and buildings on the Hanford Site for DOE-RL under the DOE’s Public Safety and Resource Protection Program until 2011. The data collected during those surveys is archived in the ECAP database, and is used to supplement ecological evaluations as available.

Priority Habitats – Priority habitats are habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type (e.g., shrub-steppe) or dominant plant species (e.g., juniper savannah), a described successional stage (e.g., old-growth forest), or a specific habitat feature (e.g., cliffs).

Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

Field Data Records

Bird, Mammal and Herpetofauna Species			
June 8 2015, IDF EU			
Patch ID	Name	Common name	Comment
0-1	<i>Zenaidura macroura</i>	mourning dove	flying

Evaluation Unit: Mixed Waste Trenches
 ID: CP-OP-8
 Group: Operations
 Operable Unit Cross-Walk: 200-SW-2
 Related EU: CP-LS-14
 Sites & Facilities: Mixed waste trenches (Trench 31 and 34, next to WRAP) operations and closure.
 Key Data Sources Docs: DOE-RL-96-32-01; Mission Support Alliance maps⁴⁸
 Field Survey Date: 05/27/2015
 Datasheet prepared by: MAC, KDH, SAM 10/30/2015
 Datasheet reviewed by:



Figure J.112. CP-OP-8 (Mixed Waste Trenches) Site Location Map

CP-OP-8: Mixed Waste Trenches

⁴⁸ MSA (Mission Support Alliance) maintains biological resource information for the Hanford Site for the Department of Energy.

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the current Endangered and Threatened Species (Federal and State) distribution data; priority habitats as defined by Washington Department of Fish and Wildlife; available current aerial imagery, locations of Hanford Site waste units and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data records.

The following steps were taken to assess the EU associated with Mixed Waste Trenches:

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. A pedestrian survey was conducted within the EU boundary by experienced shrub-steppe ecologists.
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2013 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.
6. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

Over half of the Mixed Waste Trenches EU is bare ground and is classified as level 0 habitat.. On the west side is a slope partially covered with a mix of native grasses and introduced grasses and forbs. The western 25% of the EU burned in 2000 and was revegetated with a mixture of native and introduced species in 2001. The southwest corner burned again this summer, leaving bare ground with skeletons of gray rabbitbrush (*Ericameria nauseosa*) and crested wheatgrass (*Agropyron cristatum*) (Table J.98, Survey Area 2-1).

In the northwest corner combined cover of big sagebrush (*Artemisia tridentata*), gray rabbitbrush (*Ericameria nauseosa*) and a non-native perennial Atriplex species shrub totals about 15% canopy cover with an understory mixture of native and introduced grasses and forbs (Table J.98, patch 3-1). Field data records at the end of this section provide a list of observed plant species. No wildlife were observed during the May survey.

Landscape Evaluation and Resource Classification:

Approximately 61% (28.6 acres) of the Mixed Waste Trenches EU holds the mixed waste trenches, which were carved out of east edge of a hill (Table J.99, Figure J.113). The trenches and surrounding area are graveled and kept free of vegetation and are characterized as level 0 habitat (Table J.99). The slope on the west between the waste trenches and original land surface is covered by a mixture of native and introduced species with only a few successional shrubs and is classified as resource level 1 (Table J.99, Figure J.113). The remainder of the area is classified as level 2 habitat, with the south portion being of lower quality than the north portion.

The amount and proximity of biological resources surrounding the Mixed Waste Trenches EU were examined within the adjacent landscape buffer area, which extends 2046 ft (624 m) from the geometric center of the EU. Nearly 65% of the combined EU and adjacent buffer area is level 1 or below. Another 34% has been revegetated and is still in recovery after one or more fires in the past 15 years and is classified as level 2. Areas identified as level 3 resources south of the EU are degraded, with sagebrush shrub cover but an understory dominated by Russian thistle and minimal native grass cover.

Table J.98. Percent Canopy Cover and Surface Cover Estimated at the Mixed Waste Trenches Evaluation Unit

Vegetation/Surface Cover	Survey Area 2-1 (%)	Survey Area 3-1 (%)
Bare Ground	88	-
Introduced forb	-	10
Introduced grass	3	25
Native forb	-	-
Native grass	-	20
Successional shrub	<2	1

Climax shrub	0	10
Note: a dash (-) indicates no percent cover data were collected		

Table J.99. Area and Proportion of Each Biological Resource Level Within the Mixed Waste Trenches Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources.

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
0	28.6	139.6	168.3	55.74%	61.83%	6.09%
1	5.2	19.8	25.0	8.27%	6.55%	-1.72%
2	7.8	79.3	87.0	28.83%	26.25%	-2.57%
3	5.4	16.2	21.6	7.16%	5.36%	-1.80%
4	0	0	0	0.00%	0.00%	0.00%
5	0	0	0	0.00%	0.00%	0.00%
Total	47.0	254.9	301.9	100.00%	100.00%	

1 Resource levels for both the evaluation unit and adjacent landscape boundary were reviewed in the field and via imagery during May-August 2015 and revised to reflect current habitats conditions.

2 Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.

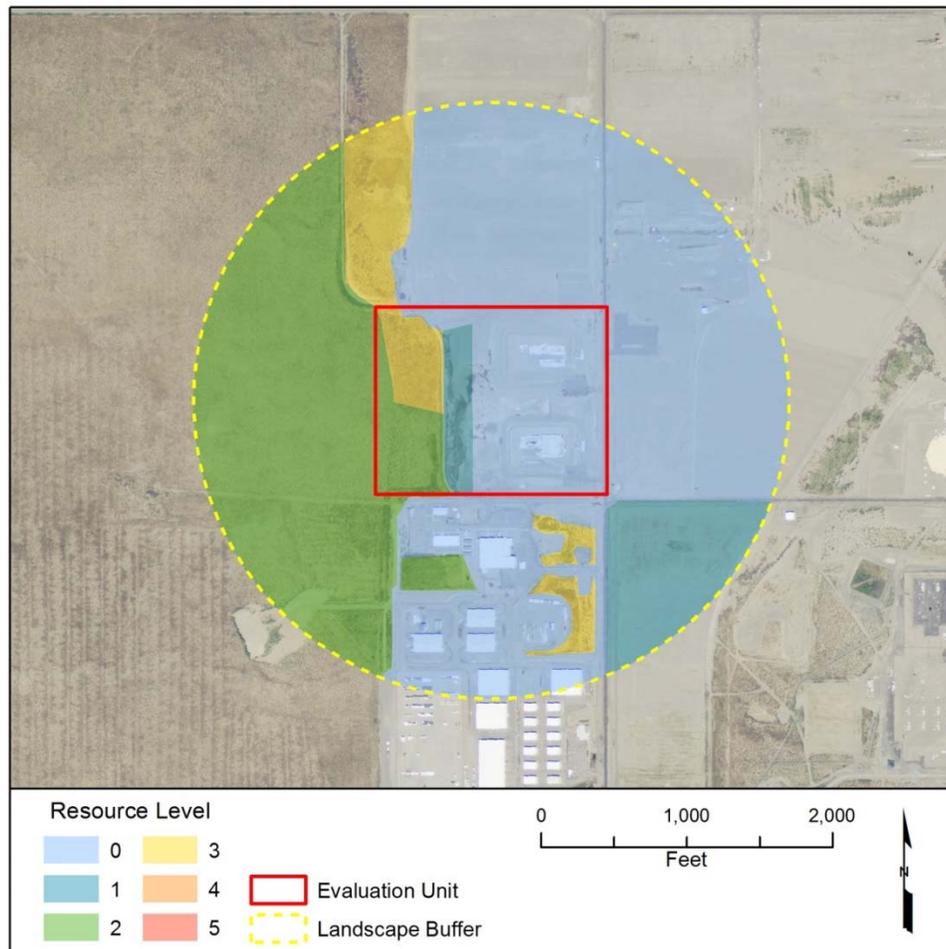


Figure J.113. Biological Resource Level Classifications Based on the May 27, 2015 Survey at the Mixed Waste Trenches Evaluation Unit (red solid line) and Adjacent Landscape Buffer Area (yellow dashed line).

Assumptions and Uncertainty:

Although all observations for species of concern and current conditions of biological resources were noted during surveys and evaluations conducted in 2015, the presence or absence of species cannot be assumed or predicted for future years. Field reconnaissance and surveys of evaluation units at the time of remediation will need to be conducted to verify resources and evaluation ecological conditions at that time.

Summary of Ecological Review:

- Nearly 99% of the habitat in the combined EU and adjacent landscape buffer area is classified as level 2 or below.
- Within the EU, 100% of the resources are level 2 or below. Loss of this habitat is not expected to impact the connectivity between higher quality resources within and those outside the 200-West Area.

References:

- DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 0.
- U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act. <http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>
- U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington. http://ecos.fws.gov/tess_public/pub/statelistingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902
- Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. <http://wdfw.wa.gov/conservation/phs/list/>
- Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington. <http://wdfw.wa.gov/conservation/endangered/>
- Washington Noxious Weed Control Board. 2014. Noxious Weed List. <http://www.nwcb.wa.gov/>
- Washington State Department of Natural Resources. 2014. Washington Natural Heritage Program Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

Definitions and Acronyms:

Adjacent Landscape Buffer – a circular area adjacent to and outside the EU boundary with the center of the circle at the centroid of the EU, and with a radius that is 1 times the maximum dimension (width or length—whichever is greatest). This circular buffer area is used to evaluate indirect effects and assess the remediation in relation to the landscape features and resources adjacent to the EU. This circular area is generally at least 3 times the area of the EU.

Biological Resource Levels (from DOE-RL-96-32-01) –

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats.
- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks.
- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.

- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.
- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.
- Level 0 resources consist of non-native plants and animals (unless otherwise listed at a higher level), non-vegetated areas, and industrial areas.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

MBTA – Migratory Bird Treaty Act; referring to species listed and protected under the federal Act.

PNNL ECAP (Ecological Compliance and Assessment Project) Database – PNNL performed ecological reviews for individual projects and annually surveyed selected areas and buildings on the Hanford Site for DOE-RL under the DOE's Public Safety and Resource Protection Program until 2011. The data collected during those surveys is archived in the ECAP database, and is used to supplement ecological evaluations as available.

Priority Habitats – Priority habitats are habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type (e.g., shrub-steppe) or dominant plant species (e.g., juniper savannah), a described successional stage (e.g., old-growth forest), or a specific habitat feature (e.g., cliffs).

Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

Field Data Records

Plant Species Identified During Visual Surveys October 28 2015, Mixed Waste Trenches EU			
Patch ID	Name	Common name	Abundance
2-1	<i>Agropyron cristatum</i>	crested wheatgrass	3
2-1	<i>Ericameria nauseosa</i>	gray rabbitbrush	2
2-1	<i>bare</i>	bare	88
3-1	<i>Atriplex species</i>	saltbush	5
3-1	<i>Artemisia tridentata</i>	big sagebrush	10
3-1	<i>Bromus tectorum</i>	cheatgrass	20
3-1	<i>Poa secunda</i>	Sandberg's bluegrass	20
3-1	<i>Agropyron cristatum</i>	crested wheatgrass	5
3-1	<i>Ericameria nauseosa</i>	gray rabbitbrush	<2
3-1	<i>Salsola tragus</i>	Russian thistle	10

Evaluation Unit: Naval Reactors Trench
 ID: CP-OP-9
 Group: Operations
 Operable Unit Cross-Walk: 200-SW-2
 Related EU: CP-LS-14
 Sites & Facilities: Naval Reactors disposal trench operations and closure.
 Key Data Sources Docs: DOE-RL-96-32-01; Mission Support Alliance maps⁴⁹
 Field Survey Date: 06/17/2015
 Datasheet prepared by: MAC, SAM, KDH 10/27/2015
 Datasheet reviewed by:

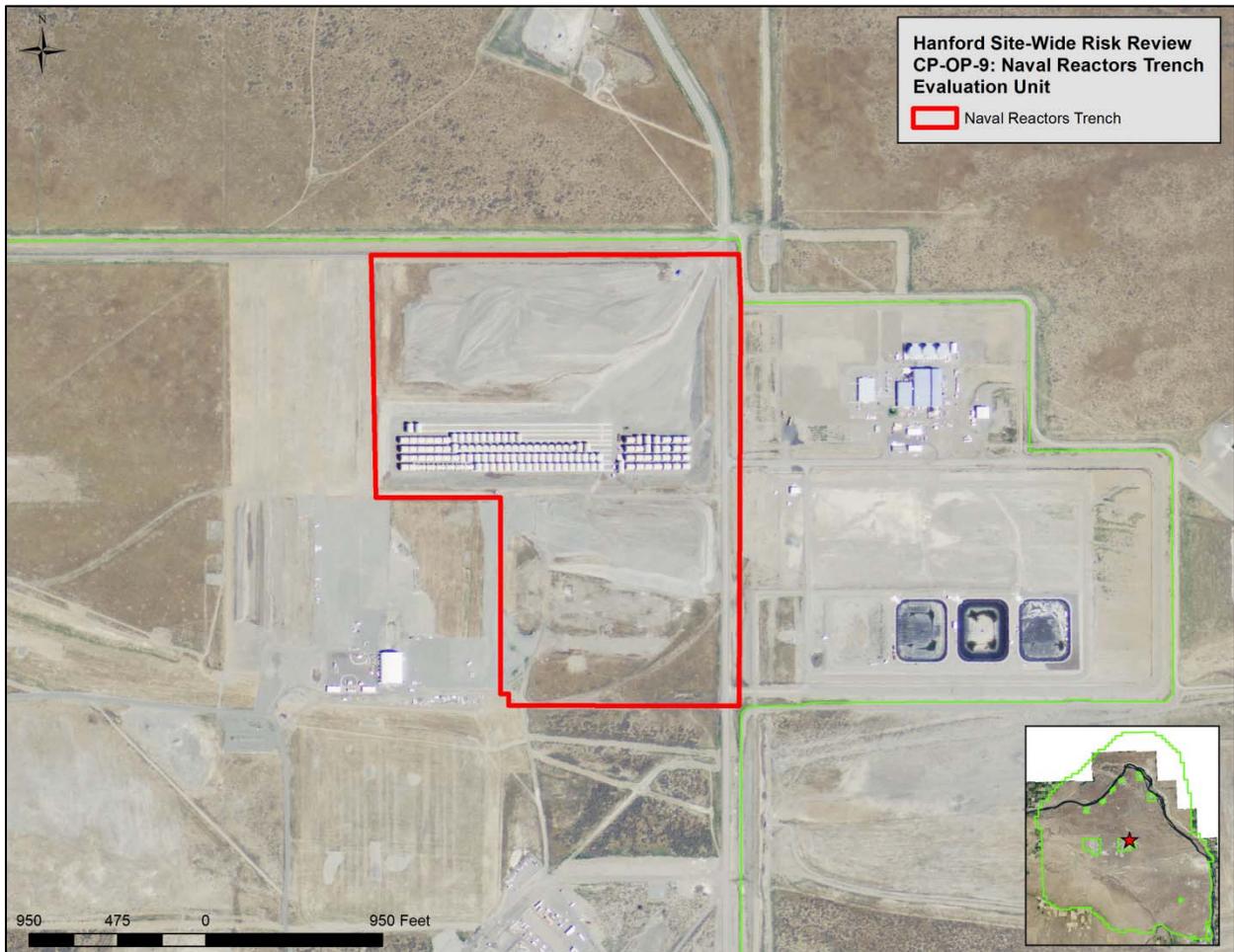


Figure J.114. CP-OP-9 (Naval Reactors Trench) Site Location Map

CP-OP-9: Naval Reactors Trench

⁴⁹ MSA (Mission Support Alliance) maintains biological resource information for the Hanford Site for the Department of Energy.

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the current Endangered and Threatened Species (Federal and State) distribution data; priority habitats as defined by Washington Department of Fish and Wildlife; available current aerial imagery, locations of Hanford Site waste units and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data records.

The following steps were taken to assess the EU associated with the Naval Reactors Trench:

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. A pedestrian survey was conducted within the EU boundary by experienced shrub-steppe ecologists.
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2013 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.
6. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

The Naval Reactors Trench EU encompasses a large open pit with a very large mound of soil removed from the pit to the north and a smaller pit and disturbed area on the south. The bottom and slopes of the main pit are kept free of vegetation. The mound consists of coarse gravel and cobbles with sand, but native species (i.e., Sandberg’s bluegrass [*Poa secunda*] and Indian ricegrass [*Achnatherum hymenoides*]) and introduced species (i.e., cheatgrass [*Bromus tectorum*] and Russian thistle [*Salsola tragus*]) have colonized the surface of the mound and the lip of the pit.

The smaller pit in the southern part of the EU is dominated by native and introduced grasses (sand dropseed (*Sporobolus cryptandrus*) and cheatgrass, respectively) with some Russian thistle (Table J.100). The semi-circular patch of level 3 resource on the south edge of the EU (Figure J.115) is based on a previously noted individual occurrence of a state sensitive species (Piper’s daisy [*Erigeron piperianus*]).

Landscape Evaluation and Resource Classification:

Over 99% of the Nuclear Reactors Trench EU is classified as level 2 or below, with roughly 1/3 of the area in each of resource levels 0, 1 and 2 (Table J.101). The south portion of the EU contains resources classified as level 2.

Table J.100. Percent Canopy Cover and Surface Cover Estimated at the Naval Reactors Trench Evaluation Unit

Vegetation/Surface Cover	Survey Area 2-1 (west) (%)	Survey Area 2-2 (south) (%)
Bare Ground	-	-
Introduced forb	40	20
Introduced grass	-	45
Native forb	-	-
Native grass	-	30
Successional shrub	-	-
Climax shrub	-	<1

Note: a dash (-) indicates no percent cover data were collected

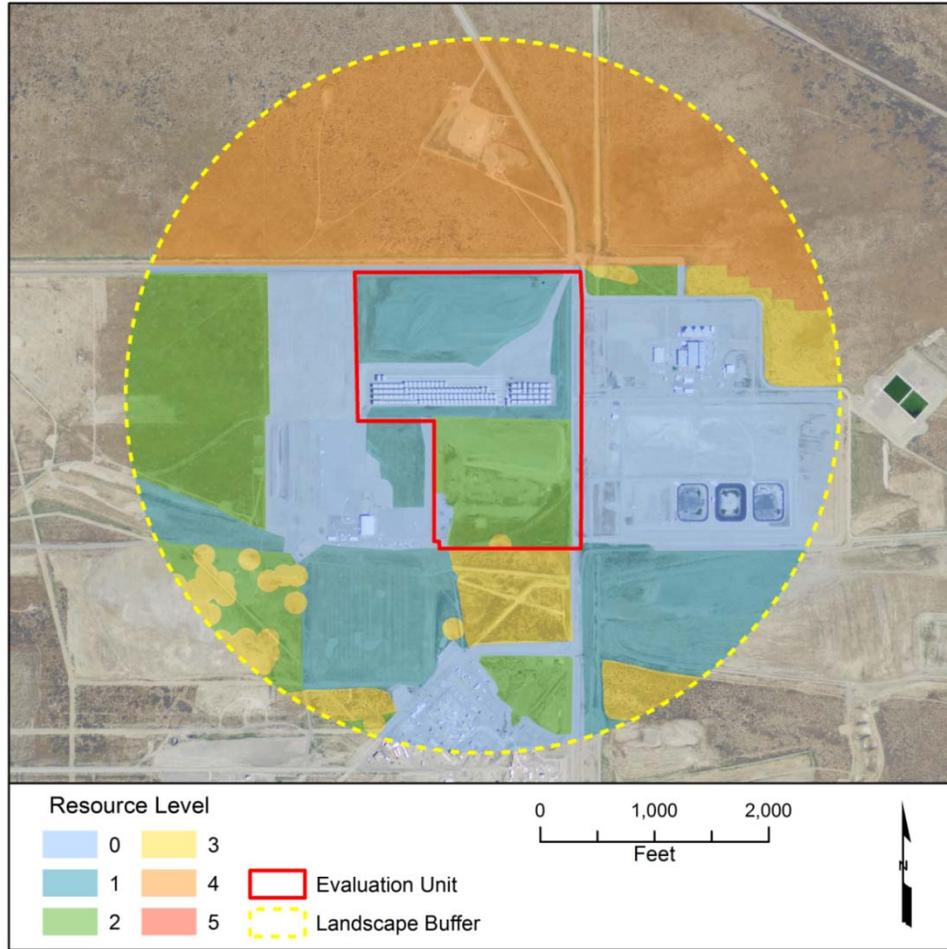


Figure J.115. Biological Resource Level Classifications Based on the June 10, 2015 Survey at the Naval Reactors Trench Evaluation Unit (red solid line) and Adjacent Landscape Buffer Area (yellow dashed line).

Table J.101. Area and Proportion of Each Biological Resource Level Within the Naval Reactors Trench Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources.

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
0	25.6	184.3	209.9	29.73%	39.15%	9.43%
1	36.4	93.9	130.3	18.45%	13.30%	-5.15%
2	29.7	81.5	111.2	15.75%	11.55%	-4.20%
3	0.5	56.6	57.1	8.08%	8.01%	-0.07%
4	0	197.7	197.7	27.99%	27.99%	0.00%
5	0	0	0	0.00%	0.00%	0.00%
Total	92.1	614.0	706.1	100.00%	100.00%	

¹ Resource levels for both the evaluation unit and adjacent landscape boundary were reviewed in the field and via imagery during May-August 2015 and revised to reflect current habitats conditions.

² Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.

The amount and proximity of biological resources surrounding the Naval Reactors Trench EU were examined within the adjacent landscape buffer area, which extends 3129 ft (954 m) from the geometric center of the EU (Figure J.115). The landscape west, south and east of the EU is mostly waste sites and disturbed sites, comprising 63% of the combined EU and adjacent landscape buffer area (Table J.101). Several other EUs (e.g., ETF, B Ponds, and 200E Burials Grounds EUs) fall within the buffer area and more details can be found on resources and plant and animal species lists in those sections of this report.

The 200-East Area fence is immediately north of the EU and marks the boundary between the industrial landscape and one that is relatively undisturbed. The northern part of the combined EU and buffer area comprises 8% level 3 and 28% level 4 biological resources that are contiguous across a large portion of the Hanford Site.

Assumptions and Uncertainty:

Although all observations for species of concern and current conditions of biological resources were noted during surveys and evaluations conducted in 2015, the presence or absence of species cannot be assumed or predicted for future years. Field reconnaissance and surveys of evaluation units at the time of remediation will need to be conducted to verify resources and evaluate ecological conditions at that time.

Summary of Ecological Review:

- Nearly 100% of the EU is characterized as level 2 resources or lower. Loss of this habitat is not expected to impact connectivity with habitat outside the 200-East Area.

References:

- DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 0.
- U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act. <http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>
- U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington. http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902
- Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. <http://wdfw.wa.gov/conservation/phs/list/>
- Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington. <http://wdfw.wa.gov/conservation/endangered/>
- Washington Noxious Weed Control Board. 2014. Noxious Weed List. <http://www.nwcb.wa.gov/>
- Washington State Department of Natural Resources. 2014. Washington Natural Heritage Program Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

Definitions and Acronyms:

Adjacent Landscape Buffer – a circular area adjacent to and outside the EU boundary with the center of the circle at the centroid of the EU, and with a radius that is 1 times the maximum dimension (width or length—whichever is greatest). This circular buffer area is used to evaluate indirect effects and assess the remediation in relation to the landscape features and resources adjacent to the EU. This circular area is generally at least 3 times the area of the EU.

Biological Resource Levels (from DOE-RL-96-32-01) –

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats.
- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks.
- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake

hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.

- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.
- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.
- Level 0 resources consist of non-native plants and animals (unless otherwise listed at a higher level), non-vegetated areas, and industrial areas.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

MBTA – Migratory Bird Treaty Act; referring to species listed and protected under the federal Act.

PNNL ECAP (Ecological Compliance and Assessment Project) Database – PNNL performed ecological reviews for individual projects and annually surveyed selected areas and buildings on the Hanford Site for DOE-RL under the DOE's Public Safety and Resource Protection Program until 2011. The data collected during those surveys is archived in the ECAP database, and is used to supplement ecological evaluations as available.

Priority Habitats – Priority habitats are habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type (e.g., shrub-steppe) or dominant plant species (e.g., juniper savannah), a described successional stage (e.g., old-growth forest), or a specific habitat feature (e.g., cliffs).

Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

Field Data Records

Plant Species Identified During Visual Surveys June 10 2015, Naval Reactors Trench EU			
Patch ID	Name	Common name	Abundance
0-1	no vegetation	no vegetation	
1-1	<i>Achillea millefolium</i>	yarrow	
1-1	<i>Achnatherum hymenoides</i>	indian ricegrass	
1-1	<i>Bromus tectorum</i>	cheatgrass	5
1-1	<i>Ericameria nauseosa</i>	gray rabbitbrush	
1-1	<i>Machaeranthera canescens</i>	hoary aster	
1-1	<i>Poa secunda</i>	Sandberg's bluegrass	
1-1	<i>Salsola tragus</i>	Russian thistle	1
1-1	<i>Tragopogon dubius</i>	Yellow salsify	
1-2	<i>Salsola tragus</i>	Russian thistle	5
2-1	<i>Artemisia tridentata</i>	big sagebrush	only 1 plant
2-1	<i>Bromus tectorum</i>	cheatgrass	
2-1	<i>Poa secunda</i>	Sandberg's bluegrass	
2-1	<i>Salsola tragus</i>	Russian thistle	40
2-2	<i>Agropyron cristatum</i>	crested wheatgrass	
2-2	<i>Artemisia tridentata</i>	big sagebrush	1
2-2	<i>Bromus tectorum</i>	cheatgrass	20
2-2	<i>Ericameria nauseosa</i>	gray rabbitbrush	
2-2	<i>Hesperostipa comata</i>	needle-and-thread grass	
2-2	<i>Poa secunda</i>	Sandberg's bluegrass	
2-2	<i>Salsola tragus</i>	Russian thistle	
2-2	<i>Sisymbrium altissimum</i>	Jim Hill's tumbled mustard	
2-2	<i>Sitanion hystrix</i>	bottlebrush grass	
2-2	<i>Sporobolus cryptandrus</i>	sand dropseed	
2-2	<i>Stephanomeria paniculata</i>	stiff wirelettuce	
2-2	<i>Tragopogon dubius</i>	Yellow salsify	

Bird, Mammal and Herpetofauna Species June 10 2015, Naval Reactors Trench EU			
Patch ID	Name	Common name	Comment
0-1	<i>Hirundo pyrrhonota</i>	cliff swallow	many nesting on reactors
0-1	<i>Sturnus vulgaris</i>	European starling	flying
0-1	<i>Columba livia</i>	rock dove	2 flying
2-2		large mammal	digs
2-2	<i>Carpodacus mexicanus</i>	house finch	2 on dead sagebrush

Evaluation Unit: 242-A Evaporator
 ID: CP-OP-10
 Group: Operations
 Operable Unit Cross-Walk: NA
 Related EU: CP-TF-5
 Sites & Facilities: Operations and D&D of the 242-A evaporator.
 Key Data Sources Docs: DOE/RL-96-32 2013; Mission Support Alliance maps⁵⁰
 Field Survey Date: 06/10/2015
 Datasheet prepared by: MAC, KDH, SAM 10/13/2015
 Datasheet reviewed by:



Figure J.116. CP-OP-10 (242-A Evaporator) Site Location Map

CP-OP-10: 242-A Evaporator

⁵⁰ MSA (Mission Support Alliance) maintains biological resource information for the Hanford Site for the Department of Energy.

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the current Endangered and Threatened Species (Federal and State) distribution data; priority habitats as defined by Washington Department of Fish and Wildlife; available current aerial imagery, locations of Hanford Site waste units and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data records.

The following steps were taken to assess the EU associated with the 242-A Evaporator:

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. A pedestrian survey was conducted within the EU boundary by experienced shrub-steppe ecologists.
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2013 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.
6. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

Survey performed on June 6, 2015 found no vegetation within the EU other than a small shade tree. Cliff swallows (*Hirundo pyrrhonota*) were observed nesting on the north side of the building and a western kingbird (*Tyrannus verticalis*) was heard in the vicinity (see the field data records at the end of this section).

Table J.102. Percent Canopy Cover and Surface Cover Estimated at the 242-A Evaporator Evaluation Unit

Vegetation/Surface Cover	Survey Area (% cover)
Bare Ground	100

Landscape Evaluation and Resource Classification:

Both the 242-A Evaporator EU and its surrounding buffer area are classified as resource level 0 (Figure J.117, Table J.103). Together, the EU and surrounding buffer area cover 6.8 acres.

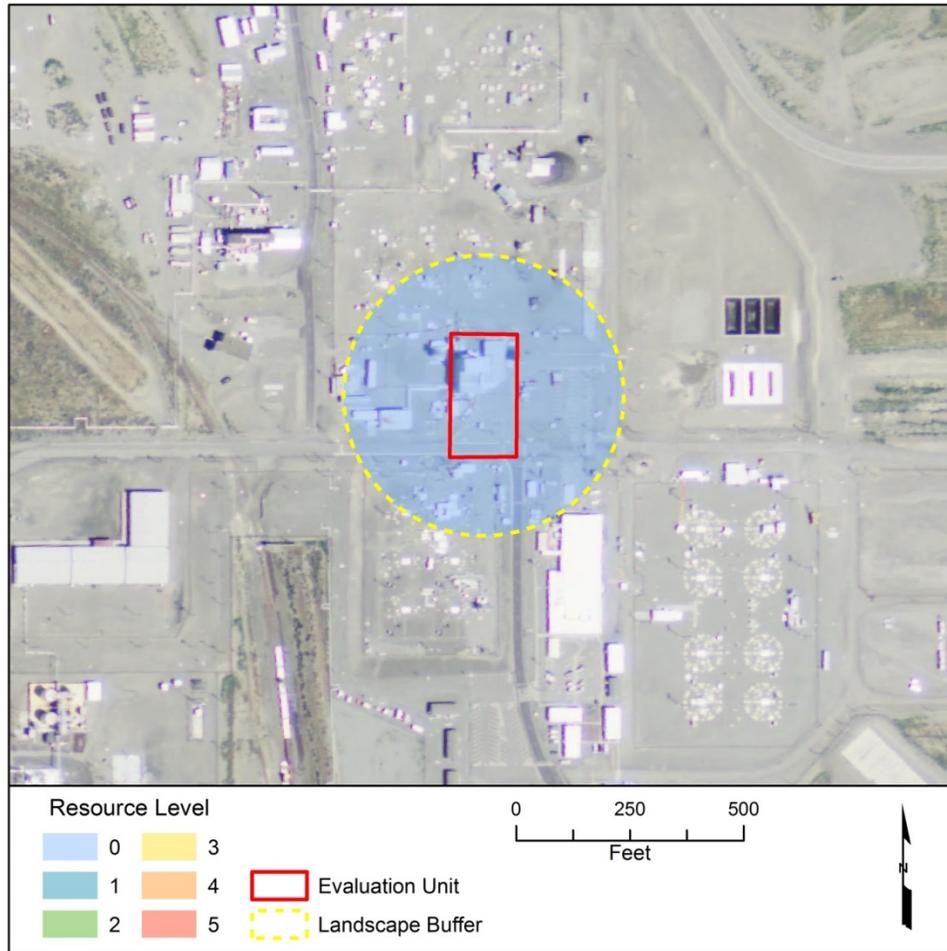


Figure J.117. Biological Resource Level Classifications Based on the June 10, 2015 Survey at the 242-A Evaporator Evaluation Unit (red solid line) and Adjacent Landscape Buffer Area (yellow dashed line).

Assumptions and Uncertainty:

Although all observations for species of concern and current conditions of biological resources were noted during surveys and evaluations conducted in 2015, the presence or absence of species cannot be assumed or predicted for future years. Field reconnaissance and surveys of evaluation units at the time of remediation will need to be conducted to verify resources and evaluation ecological conditions at that time.

Table J.103. Area and Proportion of Each Biological Resource Level Within the 242-A Evaporator Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources.

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined	Percent of Resource Level in Combined	Percent Difference at Landscape
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				Total Area	Total Area After Cleanup ²	Scale After Cleanup ²
0	0.9	5.9	6.8	100.00%	100.00%	0.00%
1	0	0	0	0.00%	0.00%	0.00%
2	0	0	0	0.00%	0.00%	0.00%
3	0	0	0	0.00%	0.00%	0.00%
4	0	0	0	0.00%	0.00%	0.00%
5	0	0	0	0.00%	0.00%	0.00%
Total	0.9	5.9	6.8	100.00%	100.00%	

1 Resource levels for both the evaluation unit and adjacent landscape boundary were reviewed in the field and via imagery during May-August 2015 and revised to reflect current habitats conditions.

2 Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.

Summary of Ecological Review:

- 100% of the EU and adjacent landscape buffer area are classified as level 0; consequently there will no loss of habitat during cleanup activities.

References:

DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 0.

U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act. <http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>

U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington. http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902

Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. <http://wdfw.wa.gov/conservation/phs/list/>

Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington. <http://wdfw.wa.gov/conservation/endangered/>

Washington Noxious Weed Control Board. 2014. Noxious Weed List. <http://www.nwcb.wa.gov/>

Washington State Department of Natural Resources. 2014. Washington Natural Heritage Program Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

Definitions and Acronyms:

Adjacent Landscape Buffer – a circular area adjacent to and outside the EU boundary with the center of the circle at the centroid of the EU, and with a radius that is 1 times the maximum

dimension (width or length—whichever is greatest). This circular buffer area is used to evaluate indirect effects and assess the remediation in relation to the landscape features and resources adjacent to the EU. This circular area is generally at least 3 times the area of the EU.

Biological Resource Levels (from DOE-RL-96-32-01) –

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats.
- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks.
- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub-steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.
- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.
- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.
- Level 0 resources consist of non-native plants and animals (unless otherwise listed at a higher level), non-vegetated areas, and industrial areas.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

MBTA – Migratory Bird Treaty Act; referring to species listed and protected under the federal Act.

PNNL ECAP (Ecological Compliance and Assessment Project) Database – PNNL performed ecological reviews for individual projects and annually surveyed selected areas and buildings on the Hanford Site for DOE-RL under the DOE's Public Safety and Resource Protection Program until 2011. The data collected during those surveys is archived in the ECAP database, and is used to supplement ecological evaluations as available.

Priority Habitats – Priority habitats are habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type (e.g., shrub-steppe) or dominant plant species (e.g., juniper savannah), a described successional stage (e.g., old-growth forest), or a specific habitat feature (e.g., cliffs).

Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being

threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

Field Data Records

Bird, Mammal and Herpetofauna Species June 10 2015, 242-A Evaporator EU			
Patch ID	Name	Common name	Comment
0	<i>Hirundo pyrrhonota</i>	cliff swallow	active nests on N side of building
0	<i>Tyrannus verticalis</i>	western kingbird	in vicinity

Evaluation Unit: ETF/LERF
 ID: CP-OP-11
 Group: Operations
 Operable Unit Cross-Walk: NA
 Related EU: CP-OP-12, CP-OP-13
 Sites & Facilities: Effluent Treatment Facility (ETF) and Liquid Effluent Retention Facility (LERF)
 Key Data Sources Docs: DOE-RL-96-32-01; MSA Biological Resources Data⁵¹
 Field Survey Date: 06/16/2015
 Datasheet prepared by: MAC, KDH, SAM 10/25/2015
 Datasheet reviewed by:

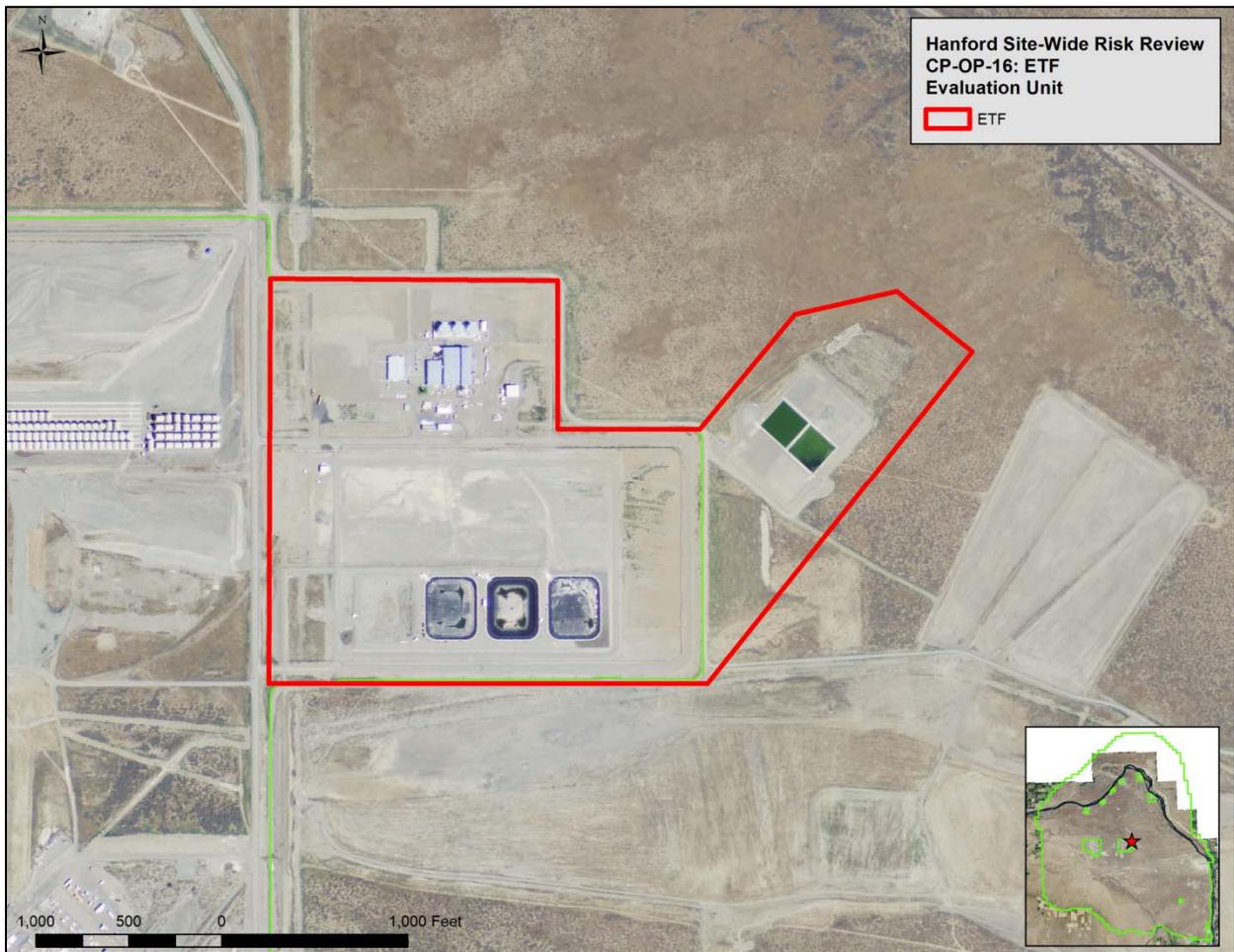


Figure J.118. CP-OP-11 (ETF/LERF) Site Location Map

CP-OP-11: ETF/LERF ETF Ecological Surveys

⁵¹ MSA (Mission Support Alliance) maintains biological resource information for the Hanford Site for the Department of Energy.

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the current Endangered and Threatened Species (Federal and State) distribution data; priority habitats as defined by Washington Department of Fish and Wildlife; available current aerial imagery, locations of Hanford Site waste units and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data tables. The following steps were taken to assess the EU associated with ETF

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. A visual survey was conducted within the EU boundary by experienced shrub-steppe ecologists. .
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2013 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.
6. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

The ETF EU is primarily bare ground surrounding buildings and effluent treatment ponds except on the east side of the EU where remnants of higher quality habitat fall within the boundary. Along the eastern edge is a narrow strip of habitat containing mature sagebrush (*Artemisia tridentata*) and spiny hopsage (*Grayia spinosa*) (Patch ID 3-1 in Table J.104). The understory in this strip has only the introduced forb Russian thistle (*Salsola tragus*) in the southern portion, but along this edge to the northeast the understory contains decreasing Russian thistle and increasing cheatgrass (*Bromus tectorum*) and native forbs and grasses.

Table J.104. Percent Canopy Cover and Surface Cover Estimated at the ETF Evaluation Unit

Vegetation/Surface Cover	Survey Area 2-1 (%)	Survey Area 3-1 (%)
Bare Ground	-	-
Introduced forb	-	5
Introduced grass	10	15
Native forb	-	-
Native grass	15	-
Successional shrub	25	-
Climax shrub	-	20

Note: a dash (-) indicates no percent cover data was collected

A patch of successional native vegetation (level 2 resource) containing 25% gray rabbitbrush (*Ericameria nauseosa*) and 15% Sandberg's bluegrass (*Poa secunda*) occurs at the northeast end of the EU (Figure J.119). This area is identified as habitat for the black-tailed jackrabbit (*Lepus californicus*), a Washington state candidate. Rabbit scat was observed in the area but could not be identified to genus. Species lists from the June survey are provided at the end of this section.

Landscape Evaluation and Resource Classification:

More than 82% of the habitat within the EU is covered by ponds, buildings and bare ground which are classified as level 0 biological resources (Figure J.119, Table J.105). An additional 8% of the habitat is classified as level 1 resource where cheatgrass and Russian thistle dominate. The remaining 7% consists of successional vegetation and somewhat degraded climax vegetation (levels 2 and 3, respectively).

The amount and proximity of biological resources surrounding the ETF EU were examined within the adjacent landscape buffer area, which extends 4185 ft (1276 m) from the geometric center of the EU (Figure J.119). Habitats to the west, east and south of the EU are a patchwork of level 0 (20%), level 1 and 2 resources (more than 31%), and isolated patches of level 3 shrub-steppe habitat (approximately 14%). North of the EU, the habitat within the adjacent landscape buffer is relatively undisturbed and is classified as a level 4 resource, with a mosaic of climax shrub-steppe with big sagebrush and spiny hopsage and native steppe.

Assumptions and Uncertainty:

Although all observations for species of concern and current conditions of biological resources were noted during surveys and evaluations conducted in 2015, the presence or absence of species cannot be assumed or predicted for future years. Field reconnaissance and surveys of evaluation units at the time of remediation will need to be conducted to verify resources and evaluation ecological conditions at that time.

Summary of Ecological Review:

- Over 82% of the EU is classified as level 0 resource. Loss of the remaining 18% of primarily level 2 and 3 resources within the EU during remediation activities would not be expected to cause significant impacts to wildlife populations.
- The eastern part of the EU falls within an area identified as black-tailed jackrabbit habitat by DOE's Public Safety and Resource Protection program⁵². Black-tailed jackrabbits are a Washington state candidate for listing as threatened or endangered.
- Level 2 and level 3 habitats within the combined EU and adjacent landscape buffer area are fragmented and are not contiguous with similar habitat outside the 200-East Area.

⁵² Map and database information about Hanford Biological Resources were supplied by Mission Support Alliance, which operates the Public Safety and Resource Protection program for DOE-RL.

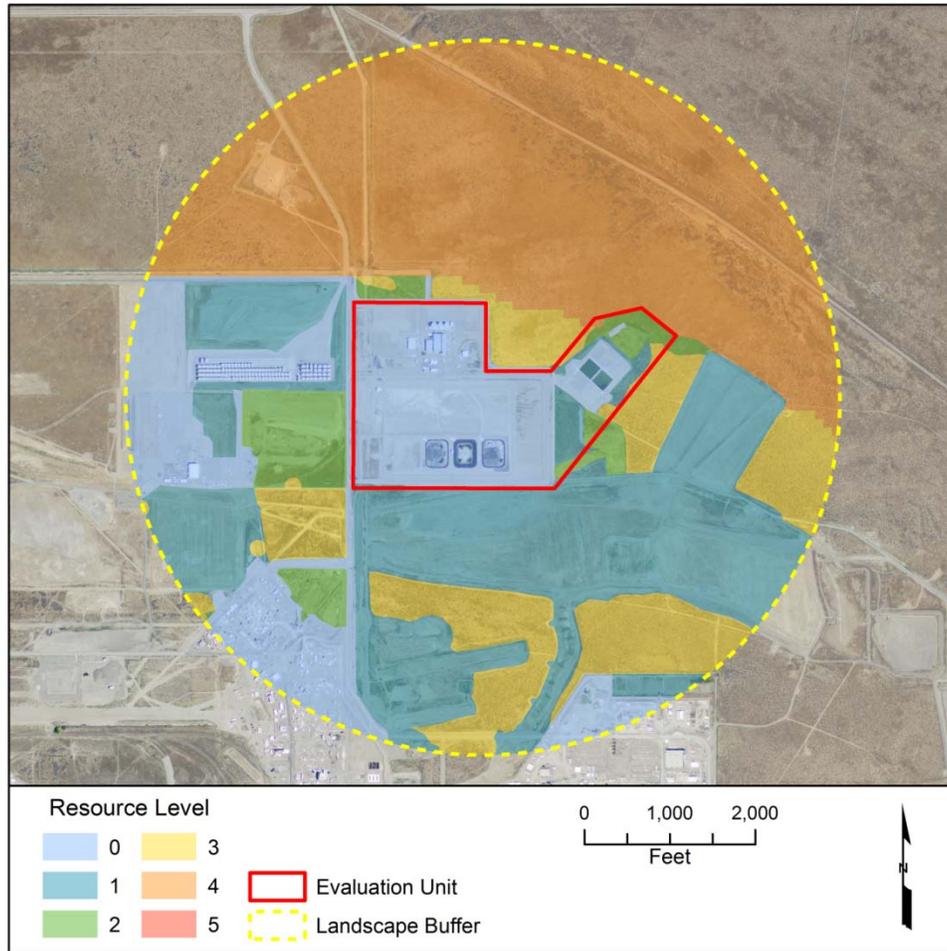


Figure J.119. Biological Resource Level Classifications Based on the June 16, 2015 Survey at the ETF Evaluation Unit (red solid line) and Adjacent Landscape Buffer Area (yellow dashed line).

Table J.105. Area and Proportion of Each Biological Resource Level Within the ETF Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources.

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
0	111.8	144.9	256.6	20.32%	22.23%	1.92%
1	11.3	325.8	337.1	26.69%	25.79%	-0.89%
2	9.5	50.0	59.5	4.71%	3.96%	-0.75%
3	2.9	168.8	171.8	13.60%	13.36%	-0.24%
4	0.3	437.8	438.2	34.69%	34.66%	-0.03%
5	0	0	0	0.00%	0.00%	0.00%
Total	135.9	1127.2	1263.1	100.00%	100.00%	

1 Resource levels for both the evaluation unit and adjacent landscape boundary were reviewed in the field and via imagery during May-August 2015 and revised to reflect current habitats conditions.

2 Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.

References:

- DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 0.
- U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act. <http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>
- U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington. http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902
- Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. <http://wdfw.wa.gov/conservation/phs/list/>
- Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington. <http://wdfw.wa.gov/conservation/endangered/>
- Washington Noxious Weed Control Board. 2014. Noxious Weed List. <http://www.nwcb.wa.gov/>
- Washington State Department of Natural Resources. 2014. Washington Natural Heritage Program Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

Definitions and Acronyms:

Adjacent Landscape Buffer – a circular area adjacent to and outside the EU boundary with the center of the circle at the centroid of the EU, and with a radius that is 1 times the maximum dimension (width or length—whichever is greatest). This circular buffer area is used to evaluate indirect effects and assess the remediation in relation to the landscape features and resources adjacent to the EU. This circular area is generally at least 3 times the area of the EU.

Biological Resource Levels (from DOE-RL-96-32-01) –

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats.
- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks.
- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub-steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.
- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.
- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.
- Level 0 resources consist of non-native plants and animals (unless otherwise listed at a higher level), non-vegetated areas, and industrial areas.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

MBTA – Migratory Bird Treaty Act; referring to species listed and protected under the federal Act.

PNNL ECAP (Ecological Compliance and Assessment Project) Database – PNNL performed ecological reviews for individual projects and annually surveyed selected areas and buildings on the Hanford Site for DOE-RL under the DOE's Public Safety and Resource Protection Program until 2011. The data collected during those surveys is archived in the ECAP database, and is used to supplement ecological evaluations as available.

Priority Habitats – Priority habitats are habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation

type (e.g., shrub-steppe) or dominant plant species (e.g., juniper savannah), a described successional stage (e.g., old-growth forest), or a specific habitat feature (e.g., cliffs).

Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

Field Data Records

Plant Species Identified During Visual Surveys June 16 2015, ETF EU			
Patch ID	Name	Common name	Abundance
3-1	<i>Achillea millefolium</i>	yarrow	
3-1	<i>Achnatherum hymenoides</i>	indian ricegrass	
3-1	<i>Artemisia tridentata</i>	big sagebrush	10
3-1	<i>Balsamorhiza careyana</i>	Carey's balsamroot	
3-1	<i>Bromus tectorum</i>	cheatgrass	15
3-1	<i>Chaenactis douglasii</i>	hoary falseyarrow	
3-1	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	
3-1	<i>Grayia spinosa</i>	spiny hopsage	10
3-1	<i>Phlox longifolia</i>	longleaf phlox	
3-1	<i>Salsola tragus</i>	Russian thistle	5
3-1	<i>Tragopogon dubius</i>	Yellow salsify	

Bird, Mammal and Herpetofauna Species June 16 2015, ETF EU			
Patch ID	Name	Common name	Comment
3-1	<i>Canis latrans</i>	coyote	tracks, digs
3-1		unidentified rabbit	jackrabbit or cottontail scat
3-1	<i>Eremophila alpestris</i>	horned lark	2 perched
3-1	<i>Sturnella neglecta</i>	western meadowlark	sing nearby

Evaluation Unit: TEDF
 ID: CP-OP-12
 Group: Operations
 Operable Unit Cross-Walk: NA
 Related EU: NA
 Sites & Facilities: Operations and closure of the Treated Effluent Disposal Facility (TEDF).
 Key Data Sources Docs: DOE-RL-96-32-01; Mission Support Alliance maps⁵³
 Field Survey Date: 06/10/2015
 Datasheet prepared by: MAC, KDH, SAM 10/27/2015
 Datasheet reviewed by:

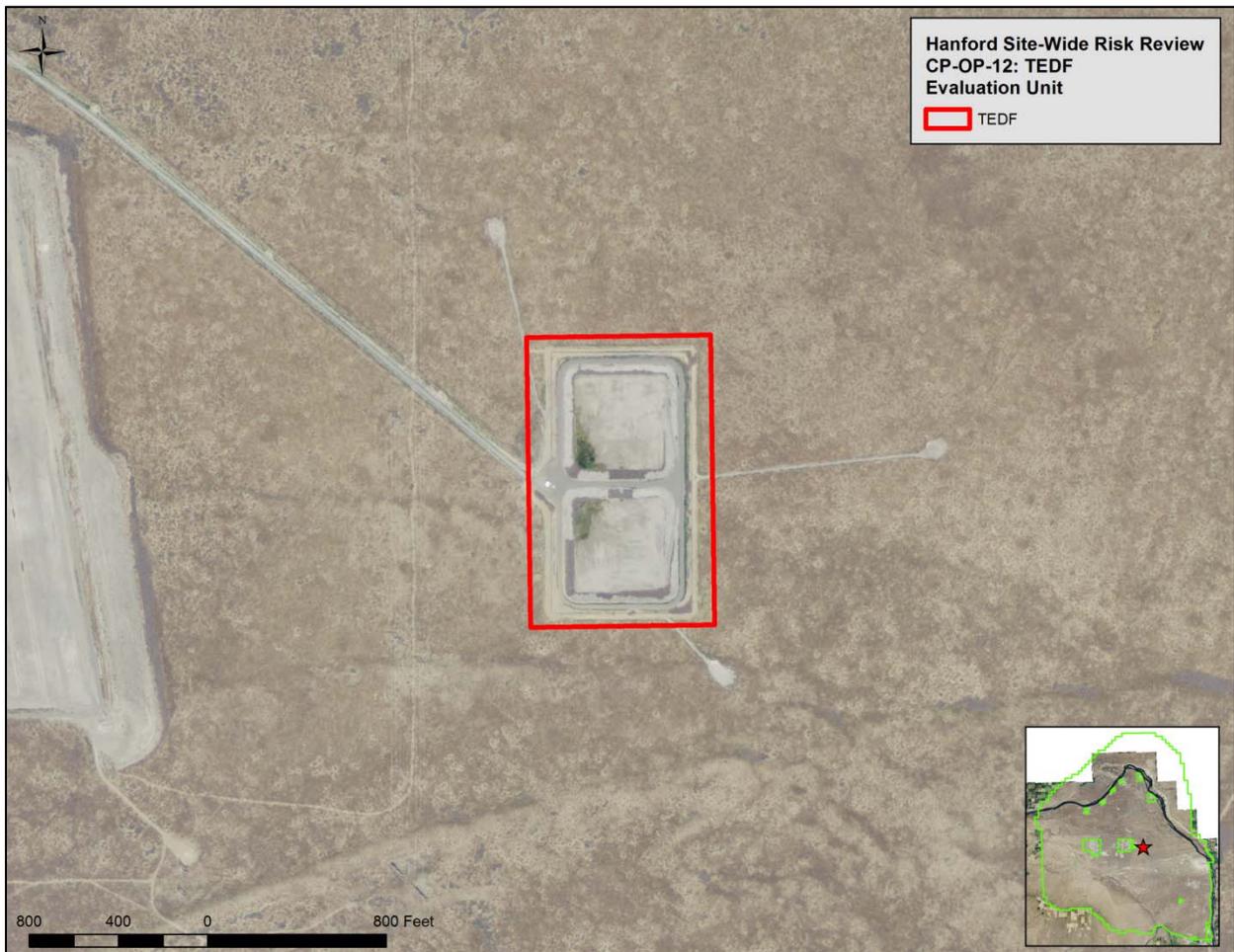


Figure J.120. CP-OP-12 (TEDF) Site Location Map

CP-OP-12: TEDF

⁵³ MSA (Mission Support Alliance) maintains biological resource information for the Hanford Site for the Department of Energy.

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the current Endangered and Threatened Species (Federal and State) distribution data; priority habitats as defined by Washington Department of Fish and Wildlife; available current aerial imagery, locations of Hanford Site waste units and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data records.

The following steps were taken to assess the EU associated with TEDF:

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. A pedestrian survey was conducted within the EU boundary by experienced shrub-steppe ecologists.
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2013 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.
6. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

Within the TEDF EU an access road leads to the facility and to wells on the north, east and south sides of TEDF (Figure J.120). Inside the facility fence are 2 retention basins encircled by a narrow strip of bare ground, and a dirt road surrounds the outside of the fence. The EU extends into the surrounding level 3 habitat. On the east the habitat consists of successional shrubs (green rabbitbrush [*Chrysothamnus viscidiflorus*]) with an understory dominated by introduced grass and forbs (Table J.106). On the west the habitat has a similar understory but the shrub layer is occupied by big sagebrush (*Artemisia tridentata*), a climax shrub, and sparse green rabbitbrush. Field data records at the end of this section provide lists of the plants and animals observed in June 2015.

Table J.106. Percent Canopy Cover and Surface Cover Estimated at the TEDF Evaluation Unit

Vegetation/Surface Cover	Survey Area 3 (east) (%cover)	Survey Area 3 (west) (% cover)
Bare Ground	-	-
Introduced forb	30	30
Introduced grass	41	40
Native forb	-	-
Native grass	5	5
Successional shrub	8	2
Climax shrub	0	2

Note: a dash (-) indicates no percent cover data were collected

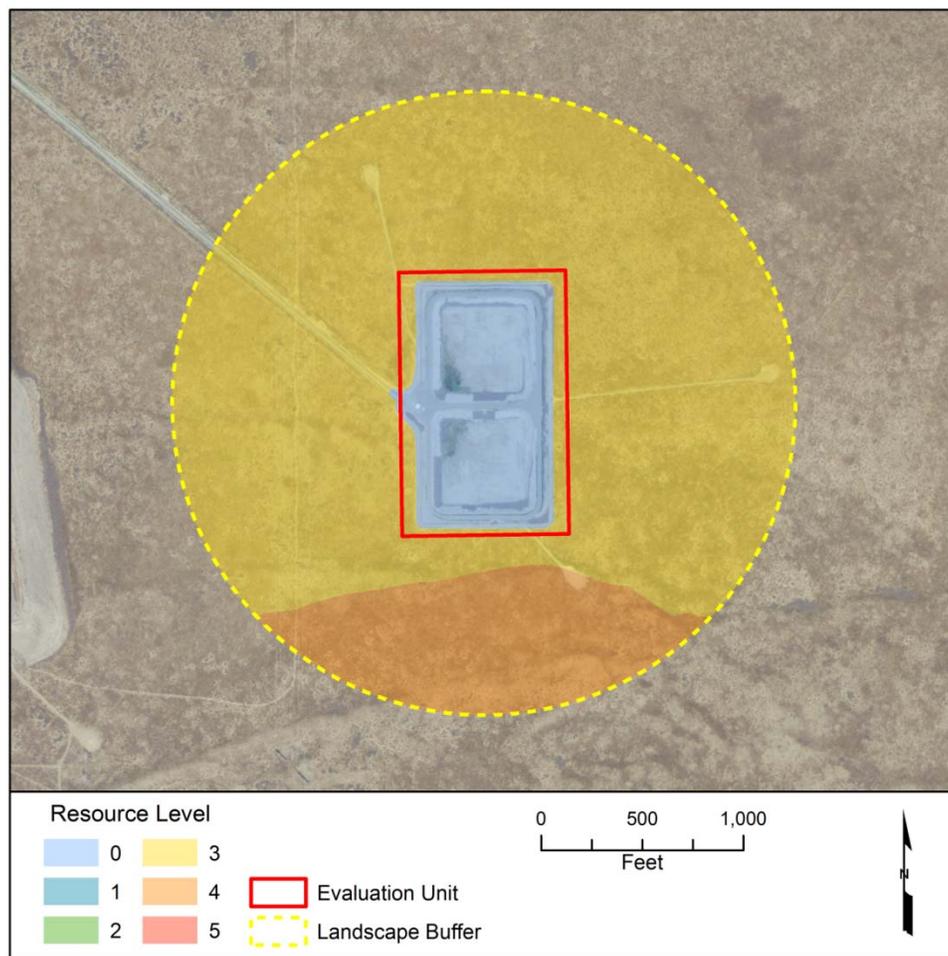


Figure J.121. Biological Resource Level Classifications Based on the June 10, 2015 Survey at the TEDF Evaluation Unit (red solid line) and Adjacent Landscape Buffer Area (yellow dashed line).

Landscape Evaluation and Resource Classification:

The TEDF EU boundary encompasses the facility basins, a perimeter road outside the fence and a thin strip of vegetated habitat beyond the perimeter road (Figure J.121). Nearly 79% of the EU is classified as level 0 resources; the remaining 21% is classified as a level 3 resource (Table J.107).

The amount and proximity of biological resources surrounding the TEDF EU were examined within the adjacent landscape buffer area, which extends 1541 ft (470 m) from the geometric center of the EU. The TEDF facility, access road and nearby monitoring well pad are the only resources classified as level 0 comprising approximately 11% of the combined EU and adjacent landscape buffer area (Table J.107). Level 3 resources surround the EU and cover approximately 74% of the combined EU and buffer area, while about 14% of the combined area is covered by level 4 resources; there are no resources classified as level 1, 2 or 5.

Table J.107. Area and Proportion of Each Biological Resource Level Within the TEDF Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources.

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
0	19.4	0.1	19.5	11.39%	14.45%	3.06%
1	0	0	0	0.00%	0.00%	0.00%
2	0	0	0	0.00%	0.00%	0.00%
3	5.2	122.1	127.3	74.32%	71.26%	-3.06%
4	0	24.5	24.5	14.28%	14.28%	0.00%
5	0	0	0	0.00%	0.00%	0.00%
Total	24.7	146.6	171.3	100.00%	100.00%	

¹ Resource levels for both the evaluation unit and adjacent landscape boundary were reviewed in the field and via imagery during May-August 2015 and revised to reflect current habitats conditions.

² Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.

Assumptions and Uncertainty:

Although all observations for species of concern and current conditions of biological resources were noted during surveys and evaluations conducted in 2015, the presence or absence of species cannot be assumed or predicted for future years. Field reconnaissance and surveys of

evaluation units at the time of remediation will need to be conducted to verify resources and evaluation ecological conditions at that time.

Summary of Ecological Review:

- Approximately 79% of the EU is classified as level 0 resources. There are no resources classified as levels 1 or 2.
- About 21% of the EU is classified as a level 3 resource that is contiguous with similar resources within the adjacent landscape buffer. Loss of this habitat is not expected to significantly impact connectivity between portions of level 3 resources occurring within the adjacent landscape buffer area or areas beyond.
- Over 88% of the combined EU and buffer area are covered by habitat classified as level 3 or above that is contiguous with similar habitat extending across much of the Hanford Site.

References:

- DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 0.
- U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act. <http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>
- U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington. http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902
- Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. <http://wdfw.wa.gov/conservation/phs/list/>
- Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington. <http://wdfw.wa.gov/conservation/endangered/>
- Washington Noxious Weed Control Board. 2014. Noxious Weed List. <http://www.nwcb.wa.gov/>
- Washington State Department of Natural Resources. 2014. Washington Natural Heritage Program Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

Definitions and Acronyms:

Adjacent Landscape Buffer – a circular area adjacent to and outside the EU boundary with the center of the circle at the centroid of the EU, and with a radius that is 1 times the maximum dimension (width or length—whichever is greatest). This circular buffer area is used to evaluate indirect effects and assess the remediation in relation to the landscape features and resources adjacent to the EU. This circular area is generally at least 3 times the area of the EU.

Biological Resource Levels (from DOE-RL-96-32-01) –

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats.

- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks.
- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub-steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.
- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.
- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.
- Level 0 resources consist of non-native plants and animals (unless otherwise listed at a higher level), non-vegetated areas, and industrial areas.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

MBTA – Migratory Bird Treaty Act; referring to species listed and protected under the federal Act.

PNNL ECAP (Ecological Compliance and Assessment Project) Database – PNNL performed ecological reviews for individual projects and annually surveyed selected areas and buildings on the Hanford Site for DOE-RL under the DOE’s Public Safety and Resource Protection Program until 2011. The data collected during those surveys is archived in the ECAP database, and is used to supplement ecological evaluations as available.

Priority Habitats – Priority habitats are habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type (e.g., shrub-steppe) or dominant plant species (e.g., juniper savannah), a described successional stage (e.g., old-growth forest), or a specific habitat feature (e.g., cliffs).

Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

Field Data Records

Plant Species Identified During Visual Surveys June 10 2015, TEDF EU			
Patch ID	Name	Common name	Abundance
3-1	<i>Lactuca serriola</i>	prickly lettuce	
3-1	<i>Populus trichocarpa</i>	black cottonwood	
3-1	<i>Salsola tragus</i>	Russian thistle	1
3-1	<i>Sporobolus cryptandrus</i>	sand dropseed	
3-2	<i>Achillea millefolium</i>	yarrow	
3-2	<i>Agropyron cristatum</i>	crested wheatgrass	<1
3-2	<i>Amsinckia species</i>		
3-2	<i>Artemisia tridentata</i>	big sagebrush	2
3-2	<i>Balsamorhiza careyana</i>	Carey's balsamroot	
3-2	<i>Bromus tectorum</i>	cheatgrass	40
3-2	<i>Chondrilla juncea</i>	Rush skeletonweed	
3-2	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	8
3-2	<i>Ericameria nauseosa</i>	gray rabbitbrush	
3-2	<i>Hesperostipa comata</i>	needle-and-thread grass	<1
3-2	<i>Microsteris gracilis</i>	pink microsteris	
3-2	<i>Poa secunda</i>	Sandberg's bluegrass	5
3-2	<i>Pterysia terebinthina var. terebinthina</i>	turpentine springparsley	
3-2	<i>Salsola tragus</i>	Russian thistle	30
3-2	<i>Sisymbrium altissimum</i>	Jim Hill's tumbled mustard	
3-2	<i>Tragopogon dubius</i>	Yellow salsify	
3-2	<i>unknown Chenopod</i>		

Bird, Mammal and Herpetofauna Species June 10 2015, TEDF EU			
Patch ID	Name	Common name	Comment
3-2	<i>Tyrannus verticalis</i>	western kingbird	nearby
3-2	<i>Zenaida macroura</i>	mourning dove	3 perch fence and powerline
3-2		Unidentified lizard	tracks
3-2		Unidentified large mammal	digs

Evaluation Unit: SALDS
ID: CP-OP-13
Group: Operations
Operable Unit Cross-Walk: NA
Related EU: NA
Sites & Facilities: Operations and closure of the State Approved Land Disposal Sites (SALDS).
Key Data Sources Docs: DOE-RL-96-32-01; Mission Support Alliance maps⁵⁴
Field Survey Date: 08/11/2015
Datasheet prepared by: MAC, KDH, SAM 10/27/2015
Datasheet reviewed by:



Figure J.122. CP-OP-13 (SALDS) Site Location Map

⁵⁴ MSA (Mission Support Alliance) maintains biological resource information for the Hanford Site for the Department of Energy.

CP-OP-13: SALDS

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the current Endangered and Threatened Species (Federal and State) distribution data; priority habitats as defined by Washington Department of Fish and Wildlife; available current aerial imagery, locations of Hanford Site waste units and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data records. The following steps were taken to assess the EU associated with SALDS:

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. A pedestrian survey was conducted within the EU boundary by experienced shrub-steppe ecologists.
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2013 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.
6. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

Survey of the SALDS EU in August 2015 indicated the waste site had not been sprayed with herbicides recently, and a scattering of Russian thistle (*Salsola tragus*) was growing on the otherwise bare ground (Figure J.123). Toward the north and west edges of the EU, a band of Russian thistle and native grass occurs with increasing plant density away from the waste site. The west side of the EU has been revegetated with native grasses and shrubs including Sandberg's bluegrass (*Poa secunda*), bluebunch wheatgrass (*Pseudoroegneria spicata*), sagebrush (*Artemisia tridentata*), and gray rabbitbrush (*Ericameria nauseosa*) (Table J.108). Field data records at the end of this section provide lists of plant and animals species observed during the survey.

Table J.108. Percent Canopy Cover and Surface Cover Estimated at the SALDS Evaluation Unit

Vegetation/Surface Cover	Survey Area 2 (west side) (% cover)
Bare Ground	-
Introduced forb	-
Introduced grass	10
Native forb	-
Native grass	5
Successional shrub	1
Climax shrub	3

Note: a dash (-) indicates no percent cover data were collected

Landscape Evaluation and Resource Classification:

Within the SALDS EU, the waste site, access roads to it and a nearby well pad are bare ground classified as resource level 0. Surrounding the 1.5 acres of bare ground is just over 1 acre of resource level 1, and beyond this area, habitat is classified as a level 2 resource, although it includes patches of big sagebrush among the native and introduced grasses. One hundred percent of the habitat within the EU is classified as level 2 or below (Table J.109).

The amount and proximity of biological resources surrounding the SALDS EU were examined within the adjacent landscape buffer area, which extends 1102 feet (336 m) from the geometric center of the EU. Nearly 81% of the buffer area is classified as a level 2 resource and over 85% of the combined EU and buffer area is characterized as level 2 or lower (Table J.109). However, areas classified as level 2 include patches of sagebrush and other native vegetation.

Assumptions and Uncertainty:

Although all observations for species of concern and current conditions of biological resources were noted during surveys and evaluations conducted in 2015, the presence or absence of species cannot be assumed or predicted for future years. Field reconnaissance and surveys of evaluation units at the time of remediation will need to be conducted to verify resources and evaluate ecological conditions at that time.

Summary of Ecological Review:

- 100% of the SALDS EU is characterized as level 2 or below.

- Level 2 habitats are contiguous with level 2 and level 3 habitats outside the EU. Because the total acreage is only 6.1 acres, the loss of all habitat within the EU is not expected to significantly impact wildlife or habitat connectivity to the surrounding areas.
- More than 13% of the combined EU and buffer area is classified as level 3 resources that are contiguous with similar habitat extending across the Hanford Site.

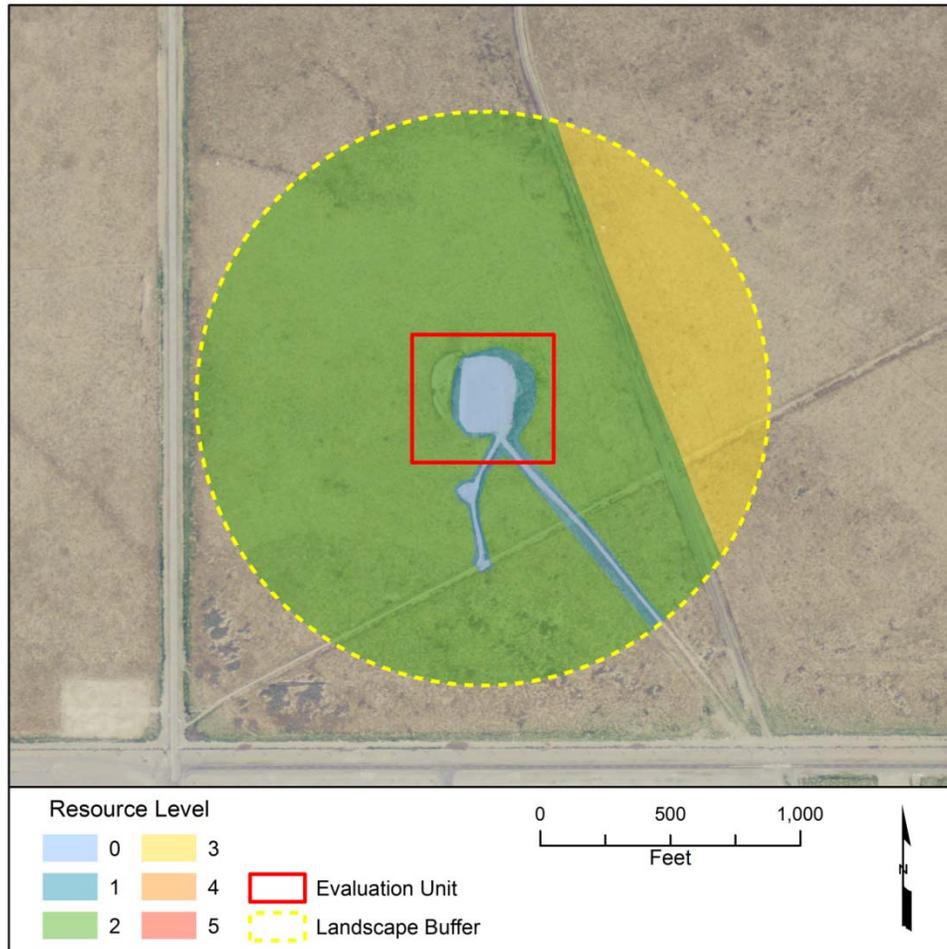


Figure J.123. Biological Resource Level Classifications Based on the August 11, 2015 Survey at the SALDS Evaluation Unit (red solid line) and Adjacent Landscape Buffer Area (yellow dashed line).

Table J.109. Area and Proportion of Each Biological Resource Level Within the SALDS Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources.

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
0	1.5	0.6	2.1	2.37%	7.72%	5.35%
1	1.1	1.2	2.3	2.63%	1.40%	-1.24%
2	3.6	65.9	69.6	79.41%	75.30%	-4.11%
3	0	13.6	13.6	15.58%	15.58%	0.00%
4	0	0	0	0.00%	0.00%	0.00%
5	0	0	0	0.00%	0.00%	0.00%
Total	6.1	81.4	87.6	100.00%	100.00%	

1 Resource levels for both the evaluation unit and adjacent landscape boundary were reviewed in the field and via imagery during May-August 2015 and revised to reflect current habitats conditions.

2 Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.

References:

- DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 0.
- U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act. <http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>
- U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington. http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902
- Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. <http://wdfw.wa.gov/conservation/phs/list/>
- Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington. <http://wdfw.wa.gov/conservation/endangered/>
- Washington Noxious Weed Control Board. 2014. Noxious Weed List. <http://www.nwcb.wa.gov/>
- Washington State Department of Natural Resources. 2014. Washington Natural Heritage Program Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

Definitions and Acronyms:

Adjacent Landscape Buffer – a circular area adjacent to and outside the EU boundary with the center of the circle at the centroid of the EU, and with a radius that is 1 times the maximum dimension (width or length—whichever is greatest). This circular buffer area is used to evaluate indirect effects and assess the remediation in relation to the landscape features and resources adjacent to the EU. This circular area is generally at least 3 times the area of the EU.

Biological Resource Levels (from DOE-RL-96-32-01) –

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats.
- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks.
- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub-steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.
- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.
- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.
- Level 0 resources consist of non-native plants and animals (unless otherwise listed at a higher level), non-vegetated areas, and industrial areas.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

MBTA – Migratory Bird Treaty Act; referring to species listed and protected under the federal Act.

PNNL ECAP (Ecological Compliance and Assessment Project) Database – PNNL performed ecological reviews for individual projects and annually surveyed selected areas and buildings on the Hanford Site for DOE-RL under the DOE's Public Safety and Resource Protection Program until 2011. The data collected during those surveys is archived in the ECAP database, and is used to supplement ecological evaluations as available.

Priority Habitats – Priority habitats are habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type (e.g., shrub-steppe) or dominant plant species (e.g., juniper savannah), a described successional stage (e.g., old-growth forest), or a specific habitat feature (e.g., cliffs).

Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

Field Data Records

Plant Species Identified During Visual Surveys August 11 2015, SALDS EU			
Patch ID	Name	Common name	Abundance
Inside EU (near site)	<i>Salsola tragus</i>	Russian thistle	15
Inside EU (near site)	<i>Bromus tectorum</i>	cheatgrass	
Inside EU (near site)	<i>Calochortus macrocarpus</i>	sagebrush mariposa lily	
Inside EU (near site)	<i>Hesperostipa comata</i>	needle-and-thread grass	
Inside EU (near site)	<i>Poa secunda</i>	Sandberg's bluegrass	
Inside EU (on/near mound)	<i>Salsola tragus</i>	Russian thistle	70
Inside EU (on/near mound)	<i>Achillea millefolium</i>	yarrow	
Inside EU (on/near mound)	<i>Agropyron cristatum</i>	crested wheatgrass	
Inside EU (on/near mound)	<i>Artemisia tridentata</i>	big sagebrush	3
Inside EU (on/near mound)	<i>Astragalus caricinus</i>	buckwheat milkvetch	
Inside EU (on/near mound)	<i>Bromus tectorum</i>	cheatgrass	10
Inside EU (on/near mound)	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	1
Inside EU (on/near mound)	<i>Ericameria nauseosa</i>	gray rabbitbrush	
Inside EU (on/near mound)	<i>Machaeranthera canescens</i>	hoary aster	
Inside EU (on/near mound)	<i>Poa secunda</i>	Sandberg's bluegrass	5
Inside EU (on/near mound)	<i>Pseudoroegneria spicata</i>	bluebunch wheatgrass	

Bird, Mammal and Herpetofauna Species August 11 2015, SALDS EU			
Patch ID	Name	Common name	Comment
EU edges	<i>Sturnella neglecta</i>	western meadowlark	in area
EU edges	<i>Eremophila alpestris</i>	horned lark	several flitting around
EU edges	<i>Canis latrans</i>	coyote	recent scat
EU edges	<i>Uta stansburiana</i>	side-blotched lizard	ran away

Evaluation Unit: WTP
 ID: CP-OP-14
 Group: Operations
 Operable Unit Cross-Walk: NA
 Related EU: NA
 Sites & Facilities: Waste Treatment Plant Operations and D&D. Includes new tanks (if needed), preconditioning, 4 major facilities, and interim storage elements.
 Key Data Sources Docs: DOE-RL-96-32-01; Mission Support Alliance maps⁵⁵
 Field Survey Date: 06/16/2015
 Datasheet prepared by: MAC, KDH, SAM 10/26/2015
 Datasheet reviewed by:



Figure J.124. CP-OP-14 (WTP) Site Location Map

⁵⁵ MSA (Mission Support Alliance) maintains biological resource information for the Hanford Site for the Department of Energy.

CP-OP-14: WTP

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the current Endangered and Threatened Species (Federal and State) distribution data; priority habitats as defined by Washington Department of Fish and Wildlife; available current aerial imagery, locations of Hanford Site waste units and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data records.

The following steps were taken to assess the EU associated with WTP:

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. Because of construction activities within the EU, a pedestrian and driving survey was conducted around the perimeter of the EU boundary by experienced shrub-steppe ecologists. Air photographs were used to confirm resource levels in parts of the perimeter not accessible by vehicle
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2013 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.

6. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

Most of the EU consists of bare or graveled surfaces, or is part of the active construction for the future vitrification plant. Where access to the EU was restricted, review of aerial photographs revealed a relatively small area on the north side of the EU that appears to be vegetated with a few shrubs and Russian thistle (*Salsola tragus*) and/or cheatgrass (*Bromus tectorum*) (Table J.110).

Table J.110. Percent Canopy Cover and Surface Cover Estimated at the WTP Evaluation Unit

No field measurements of vegetation were taken; visual survey and evaluation of air photographs indicate the evaluation unit consists mainly of graveled surfaces, buildings, and bare soils (cover =94%) with minor introduced forbs and grass.
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Landscape Evaluation and Resource Classification:

Most of the land within the EU is either within the footprint of the future vitrification plant or is otherwise actively being used in support of construction activities, and is classified as resource level 0 (Figure J.125). About 6% of the EU on the north side is classified as resource level 1 (Table J.111) with scattered Russian thistle and possibly a couple gray rabbitbrush (*Ericameria nauseosa*).

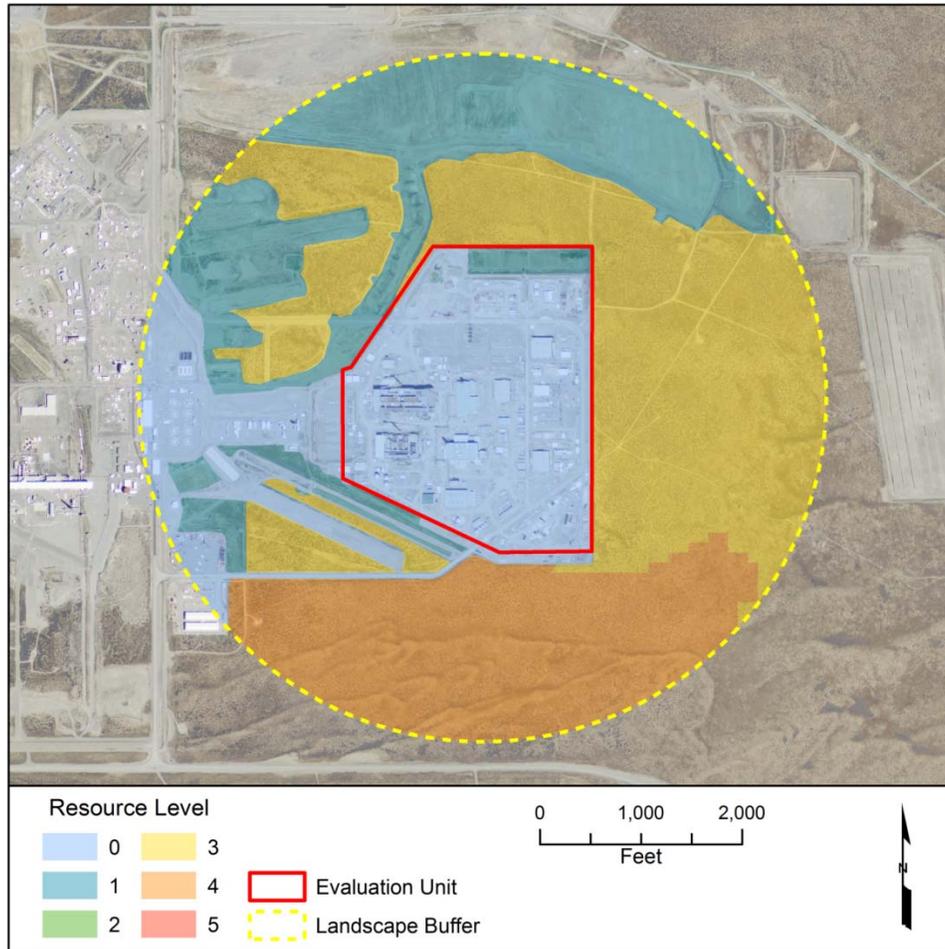


Figure J.125. Biological Resource Level Classifications Based on the June 16 Survey at the WTP Evaluation Unit (red solid line) and Adjacent Landscape Buffer Area (yellow dashed line).

The amount and proximity of biological resources surrounding the WTP EU were examined within the adjacent landscape buffer area, which extends 3401 ft (1037 m) from the geometric center of the EU (Figure J.125). Twelve percent of the buffer area is classified as level 0 and approximately 25% is classified as level 1 (Table J.111), with almost no level 2 resources. To the east and southeast of the EU the landscape contains habitat classified as level 3 and level 4, respectively. Together they comprise 63% of the adjacent landscape buffer area, and are contiguous with a much larger region of higher quality habitat.

The southeast corner of the EU and buffer area is identified as habitat for the black-tailed jackrabbit (*Lepus californicus*), a Washington state candidate species; however, no evidence of jackrabbits was found during the June survey.

Table J.111. Area and Proportion of Each Biological Resource Level Within the WTP Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources.

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
0	136.2	82.3	218.5	26.19%	27.23%	1.04%
1	8.0	174.8	182.7	21.90%	20.95%	-0.95%
2	0	0.2	0.2	0.03%	0.03%	0.00%
3	0.7	272.1	272.8	32.70%	32.61%	-0.08%
4	0	160.1	160.1	19.18%	19.18%	0.00%
5	0	0	0	0.00%	0.00%	0.00%
Total	144.9	689.4	834.3	100.00%	100.00%	

1 Resource levels for both the evaluation unit and adjacent landscape boundary were reviewed in the field and via imagery during May-August 2015 and revised to reflect current habitats conditions.

2 Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.

Assumptions and Uncertainty:

Although all observations for species of concern and current conditions of biological resources were noted during surveys and evaluations conducted in 2015, the presence or absence of species cannot be assumed or predicted for future years. Field reconnaissance and surveys of evaluation units at the time of remediation will need to be conducted to verify resources and evaluate ecological conditions at that time.

Summary of Ecological Review:

- 94% of the EU is classified as a level 0 resource.
- Loss of the remaining 6% level 1 habitat during remediation activities is not expected to impact overall connectivity with habitat outside the EU.
- The southeastern part of the EU and adjacent landscape buffer area lies within an area identified as black-tailed jackrabbit habitat (MSA 2015). Black-tailed jackrabbits are a Washington state candidate species.

References:

DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 0.

U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act. <http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>

- U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington.
http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902
- Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. <http://wdfw.wa.gov/conservation/phs/list/>
- Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington. <http://wdfw.wa.gov/conservation/endangered/>
- Washington Noxious Weed Control Board. 2014. Noxious Weed List. <http://www.nwcb.wa.gov/>
- Washington State Department of Natural Resources. 2014. Washington Natural Heritage Program Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

Definitions and Acronyms:

Adjacent Landscape Buffer – a circular area adjacent to and outside the EU boundary with the center of the circle at the centroid of the EU, and with a radius that is 1 times the maximum dimension (width or length—whichever is greatest). This circular buffer area is used to evaluate indirect effects and assess the remediation in relation to the landscape features and resources adjacent to the EU. This circular area is generally at least 3 times the area of the EU.

Biological Resource Levels (from DOE-RL-96-32-01) –

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats.
- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks.
- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub-steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.
- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.
- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.
- Level 0 resources consist of non-native plants and animals (unless otherwise listed at a higher level), non-vegetated areas, and industrial areas.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

MBTA – Migratory Bird Treaty Act; referring to species listed and protected under the federal Act.

PNNL ECAP (Ecological Compliance and Assessment Project) Database – PNNL performed ecological reviews for individual projects and annually surveyed selected areas and buildings on the Hanford Site for DOE-RL under the DOE's Public Safety and Resource Protection Program until 2011. The data collected during those surveys is archived in the ECAP database, and is used to supplement ecological evaluations as available.

Priority Habitats – Priority habitats are habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type (e.g., shrub-steppe) or dominant plant species (e.g., juniper savannah), a described successional stage (e.g., old-growth forest), or a specific habitat feature (e.g., cliffs).

Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

Field Data Records

No birds or animals were observed. A list of plant species was not collected.

Evaluation Unit: 222-S Laboratory
 ID: CP-OP-15
 Group: Operations
 Operable Unit Cross-Walk: NA
 Related EU: NA
 Sites & Facilities: Operations and D&D of the 222-S Laboratory.
 Key Data Sources Docs: DOE/RL-96-32 2013; Mission Support Alliance maps⁵⁶
 Field Survey Date: 05/27/2015
 Datasheet prepared by: MAC, KDH, SAM 10/013/2015
 Datasheet reviewed by:



Figure J.126. CP-OP-15 (222-S Laboratory) Site Location Map

CP-OP-15: 222-S Laboratory

⁵⁶ MSA (Mission Support Alliance) maintains biological resource information for the Hanford Site for the Department of Energy.

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the current Endangered and Threatened Species (Federal and State) distribution data; priority habitats as defined by Washington Department of Fish and Wildlife; available current aerial imagery, locations of Hanford Site waste units and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data records.

The following steps were taken to assess the EU associated with the 222-S Laboratory:

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.
2. A pedestrian survey was conducted within the EU boundary by experienced shrub-steppe ecologists.
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2013 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.
6. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

The 222-S Laboratory EU encompasses a complex of buildings and modular buildings surrounded by parking lots, bare ground and landscaped areas (Figure J.127). A small patch of successional vegetation including gray rabbitbrush (*Ericameria nauseosa*) with an understory dominated by introduced grasses and forbs was noted in the northwest corner of the EU (Table J.112). The landscaping and buildings provide nesting and foraging habitat for several species of birds. Plant and animal species were recorded and datasheets are provided at the end of this section.

Table J.112. Percent Canopy Cover and Surface Cover Estimated at the 222-S Laboratory Evaluation Unit

Vegetation/Surface Cover	Survey Area 2 (%)
Introduced forb	5
Introduced grass	40
Native forb	-
Native grass	-
Successional shrub	10
Climax shrub	-

Note: a dash (-) indicates no percent cover data were collected

Landscape Evaluation and Resource Classification:

Within the EU boundary, 95% of the area is classified as a level 0 resource (Figure J.127, Table J.113). DOE/RL-96-32 (2013) includes landscaped areas and buildings as a level 0 resource unless birds are using the habitat for nesting/fledging. If landscaped areas or buildings are actively being used for nesting/fledging, such areas are protected under the Migratory Bird Treaty Act; otherwise such areas are considered level 0 resources. Most of the birds observed in the EU were using the landscaping or buildings for nesting during the May survey.

The amount and proximity of biological resources surrounding the 222-S Laboratory EU were examined within the adjacent landscape buffer area, which extends 1395 ft (425 m) from the geometric center of the EU. A little over 0.5 acre of level 2 habitat is located within the northwest corner of the EU and is contiguous with a larger patch of level 2 vegetation observed in the adjacent landscape buffer area (Figure J.127).

Assumptions and Uncertainty:

Although all observations for species of concern and current conditions of biological resources were noted during surveys and evaluations conducted in 2015, the presence or absence of species cannot be assumed or predicted for future years. Field reconnaissance and surveys of evaluation units at the time of remediation will need to be conducted to verify resources and evaluate ecological conditions at that time.

Summary of Ecological Review:

- The majority of the EU is a level 0 resource, and cleanup activities are not expected to remove significant habitat.
- Landscaped areas are considered level 0 resources except when birds are actively nesting or fledging, and the loss of structures outside of nesting season is not considered an impact to resources.

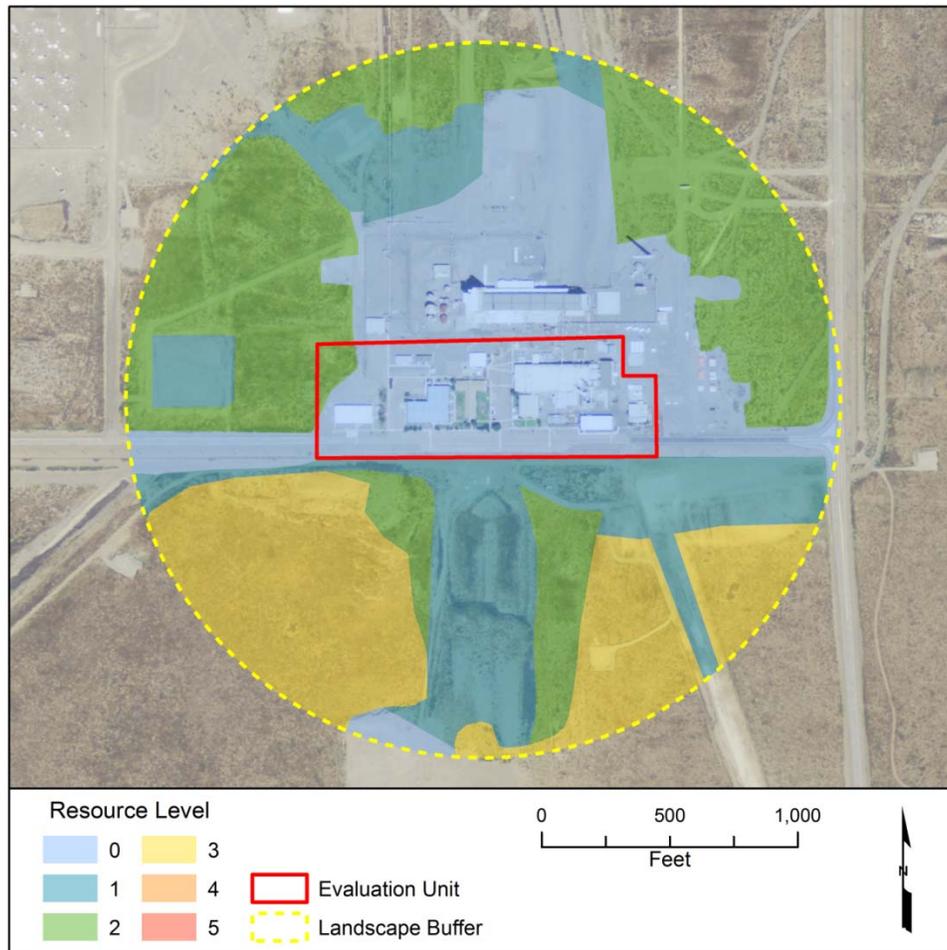


Figure J.127. Biological Resource Level Classifications Based on the May 27, 2015 Survey at the 222-S Laboratory Evaluation Unit (red solid line) and Adjacent Landscape Buffer Area (yellow dashed line).

Table J.113. Area and Proportion of Each Biological Resource Level Within the 222-S Laboratory Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources.

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
0	12.8	29.2	42.0	29.92%	30.36%	0.44%
1	0	28.5	28.5	20.29%	20.29%	0.00%
2	0.6	41.1	41.7	29.71%	29.27%	-0.44%
3	0	28.2	28.2	20.08%	20.08%	0.00%
4	0	0	0	0.00%	0.00%	0.00%
5	0	0	0	0.00%	0.00%	0.00%
Total	13.4	126.9	140.3	100.00%	100.00%	

1 Resource levels for both the evaluation unit and adjacent landscape boundary were reviewed in the field and via imagery during May-August 2015 and revised to reflect current habitats conditions.

2 Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.

References:

- DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 0.
- U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act. <http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>
- U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington. http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902
- Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. <http://wdfw.wa.gov/conservation/phs/list/>
- Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington. <http://wdfw.wa.gov/conservation/endangered/>
- Washington Noxious Weed Control Board. 2014. Noxious Weed List. <http://www.nwcb.wa.gov/>
- Washington State Department of Natural Resources. 2014. Washington Natural Heritage Program Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

Definitions and Acronyms:

Adjacent Landscape Buffer – a circular area adjacent to and outside the EU boundary with the center of the circle at the centroid of the EU, and with a radius that is 1 times the maximum dimension (width or length—whichever is greatest). This circular buffer area is used to evaluate indirect effects and assess the remediation in relation to the landscape features and resources adjacent to the EU. This circular area is generally at least 3 times the area of the EU.

Biological Resource Levels (from DOE-RL-96-32-01) –

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats.
- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks.
- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub-steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.
- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.
- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.
- Level 0 resources consist of non-native plants and animals (unless otherwise listed at a higher level), non-vegetated areas, and industrial areas.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

MBTA – Migratory Bird Treaty Act; referring to species listed and protected under the federal Act.

PNNL ECAP (Ecological Compliance and Assessment Project) Database – PNNL performed ecological reviews for individual projects and annually surveyed selected areas and buildings on the Hanford Site for DOE-RL under the DOE's Public Safety and Resource Protection Program until 2011. The data collected during those surveys is archived in the ECAP database, and is used to supplement ecological evaluations as available.

Priority Habitats – Priority habitats are habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type (e.g., shrub-steppe) or dominant plant species (e.g., juniper savannah), a described successional stage (e.g., old-growth forest), or a specific habitat feature (e.g., cliffs).

Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

Field Data Records

Bird, Mammal and Herpetofauna Species May 27 2015, 222-S Laboratory EU			
Patch ID	Name	Common name	Comment
0	<i>Turdus migratorius</i>	American robin	
0	<i>Hirundo pyrrhonota</i>	cliff swallow	
0	<i>Icterus galbula</i>	Bullock's oriole	
0	<i>Carpodacus mexicanus</i>	house finch	
0	<i>Hirundo rustica</i>	barn swallow	
0	<i>Carpodacus mexicanus</i>	house finch	
0	<i>Tyrannus verticalis</i>	western kingbird	
0	<i>Sayornis saya</i>	Say's phoebe	
0	<i>Sturnus vulgaris</i>	European starling	

Evaluation Unit: WSCF
ID: CP-OP-17
Group: Operations
Operable Unit Cross-Walk: 200-ZP-1
Related EU: CP-GW-2
Sites & Facilities: Waste Sampling and Characterization Facility and ancillary buildings and structures
Key Data Sources Docs: DOE-RL-96-32-01; PNNL ECAP Database⁵⁷; Mission Support Alliance maps⁵⁸
Field Survey Date: 09/03/2015
Datasheet prepared by: MAC, KDH, SAM 10/29/2015
Datasheet reviewed by:

¹ The Ecological Compliance and Assessment Project (ECAP) database is an evolving set of data that is maintained by Pacific Northwest National Laboratory (PNNL) and updated as new ecological assessments are completed.

⁵⁸MSA (Mission Support Alliance) maintains biological resource information for the Hanford Site for the Department of Energy



Figure J.128. CP-OP-17 (WSCF) Site Location Map

CP-OP-17: WSCF

Survey and Analysis Methods:

The evaluation process makes use of existing biological resource level maps (DOE/RL-96-32 2013), field surveys and measurement of current vegetation and habitat conditions, and wildlife observations to evaluate potential ecological impacts associated with cleanup activities at the evaluation unit (EU). Additional information used in the ecological evaluation includes the current Endangered and Threatened Species (Federal and State) distribution data; priority habitats as defined by Washington Department of Fish and Wildlife; available current aerial imagery, locations of Hanford Site waste units and infrastructure spatial data; and available information about species of concern distribution and habitat use in the vicinity of the EUs including data previously collected by PNNL for DOE-RL. Definitions relevant to the methods and ecological survey results are provided at the end of this summary along with field data records.

The following steps were taken to assess the EU associated with WSCF:

1. The EU boundary (polygon) is assumed to represent the estimated boundary or extent of potential habitat removal and direct disturbance due to remediation.

2. A visual survey was conducted within the EU boundary by experienced shrub-steppe ecologists. PNNL biologists also reviewed the observations and biological survey data available in the Ecological Compliance and Assessment Project (ECAP) database from 2009 and 2010 for the EU to supplement the evaluation with previous wildlife observations.
3. A second boundary (polygon) outside the EU was established to evaluate indirect effects and assess the remediation in relation to adjacent landscape features. This polygon is centered on the EU and encompasses a circular area with a radius 1 times the maximum width of the EU and is referred to as the **adjacent landscape buffer**.
4. A reconnaissance survey of the boundary of the EU was conducted to confirm the validity of past mapping of biological resources. Aerial imagery from 2013 was reviewed to identify any significant changes in habitat and resource levels (such as new well pads, roads, or other ground disturbance not captured by the available biological resources mapping) within the EU and adjacent landscape buffer. Where significant change is evident from ground survey or imagery, the biological resource map was updated to reflect the change in resource level.
5. The spatial extent of habitat classified at each of 6 resource levels (0 – 5) (DOE/RL-96-32 2013; definitions at end of this summary) within the adjacent landscape buffer area and the EU were assessed and compared using a Geographic Information System (GIS) to examine potential indirect effects on habitat condition within the adjacent landscape. For purposes of assessing indirect effects on the adjacent landscape, this evaluation assumes the maximum potential change in biological resources—that is, all habitat within the EU is assumed to be lost to remediation and cleanup activities and resources in the EU are considered level 0.
6. PNNL biologists assembled the information from field survey, reconnaissance, and spatial analyses of resource availability to provide a subjective evaluation of potential effects on habitat connectivity in the vicinity of the EU.

Field Survey:

A pedestrian survey was conducted in September 2015. Because the WSCF EU was added to the project after the nesting season, information from 2009 and 2010 in the ECAP database was reviewed to supplement bird and other animal observed within the WSCF EU. These data are included at the end of this section along with species observed during the September survey.

Much of the area within the EU (over 67%) is covered by buildings, parking lots and the surrounding bare ground. In the southwest portion of the EU is a patch of shrub-steppe with approximately 35% cover by mature sagebrush (*Artemisia tridentata*) and an understory dominated by an introduced grass and forb (cheatgrass (*Bromus tectorum*) and Russian thistle) (Table J.114). The northwest and southeast corners of the EU contain previously disturbed habitat now vegetated with a mixture of introduced and native grasses and Russian thistle. Based on previous data from the ECAP database and the September survey, several bird and animal species use the area within the EU.

Table J.114. Percent Canopy Cover and Surface Cover Measured at the WSCF Evaluation Unit

Vegetation/Surface Cover	4-1 Visual Survey
Bare Ground	-
Introduced forb	5
Introduced grass	30
Native forb	-
Native grass	5
Successional shrub	-
Climax shrub	35

Note: a dash (-) indicates no percent cover data were collected

Landscape Evaluation and Resource Classification:

Approximately 20 acres (about 79%) of the WSCF EU consists of habitat classified as level 2 or below (Figure J.129, Table J.115). A little over 5 acres (21%) of the EU is classified as level 4 habitat, although the outer edges of the vegetation patch has lost its shrub component and has increased introduced forbs due to road and parking lot maintenance.

The amount and proximity of biological resources surrounding the WSCF EU were examined within the adjacent landscape buffer area, which extends 1524 feet (465 m) from the geometric center of the EU. Almost 75% of the buffer area comprises high quality level 4 resources with climax shrubs and an understory of mixed native and introduced forbs and grasses (Table J.115). The buffer area extends into the eastern side of the 200-West Area, where level 3 resources occur.

Based on previous data from the ECAP database and the September survey, several bird and animal species use the combined EU and landscape buffer area. A sage sparrow (*Amphispiza belli*), a Washington state candidate species, was heard in the vicinity of the WSCF in 2009.

Assumptions and Uncertainty:

Although all observations for species of concern and current conditions of biological resources were noted during surveys and evaluations conducted in 2015, the presence or absence of species cannot be assumed or predicted for future years. Field reconnaissance and surveys of evaluation units at the time of remediation will need to be conducted to verify resources and evaluation ecological conditions at that time.

Summary of Ecological Review:

- The dirt road around the perimeter of the WSCF EU is roughly 90 ft (27 m) wide, but is not expected to be an overwhelming obstacle to habitat connectivity with areas outside the WSCF fence.

- The level 4 resources within the adjacent landscape buffer is contiguous with similar habitat extending across much of the Hanford Site.
- Loss of all habitat within the EU is not expected to significantly impact resources in the area.

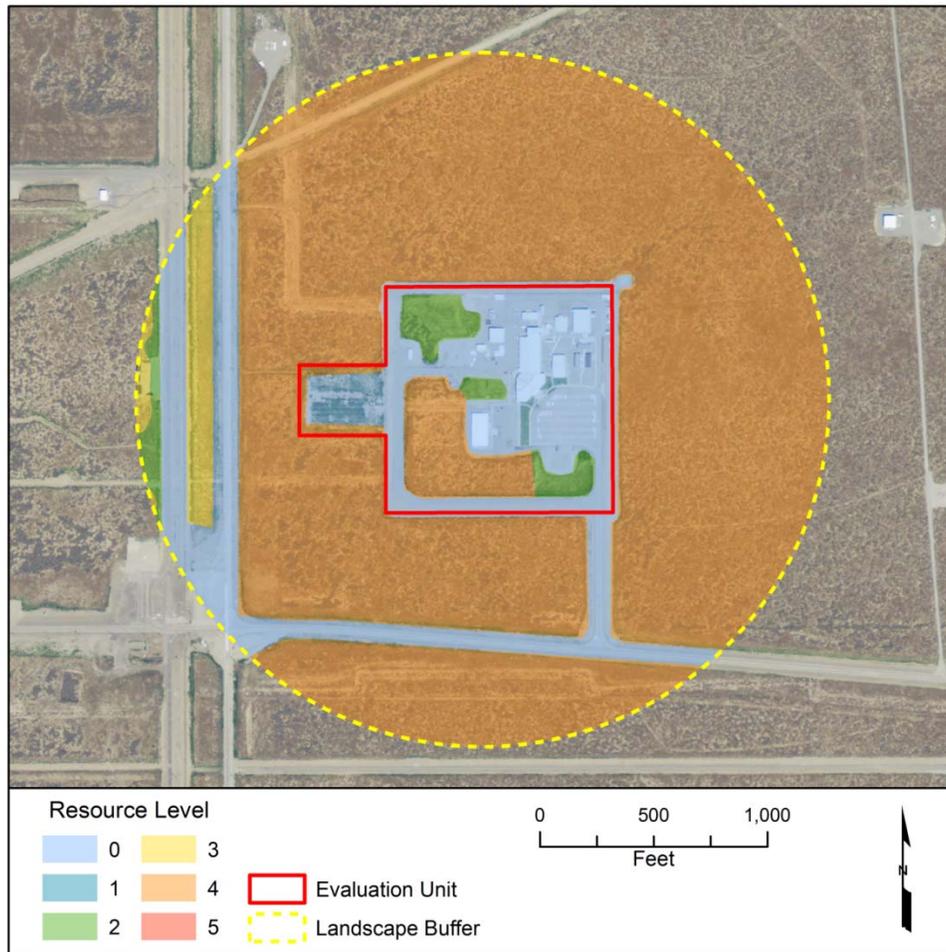


Figure J.129. Biological Resource Level Classifications Based on the September 1, 2015 Survey at the WSCF Evaluation Unit (red solid line) and Adjacent Landscape Buffer Area (yellow dashed line).

Table J.115. Area and Proportion of Each Biological Resource Level Within the SCF Evaluation Unit in Relation to Adjacent Landscape and Potential Maximum Change in Resources.

Resource Level ¹	Evaluation Unit Area (ac)	Adjacent Landscape Buffer (ac)	Combined Total Area (ac)	Percent of Resource Level in Combined Total Area	Percent of Resource Level in Combined Total Area After Cleanup ²	Percent Difference at Landscape Scale After Cleanup ²
0	17.1	17.0	34.1	20.29%	25.22%	4.94%
1	0	0	0	0.00%	0.00%	0.00%
2	2.9	1.9	4.8	2.86%	1.13%	-1.73%
3	0	4.4	4.4	2.62%	2.62%	0.00%
4	5.4	119.4	124.8	74.24%	71.03%	-3.21%
5	0	0	0	0.00%	0.00%	0.00%
Total	25.4	142.7	168.1	100.00%	100.00%	

1 Resource levels for both the evaluation unit and adjacent landscape boundary were reviewed in the field and via imagery during May-August 2015 and revised to reflect current habitats conditions.

2 Potential maximum change in area of a given resource level within the combined total area (Evaluation Unit + Adjacent Landscape Buffer) that would occur assuming that all habitat within the evaluation unit is destroyed by remediation activities and the resource level of the evaluation unit is level 0.

References:

- DOE/RL-96-32. 2013. Hanford Site Biological Resources Management Plan, Revision 0.
- U.S. Fish and Wildlife Service (USFWS). 2014. Birds Protected by the Migratory Bird Treaty Act. <http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/mbtintro.html>
- U.S. Fish and Wildlife Service (USFWS). 2014. Environmental Conservation Online System, Listings and Occurrences for Washington. http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WA&s8fid=112761032792&s8fid=112762573902
- Washington Department of Fish and Wildlife. 2008. Washington State Priority Habitats and Species List. Olympia Washington. 174 pp. <http://wdfw.wa.gov/conservation/phs/list/>
- Washington Department of Fish and Wildlife. 2014. Species of Concern in Washington. <http://wdfw.wa.gov/conservation/endangered/>
- Washington Noxious Weed Control Board. 2014. Noxious Weed List. <http://www.nwcb.wa.gov/>
- Washington State Department of Natural Resources. 2014. Washington Natural Heritage Program Plant Ranks. <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

Definitions and Acronyms:

Adjacent Landscape Buffer – a circular area adjacent to and outside the EU boundary with the center of the circle at the centroid of the EU, and with a radius that is 1 times the maximum dimension (width or length—whichever is greatest). This circular buffer area is used to evaluate indirect effects and assess the remediation in relation to the landscape features and resources adjacent to the EU. This circular area is generally at least 3 times the area of the EU.

Biological Resource Levels (from DOE-RL-96-32-01) –

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats.
- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks.
- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub-steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species.
- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.
- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields.

Evaluation Units (EUs) – groupings of sources, aggregated for evaluation as part of the Hanford Site-wide Risk Review Project. Sources may be aggregated into an EU based on potential impacts to a common set of receptors or receptor geographic area, common past waste management practices, or integration in the waste management process.

MBTA – Migratory Bird Treaty Act; referring to species listed and protected under the federal Act.

PNNL ECAP (Ecological Compliance and Assessment Project) Database – PNNL performed ecological reviews for individual projects and annually surveyed selected areas and buildings on the Hanford Site for DOE-RL under the DOE's Public Safety and Resource Protection Program until 2011. The data collected during those surveys is archived in the ECAP database, and is used to supplement ecological evaluations as available.

Priority Habitats – Priority habitats are habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type (e.g., shrub-steppe) or dominant plant species (e.g., juniper savannah), a described successional stage (e.g., old-growth forest), or a specific habitat feature (e.g., cliffs).

Species of Concern or Species of Conservation Concern – An informal term that for the purpose of this assessment includes those species listed at the federal or state level as being threatened endangered, sensitive, or candidate, as well as those listed by the U.S. Fish and Wildlife Service as species of concern within the ecoregion.

Field Data Records

Plant Species Identified During Visual Surveys September 3 2015, WSCF EU			
Patch ID	Name	Common name	Abundance
0-1	<i>no vegetation</i>	no vegetation	90
4-1	<i>Achnatherum hymenoides</i>	indian ricegrass	
4-1	<i>Agropyron cristatum</i>	crested wheatgrass	
4-1	<i>Artemisia tridentata</i>	big sagebrush	35
4-1	<i>Balsamorhiza careyana</i>	Carey's balsamroot	
4-1	<i>Bromus tectorum</i>	cheatgrass	30
4-1	<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	
4-1	<i>Cryptantha circumscissa</i>	matted cryptantha	
4-1	<i>Ericameria nauseosa</i>	gray rabbitbrush	
4-1	<i>Hesperostipa comata</i>	needle-and-thread grass	
4-1	<i>Machaeranthera canescens</i>	hoary aster	
4-1	<i>Poa secunda</i>	Sandberg's bluegrass	
4-1	<i>Salsola tragus</i>	Russian thistle	5

Bird, Mammal and Herpetofauna Species September 3 2015, WSCF EU			
Patch ID	Name	Common name	Comment
0-1	<i>Charadrius vociferus</i>	killdeer	hanging around graveled area
0-1	<i>Columba livia</i>	rock dove	flew from building

ECAP Database Query Bird and Other Animal Results for Areas within the WSCF EU					
Observer	Date	Patch ID	Name	Common name	Comments
MAC	6/10/09	2009-600-011	<i>Taxidea taxus</i>	badger	sign outside fence
MAC	6/10/09	2009-600-011	<i>Chordeiles minor</i>	common nighthawk	1 foraging nearby
KDH	6/10/09	2009-600-011	<i>Pituiphis melanoleucus</i>	great basin gopher snake	1 near sidewalk
KDH	6/10/09	2009-600-011	<i>Charadrius vociferus</i>	killdeer	1 harassing snake
MAC	6/10/09	2009-600-011	<i>Amphispiza belli</i>	sage sparrow	heard to east
CAD	6/19/02	225-BG WSCF	<i>Carpodacus mexicanus</i>	house finch	active nest on motor support