Evaluating Ecological Risks in the West Valley Probabilistic Performance Assessment

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Abstract

Performance assessments (PAs), whether probabilistic or point estimates, have traditionally focused on evaluating human health effects of radionuclides. In the past it was asserted that protecting human health would also protect the environment, but this idea was brought into question, and therefore, tools and methodologies to directly estimate non-human biota dose were developed and have been readily available since the early 2000s. For example, the Biota Dose Assessment Committee (BDAC) guidance led to the development of the RESRAD-BIOTA software to implement this guidance. More recently, interpretation of the requirements of DOE Order 458.1 have led some waste management facilities to include ecological risks in addition to human health effects in their PAs. We have recently applied methodologies to assess ecological risks within probabilistic PAs (PPAs) using GoldSim for the West Valley site in western New York.

West Valley Waste Areas and Reaches

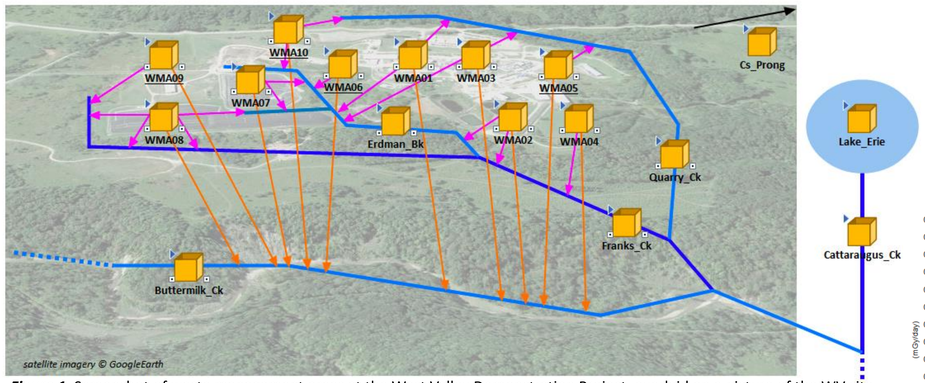

Figure 1. Screenshot of waste management areas at the West Valley Demonstration Project, overlaid on a picture of the WV site.

Model Design and Implementation

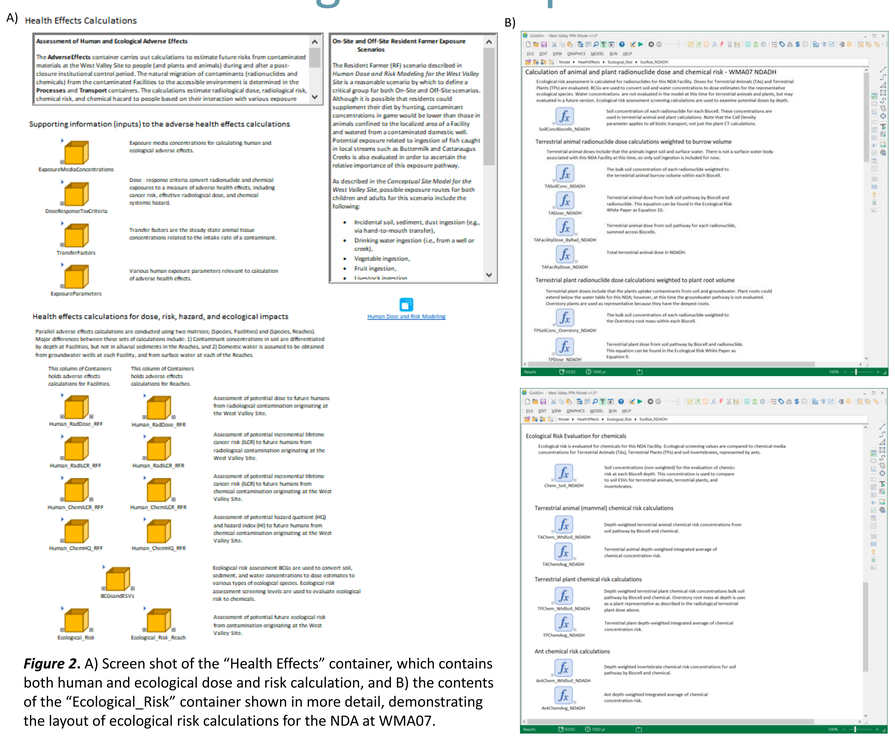

Figure 2. A) Screen shot of the "Health Effects" container, which contains both human and ecological dose and risk calculation, and B) the contents of the "Ecological_Risk" container shown in more detail, demonstrating the layout of ecological risk calculations for the NDA at WMA07.

Background

To assess radiological dose and risk, an initial ecological dose and risk (IEDR; i.e. RESRAD-BIOTA Tier 1) biota dose assessment with protectively biased, but simple, assumptions. The "Tier 1" biota dose assessment is based on a set of generic receptors that broadly representative of relevant ecological receptors, as shown below:

- *Terrestrial plant* represents plants
- *Terrestrial animal* represents meadow voles, short-tailed shrews, weasels, mourning doves, American woodcock, and American kestrel
- *Aquatic animal* represents aquatic snails, daphnids, rayed beans, clubshells, crayfish, Odonate nymphs, tadpoles, frogs, and fish
- *Riparian animal* represents northern long-eared bats, raccoons, olive-sided flycatchers, and belted kingfishers

The IEDR assessment for chemical ecological risks is accomplished by comparing the location-specific abiotic medium concentration to ecological screen values (e.g., those published by EPA). Based on the results of the IEDR screen, a more complex, site-specific biota dose and risk assessment is next performed.

Select Results

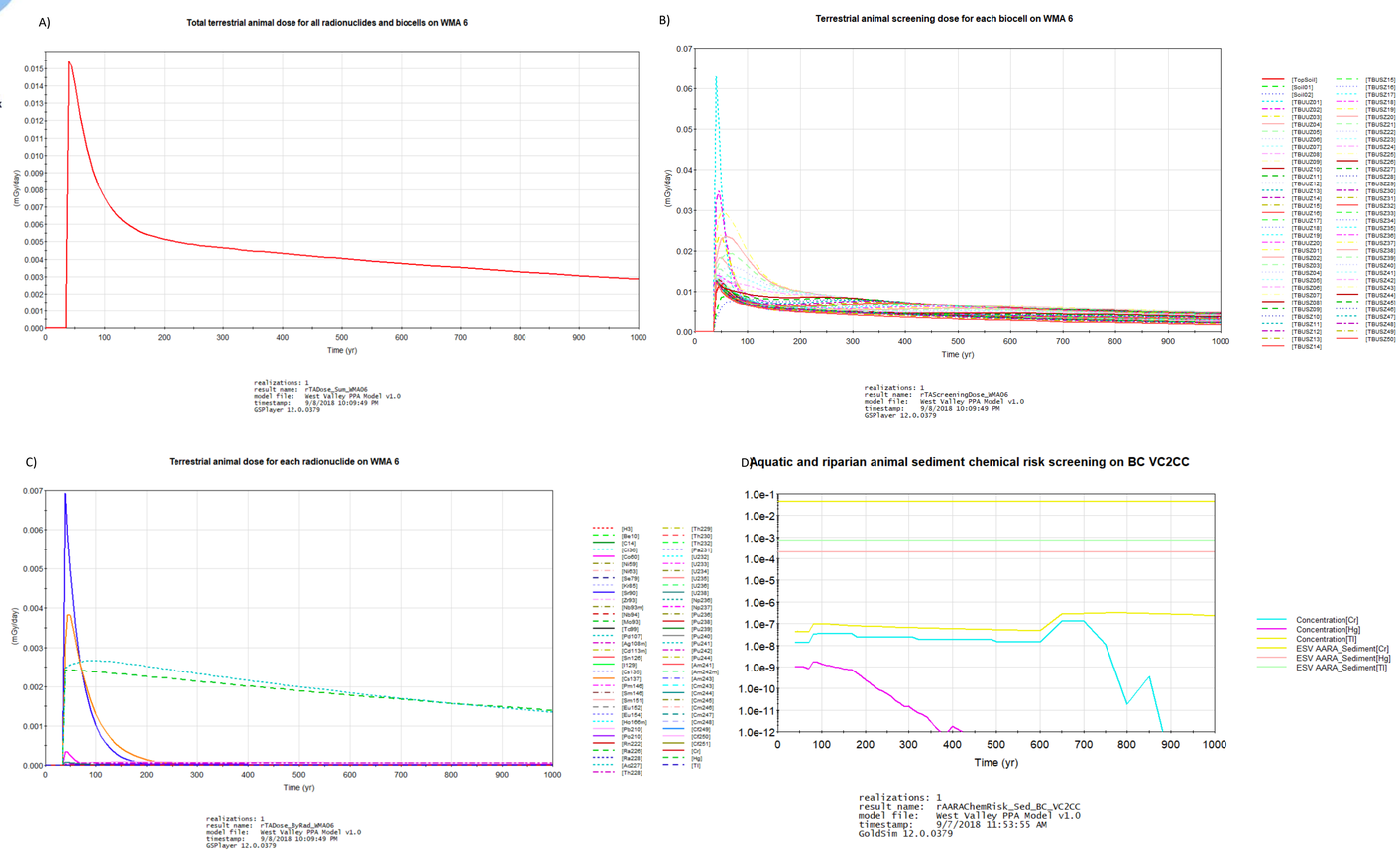

Figure 3. Example 1000-year probabilistic run results of dose for terrestrial animals at the WMA 06, displaying A) total dose, B) dose by biocell, and C) dose by radionuclide/chemical species. Panel D) displays results of chemical risk screening for aquatic and riparian animals in the sediment at reach of Buttermilk Creek, Validation Creek to Cattaraugus Creek.