



LAND RESEARCH PROGRAM

TOOLS FOR ECOLOGICAL RISK ASSESSMENT OF CONTAMINATED SITES

Issue

At contaminated sites, EPA's Superfund program must decide how best to protect public health and the environment. The Land Research Program in EPA's Office of Research and Development (ORD) conducts research to answer key scientific questions to improve the scientific basis for making decisions about contaminated areas.

To assess the potential for risk from contaminated sediments and to help determine contamination levels for remedial designs, the Land Research Program has developed several ecological risk assessment tools:

- Biota-Sediment Accumulation Factor Data Set
- PCB Residue Effects Database
- ECOTOX Database

Each of these tools facilitate a scientifically defensible risk

assessment, improve the decision-making ability of risk managers at Superfund and other contaminated sites, and facilitate successful remediation efforts.

Biota-Sediment Accumulation Factor Data Set

One tool, the Biota-Sediment Accumulation Factor (BSAF), can be used to evaluate the transfer of chemicals from sediments into the aquatic food chain. Simply put, the BSAF is the ratio of contaminant concentration in an organism to the contaminant concentration in the sediment in the organism's aquatic habitat.

The BSAFs are derived from sediment and biota (e.g., fish, invertebrates) data collected from Superfund sites. The data set is particularly important for those who use it to retrieve individual BSAFs that may be applicable to their sites.

Users may upload BSAF data from their sites and then check their values against the other sites in the data set for reasonability, or oddity in their data.

For Superfund sites with limited or no field tissue data, BSAFs from the data set can be used as a screening tool for predicting bioaccumulation (the accumulation of a substance in tissues of a living organism).

Finally, output from the BSAF data set can interface with the PCB Residue Effects Database to determine if accumulated levels may be of concern relative to effects documented in the toxicological literature.

PCB Residue Effects Database

The PCB Residue Effects database (PCBRes) holds an abundance of information for risk assessors to use for correlating polychlorinated biphenyls (PCBs)

continued on back

LAND RESEARCH PROGRAM

continued from front

and other dioxin-like compound residues with toxic effects. The purpose is to help users identify residue values for aquatic and aquatic-dependent species (mammals and birds) that may cause harmful effects.

PCBs are organic compounds that were banned in the 1970s due to their high level of toxicity and persistence in the environment. Because they have similar toxic effects, PCBs are grouped with dioxins, a general term for chemicals formed as an unintentional by-product of many industrial processes involving chlorine.

The database supports development of Toxicity Reference Values (TRVs), which are estimates of tissue levels of known effects on the growth, reproduction, or survival of bird, mammal, and fish species. Output from the BSAF Dataset can then be compared to the TRVs and used by risk assessors and remedial project managers for risk characterization and remedial design.

ECOTOX Database

When risk assessors and managers need to develop TRVs for sediment sites that have contaminants other than, or in addition to, PCBs and dioxins, they can turn to the ECOTOX database. This database provides ready access to single-chemical toxicity information for aquatic and terrestrial life.

The data are used to perform ecological hazard assessments, including characterizing, diagnosing, and predicting the effects associated with chemical stressors.

For example, EPA program offices use ECOTOX to support ongoing risk assessments and hazard rankings of chemical stressors. This includes setting benchmarks at Superfund and Resource Conservation and Recovery Act sites, setting permit levels for EPA's Office of Water, and conducting assessments of new and existing chemicals within EPA's Office of Pollution Prevention and Toxics.

ECOTOX was a critical tool in the development of Ecological

Soil Screen Levels (Eco-SSLs), which are contaminant concentrations in soil considered to be acceptable levels of risk for wildlife that live or feed on plants and soil dwelling organisms. These values are used during Step 2 of the Superfund Ecological Risk Assessment process, the screening-level risk calculation.

Users can browse an index of all chemicals, species, and effects, and create reports.

All of these tools facilitate the exchange of credible scientific data and risk assessment information among private and public stake holders—a long-term goal for ORD.

REFERENCES

BSAF

http://www.epa.gov/med/Prods_Pubs/bsaf.htm

ECOTOX

<http://cfpub.epa.gov/ecotox/>

PCB Residue Effects

<http://www.epa.gov/ORD/lrp/database/PCB.htm>

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