Risk in Complex Environments: Whence & Whither in a Continuing Struggle Better to Relate Risk Evaluation to the Cleanup of Radioactive Sites

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Session on New Challenges and Approaches
For Assessing Risk at Radioactive Sites
Society for Risk Analysis
2004 Annual Meeting
Wednesday, December 8, 2004

Presentation in two parts:

Part I Whence: Recent advances in improving/deploying risk analysis tools actually used by the Department of Energy

Some addressed in this afternoon's session
Other recent risk tools development

Interlude: Acknowledgement of current situation about risk at radioactive sites

Part II Whither: Where should we go from here and what are the obstacles

What is missing from the available risk tools and why they matter
What, in addition to better tools, is needed

Part I Whence: Recent advances in improving/deploying risk analysis tools actually used by the Department of Energy

As we described last year in an introduction to the RBES program

New DOE Policy 455.1

A new focus on end-states –
suggesting how an end state can be defined – and how to link risk to the site's hazards and the site's geographical context

A welcome focus on the "regional environments" in which the sites are found – mapped with consistency

A commitment to describe the results of remediation through conceptual site models (CSM) - although not with the needed focus on depicting relationship of post-construction and in-remediation risks

Somewhat improved use of ecological risk assessment tools (see Burger/Gochfeld) in this session

Recognition/tools (though with poor execution) of life-cycle risk and cost concepts as two parts of the same puzzle (Greenberg/Mayer) in this session

Let's be honest:

When the word "risk" is used (and particularly when the words "risk-based" are used) to depict the primary criterion for remedial choice, there is engendered an intense and negative public reaction

> The acrid stakeholder characterization of the effort centrally to to employ the term "Risk" for these choices, has for a decade, remained "dirty cleanup".

The risk initiatives, time and time again are initially lauded by the primary technical and public advisors to the Department, and then the enthusiasm for risk atrophies

Why?

Part II Whither: Where should we go from here and what are the obstacles

What is missing from the available risk tools and why these matter?

What, in addition to better tools, is needed?

Missing are four fundamental risk related tools:

A persuasive account of what it would take actually to **sustain** a level of potential exposure control consistent with acceptable risk – so that the site is perceived as sustainably safe, not dirty

A persuasive algorithm for actually comparing/**relating** short (**in-remediation**) **and** long-term (**life-cycle) risks** to receptors (human and ecological)

A candid account - based on a consistently applied basis (another algorithm?) - for **comparing/evaluating natural resource damages and benefits** of post-cleanup DOE site or property management

A candid assessment of the **right relationship between public and private sector capabilities** for effective management both of cleanup and of sustainable and credible protective stewardship

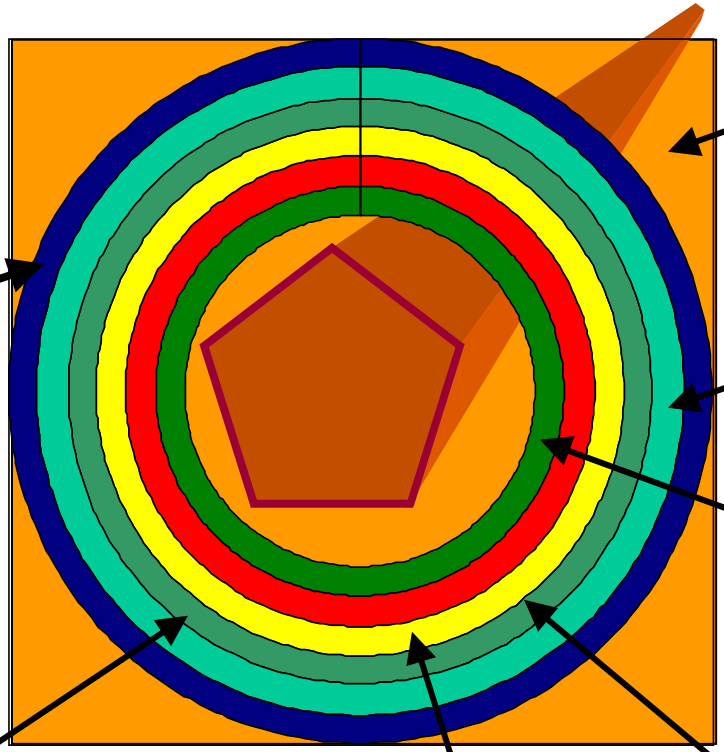
In the remainder of this presentation we focus on the first issue

1. A persuasive account of what it would take to actually **sustain** a level of exposure control consistent with acceptable risk

Sustainability: What Does it Mean?

A Stewardship Safety Net with Appropriate
Multiple Rings to Assure Sustainability
While Hazards Pose a Possible Risk

We think these are the elements



A sustainable management of the "net"

Institutional controls

Continuing Health Assurance Monitoring Program

Engineering controls

Ecological Evaluation

Contaminant movement monitoring

Exposure monitoring

Figure 1

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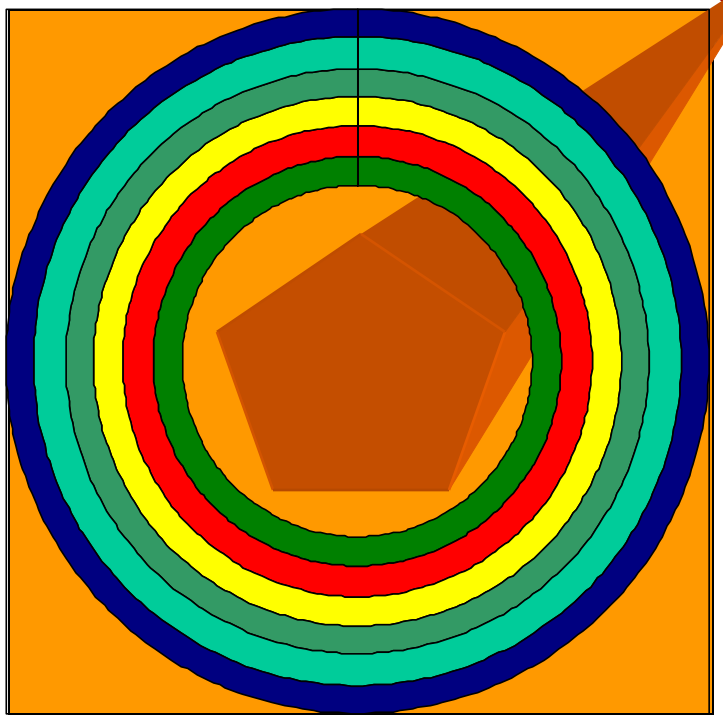
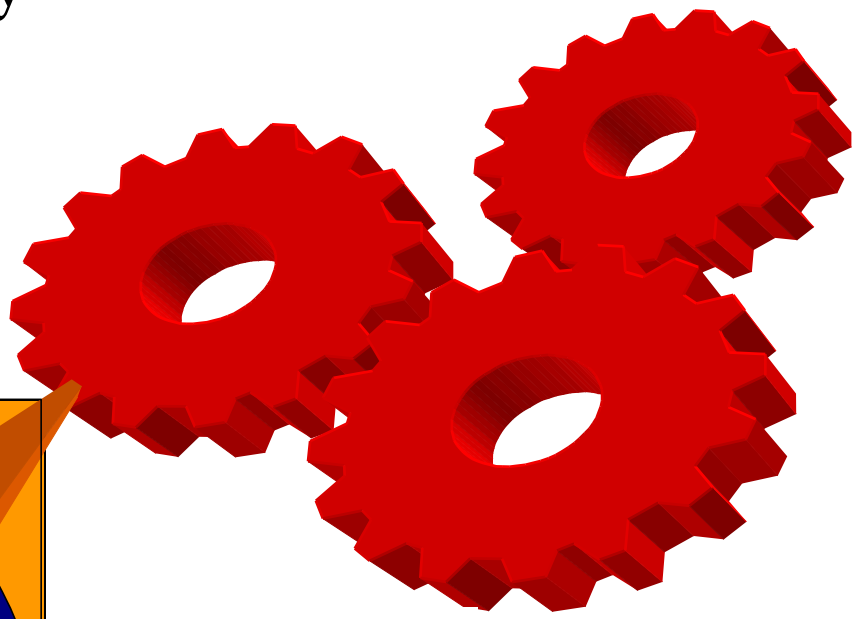
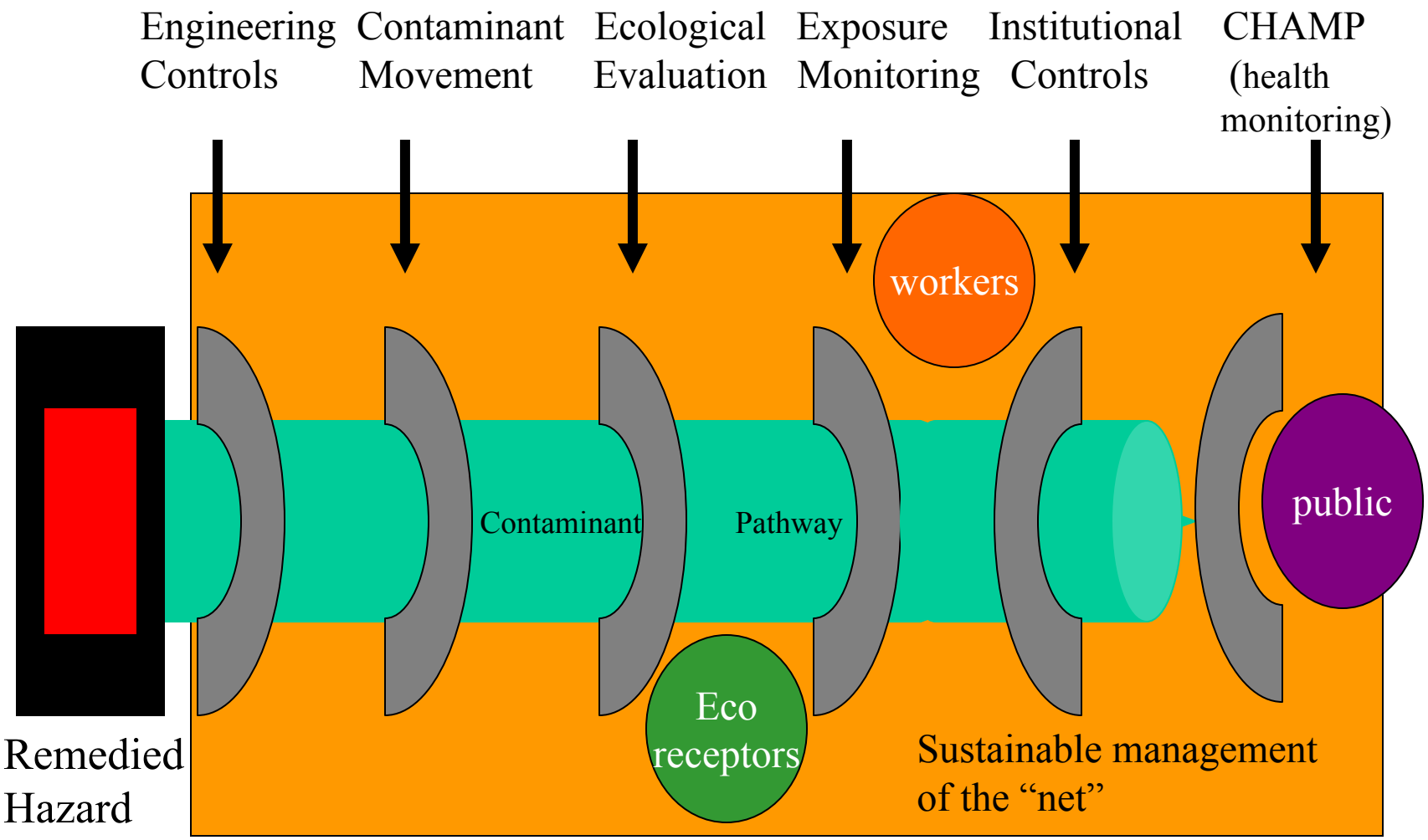
The real challenge for sustainability is to determine which of these Sustainability Rings is needed For a safety net at a specific site to go with the right remedy

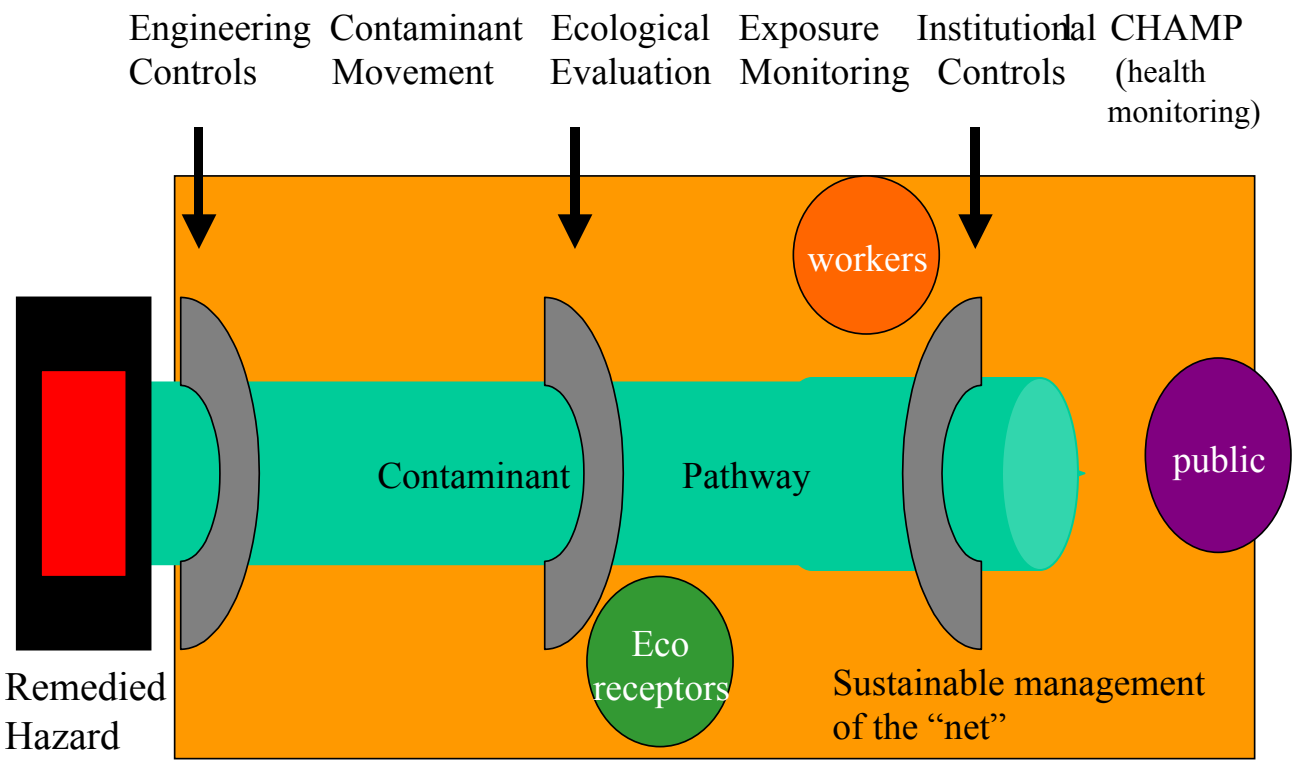




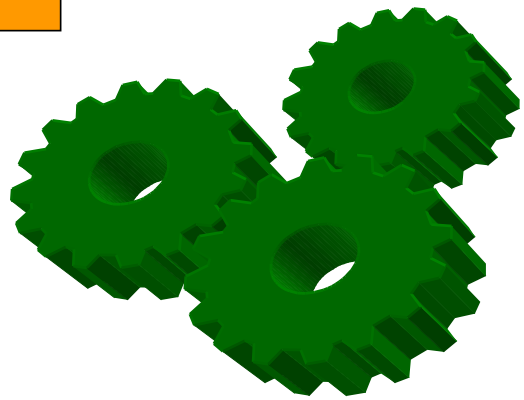
And then try to make sure that the selected elements, shaped to the specific needs are not independent circles, but are like gears of a protective system

Putting post-Remedial Sustainability in a Risk Context reviewing all the elements or baffles of a stewardship safety net

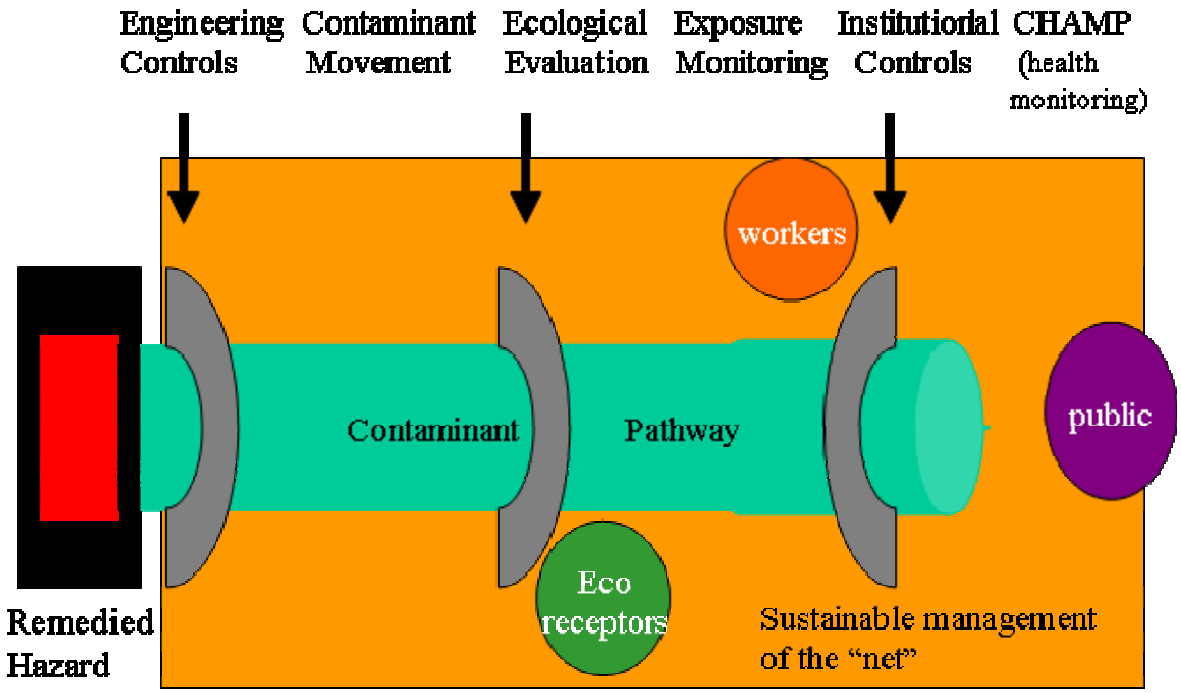




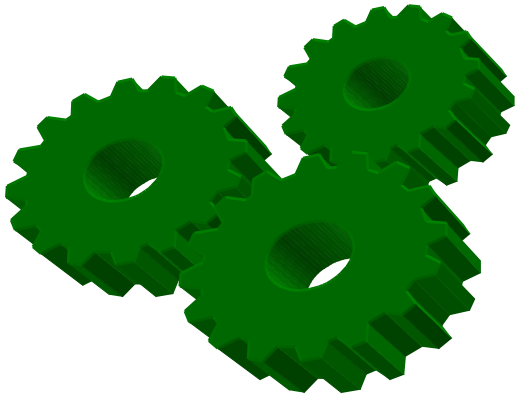
Then fitting the appropriate Sustainability Safety Net to the Specifics of the site and its remedy

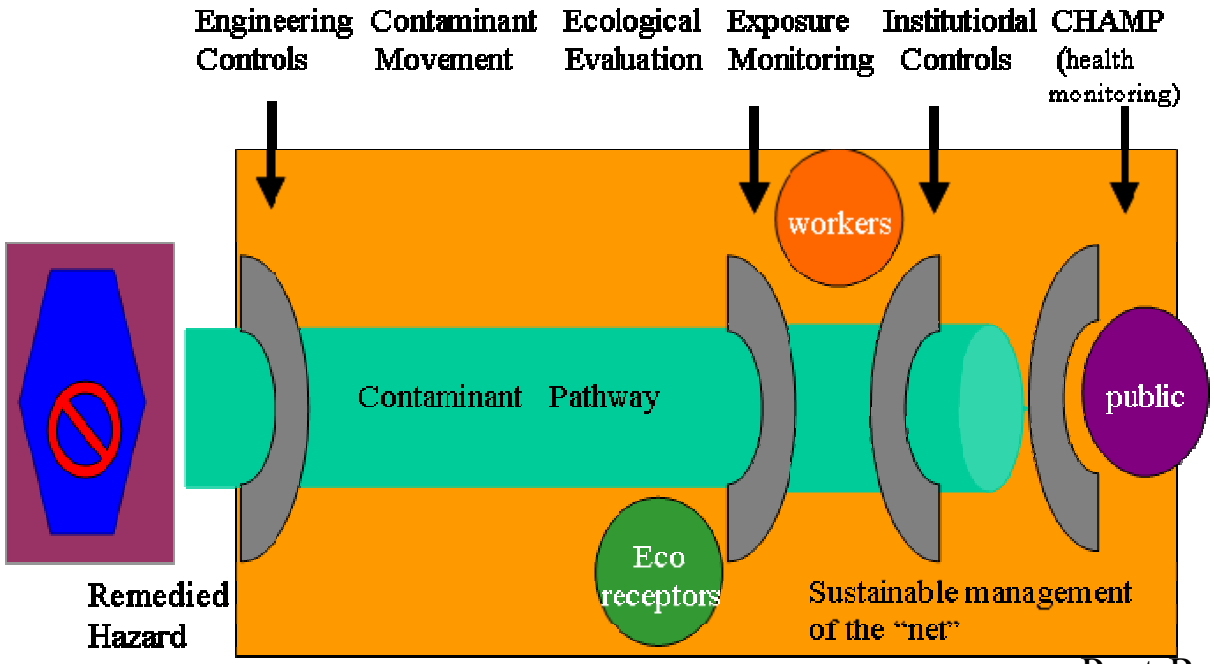


Post-Remedial Sustainability in a Risk Context



Not every site or even site area will be the same!





Fitting the appropriate Sustainability Safety Net to the Specifics of the site and its remedy is tough work

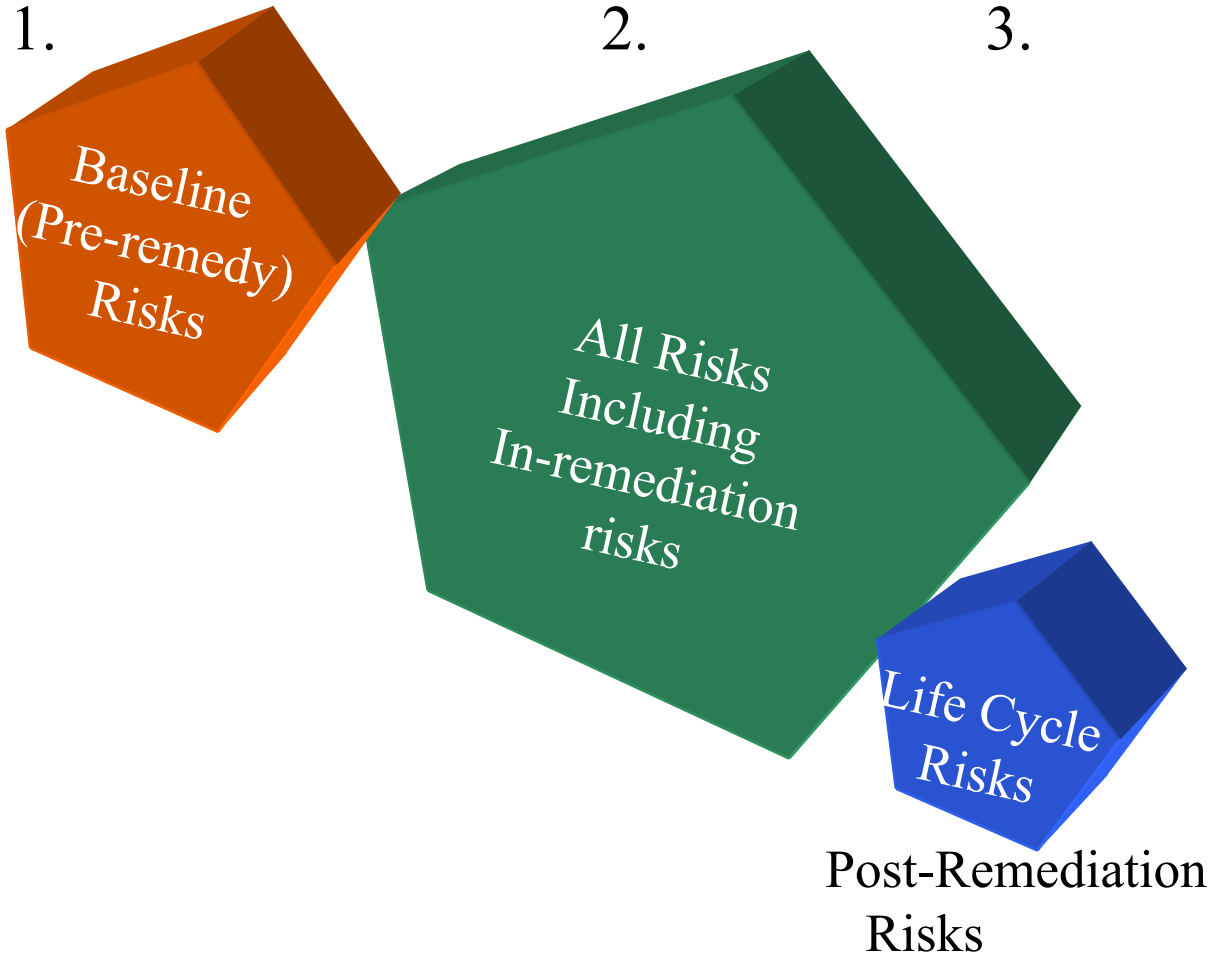
Missing are four fundamental risk related tools:

2.

A persuasive algorithm for actually comparing/**relating**
short (**in-remediation**) **and** long-term (**life-cycle) risks**
to receptors (human and ecological)

RBES – a disciplined effort to define a risk basis for risk-informed cleanup

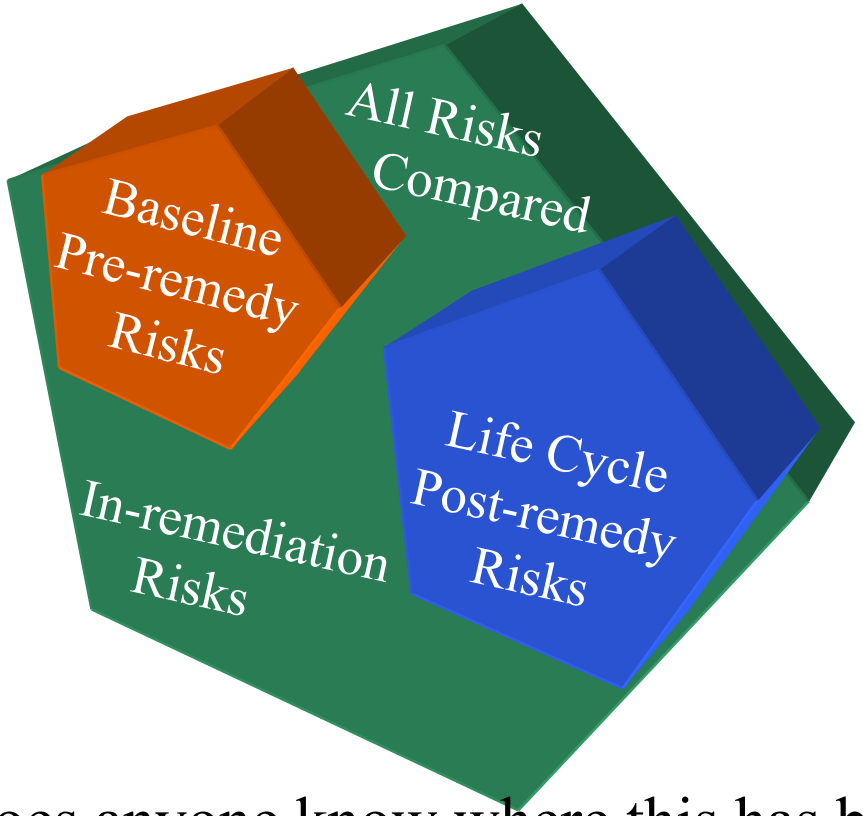
The baseline assessment (BRA) is a only a first step – Real risk evaluation would do the analysis of remedy and post-remedy sustainability as an integrated effort with a credible algorithm guiding the analysis



Developed by Charles W. Powers

RBES – a disciplined effort to define a risk basis for risk-informed cleanup

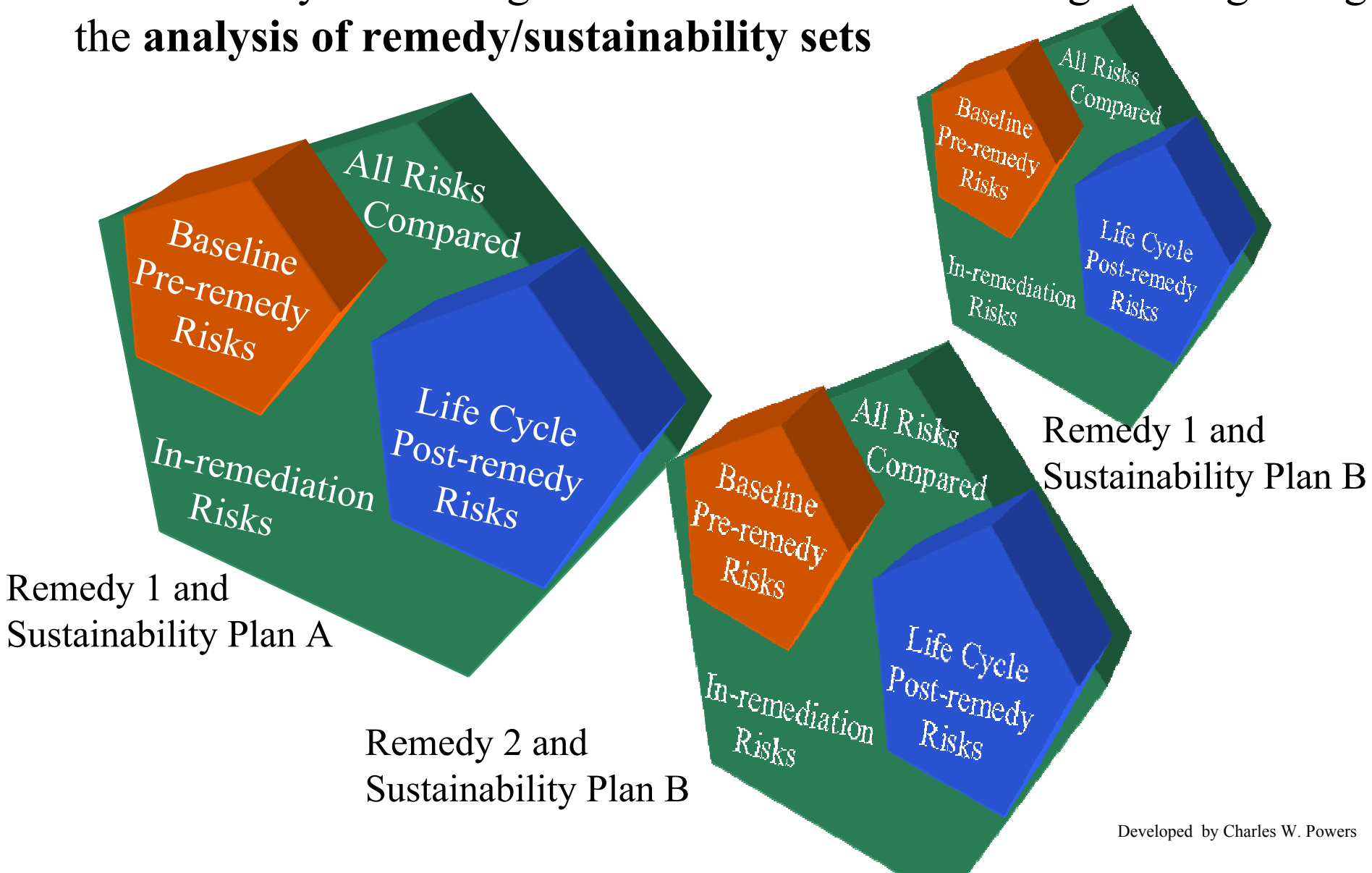
Real risk evaluation would do the analysis of remedy and post-remedy sustainability as an integrated effort with a credible algorithm guiding the analysis of remedy/sustainability sets



Does anyone know where this has been done successfully – or even tried?

RBES – a disciplined effort to define a risk basis for risk-informed cleanup

Real risk evaluation would do the analysis of remedy and post-remedy sustainability as an integrated effort with a credible algorithm guiding the **analysis of remedy/sustainability sets**



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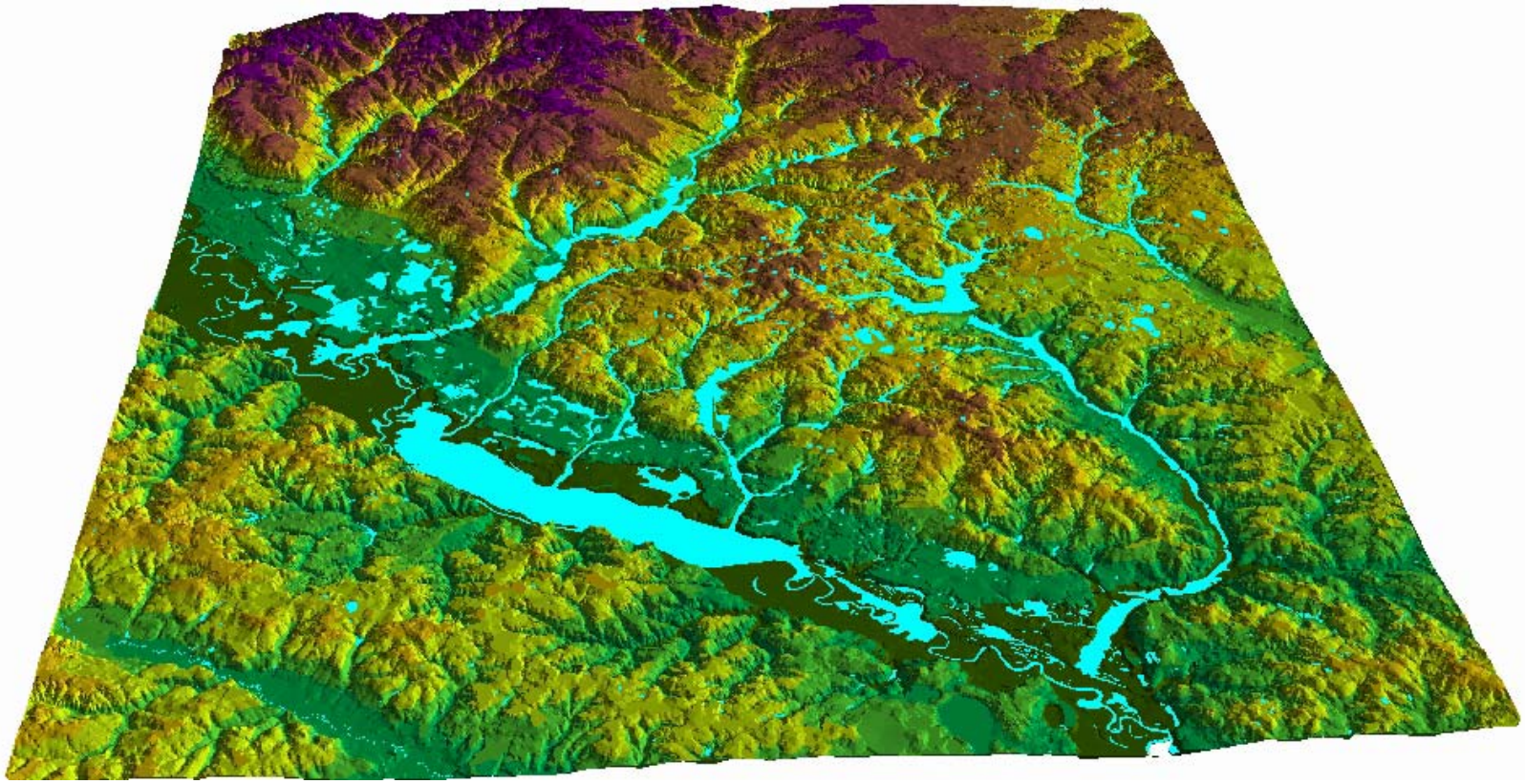
Missing are four fundamental risk related tools:

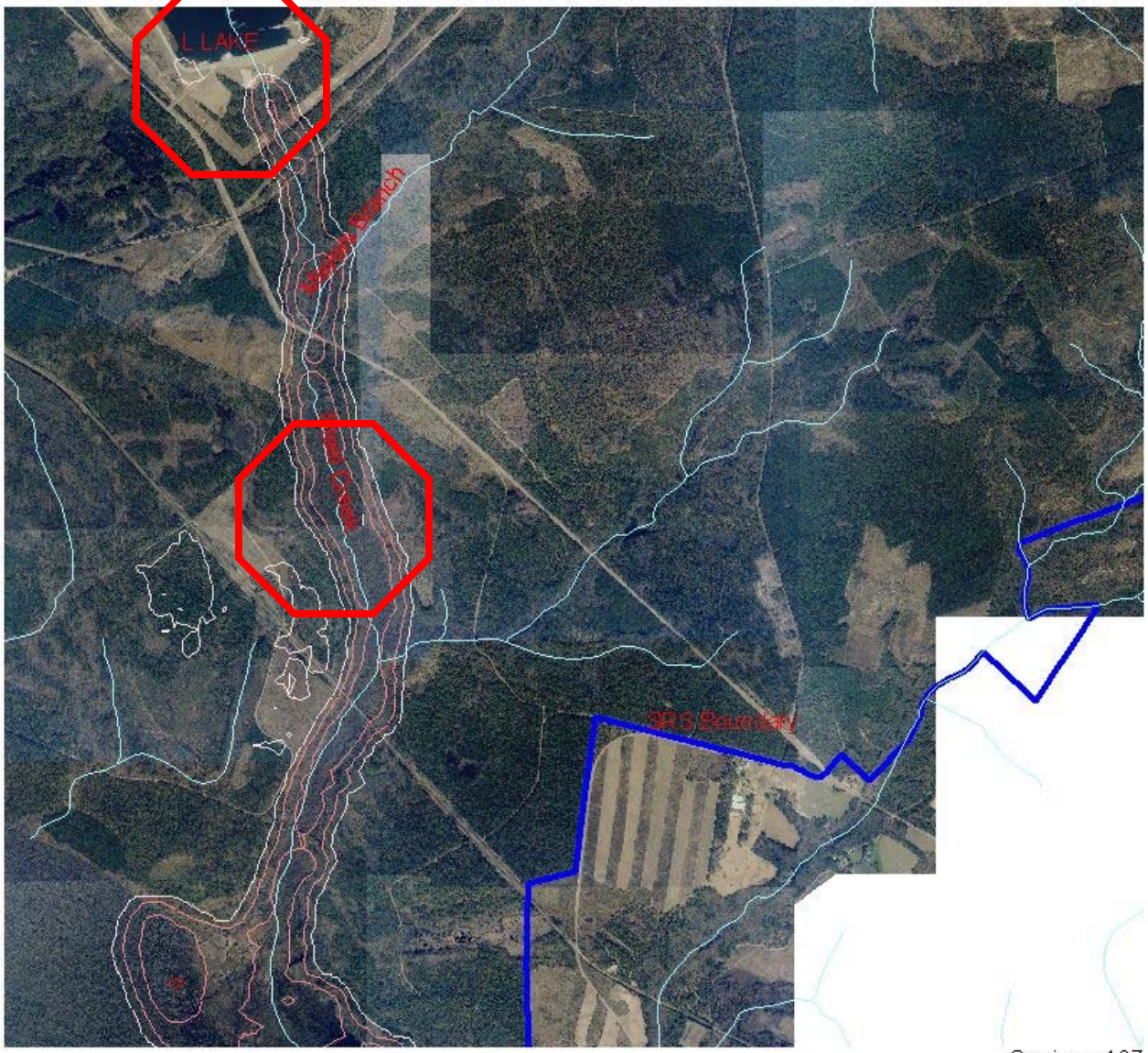
3.

A candid account - based on a consistently applied basis (another algorithm?) - for **comparing/evaluating both the natural resource damages and possible benefits** of post-cleanup DOE site or property management

The Savannah River site



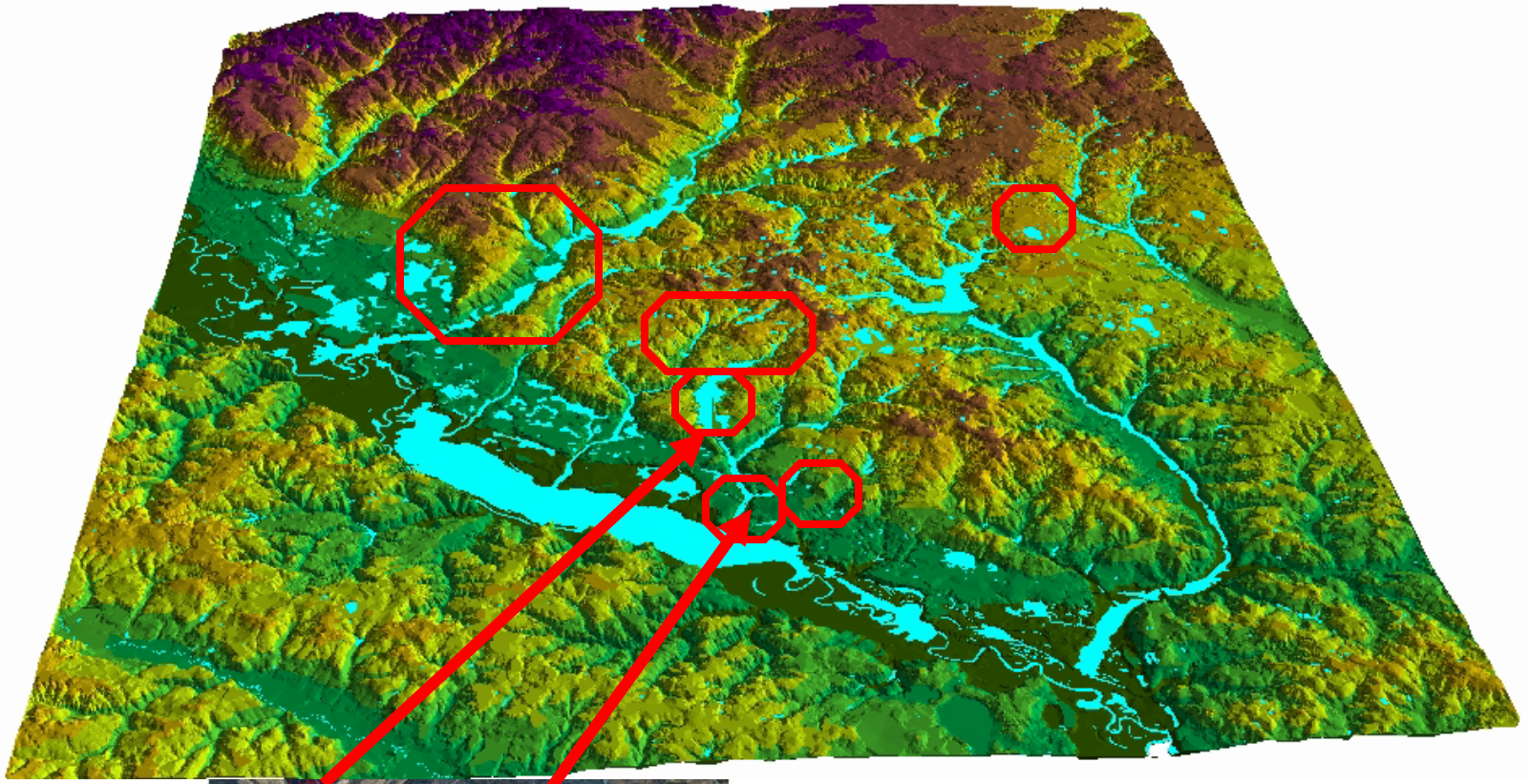
Overflight Imagery Downstream of L Lake

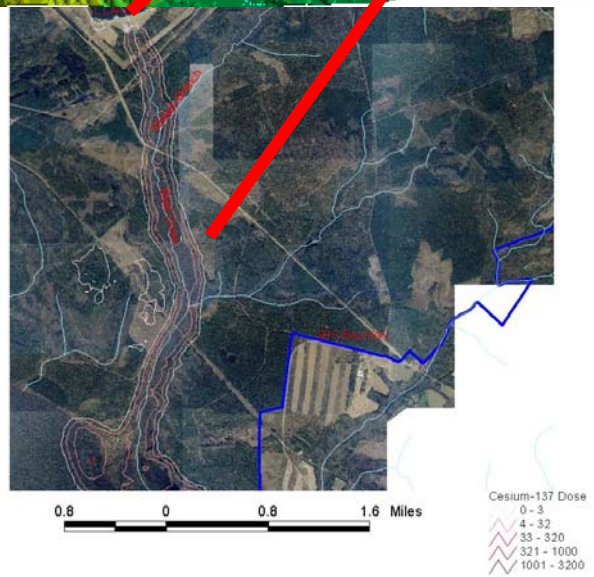


0.8 0 0.8 1.6 Miles

N

Cesium-137 Dose
0 - 3
4 - 32
33 - 320
321 - 1000





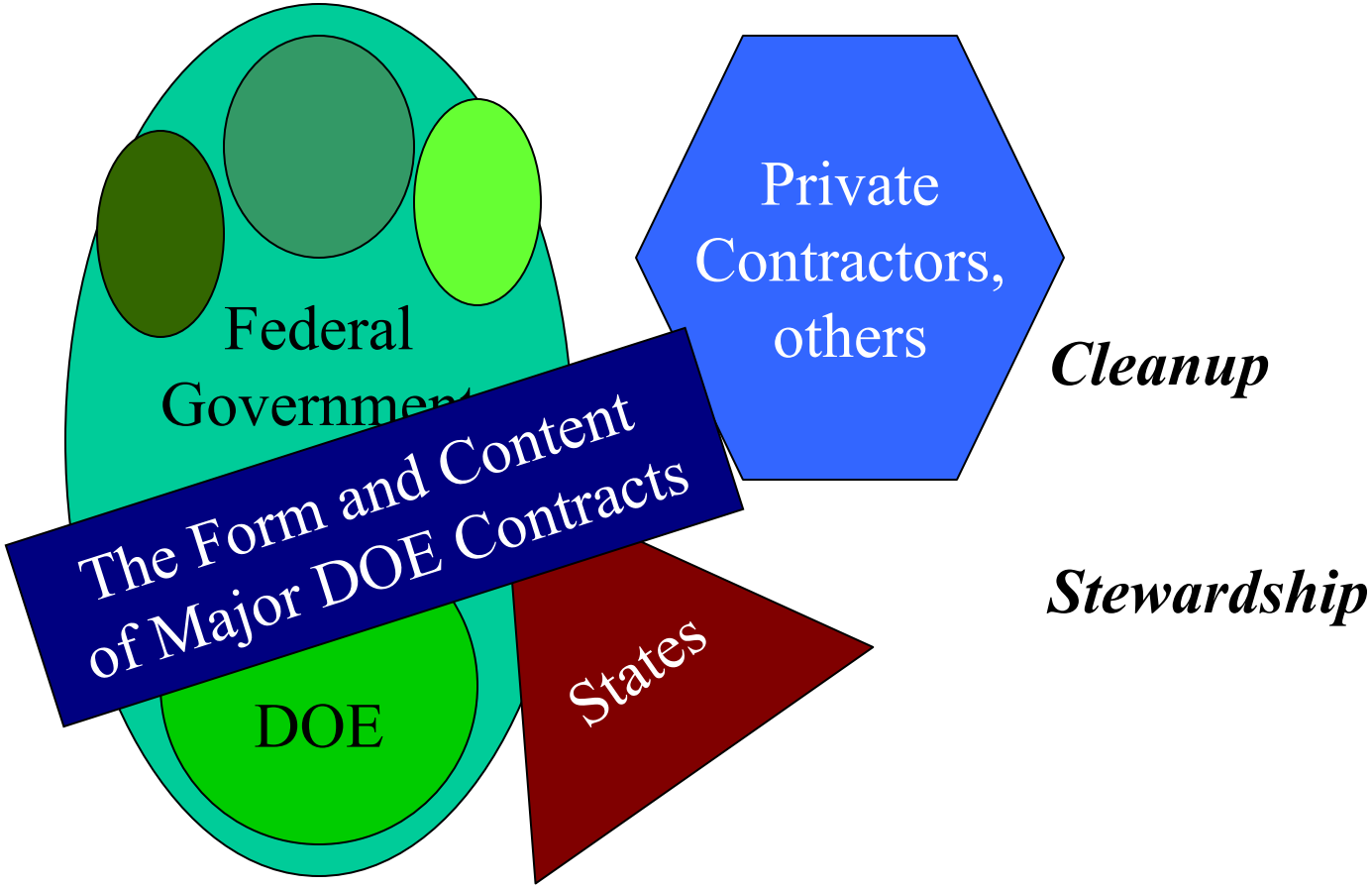
The Savannah River site

Missing are four fundamental risk related tools:

4.

A candid assessment of the **right relationship between public and private sector capabilities** for effective management both of cleanup and of sustainable and credible protective stewardship

A set of relationships and configurations – most of which were formed in the early days of weapons development – that do not fit into an integrated approach or have not yet been organized to serve the diverse functions now needed



Is it not possible that the reason these sites
do not get to closure is NOT because
there has been too much analysis – but

because there has been far too little?
of sustainability - of comparative total risk
of damage and benefits – of how/who to manage?

and is the public opposition to both risk
and actual closure partly due to this?

P.S. Rocky Flats (which actually will close soon)
is actually an example of a site where
far more of the kinds of analysis discussed here
has been done than anywhere else in the DOE system

Part II Whither: Where should we go from here and what are the obstacles

What is missing from the available risk tools and why they matter? *What, in addition to better tools, is needed* ? Three elements are missing:

1) Willingness/ability to communicate the obvious, that radionuclides actually go away at specific decay rates and the issues are *not* whether *but* where they will be stored/contained protectively.

2) Recognition in everything that is done that risk is part of – but only a part of the decision process and, while it must be done rigourously, it finally folds back into a larger **risk-informed** process

3) A willingness to give risk initiatives the time to be defined and time to be meaningfully implemented and the courage to pursue a course of action through initial misunderstanding. Sustainable and transparent DOE processes – openly communicated

P.S. New indications that this message has been heard