



Office of Environment, Safety & Health

RESRAD-BIOTA

What is RESRAD-BIOTA?

A user-friendly tool that provides a full spectrum of analysis capabilities, from practical, cost-effective screening to realistic dose estimates for plants and animals.

RESRAD-BIOTA is a computer code that implements the U.S. Department of Energy's (DOE's) Graded Approach methodology described in DOE Technical Standard DOE-STD-1153-2002, *A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota*. The Graded Approach methodology was developed through the Department's Biota Dose Assessment Committee (BDAC).

The code was sponsored by DOE's Office of Environment, Safety and Health, and the Office of Environmental Management, with support from the U.S. Environmental Protection Agency and the U.S. Nuclear Regulatory Commission. The code was developed by Argonne National Laboratory (Argonne). Code and version control are currently maintained by DOE through Argonne as part of the RESRAD family of codes.



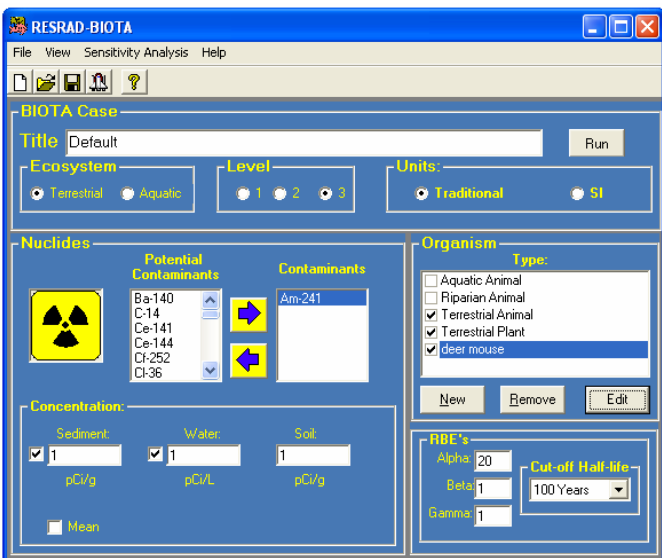
A computer program for evaluating radiation doses to nonhuman biota

How can it be used?

RESRAD-BIOTA is designed for multiple users and has many current and potential applications, including:

- Demonstrating compliance with biota protection requirements and dose rate guidelines contained in DOE Order 5400.5, *Radiation Protection of the Public and the Environment*, and DOE Order 450.1, *General Environmental Protection Program*.
- Deriving remediation goals for contaminated environmental media to meet these or other user- or regulator-specific requirements.
- Evaluating radiological hazards to biota in support of site Environmental Management Systems (EMSs).
- Evaluating prospective risks to biota in support of National Environmental Policy Act (NEPA) environmental impact assessments associated with decontamination and decommissioning, facility construction and operation, and waste management.
- Evaluating radiological impacts to biota and ecosystems in the long-term recovery phase of emergency response to a radiological incident.
- Conducting detailed ecological risk assessments of radiation as a stressor to the environment.

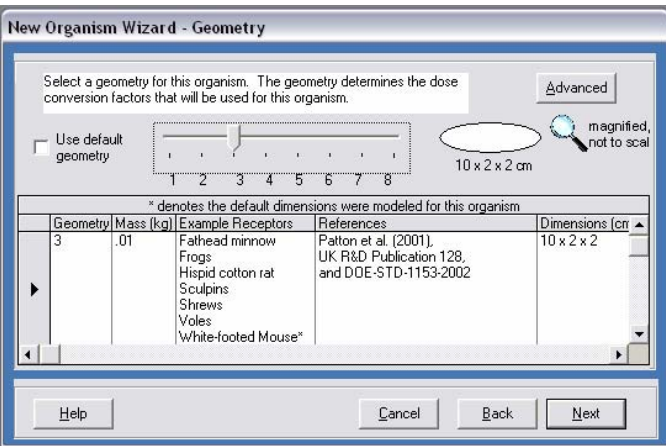




Organisms in each category were analyzed for radiation exposures to each of the 45 radionuclides currently in the database, assuming contamination in their living environment. RESRAD-BIOTA has the capability of evaluating radiation exposures for specific organisms, providing their exposure parameters are input by the users.

What exposure pathways are considered in RESRAD-BIOTA?

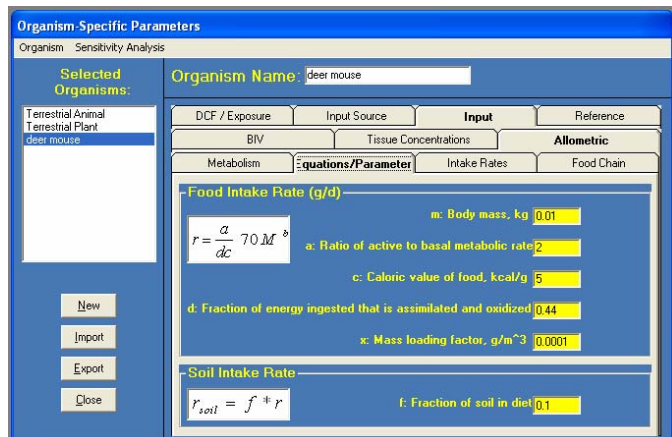
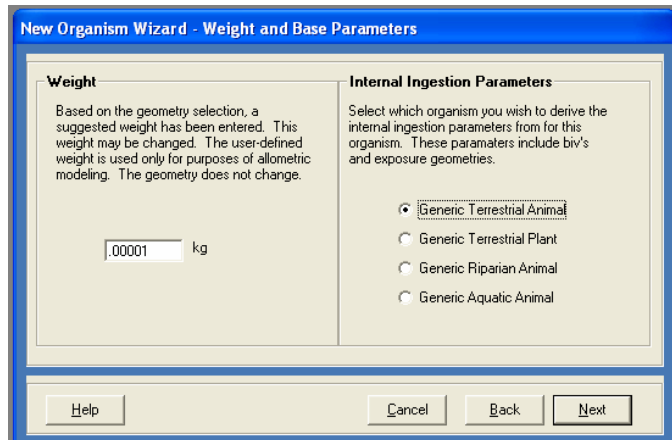
RESRAD-BIOTA calculates absorbed radiation doses resulting from external and internal exposures. For external exposure, it considers the living pattern of an organism that spends time in the contaminated media. For internal exposure, it considers the intake of radionuclides through inhalation of dust particles and ingestion of contaminated soil, water, sediment, and different food sources.

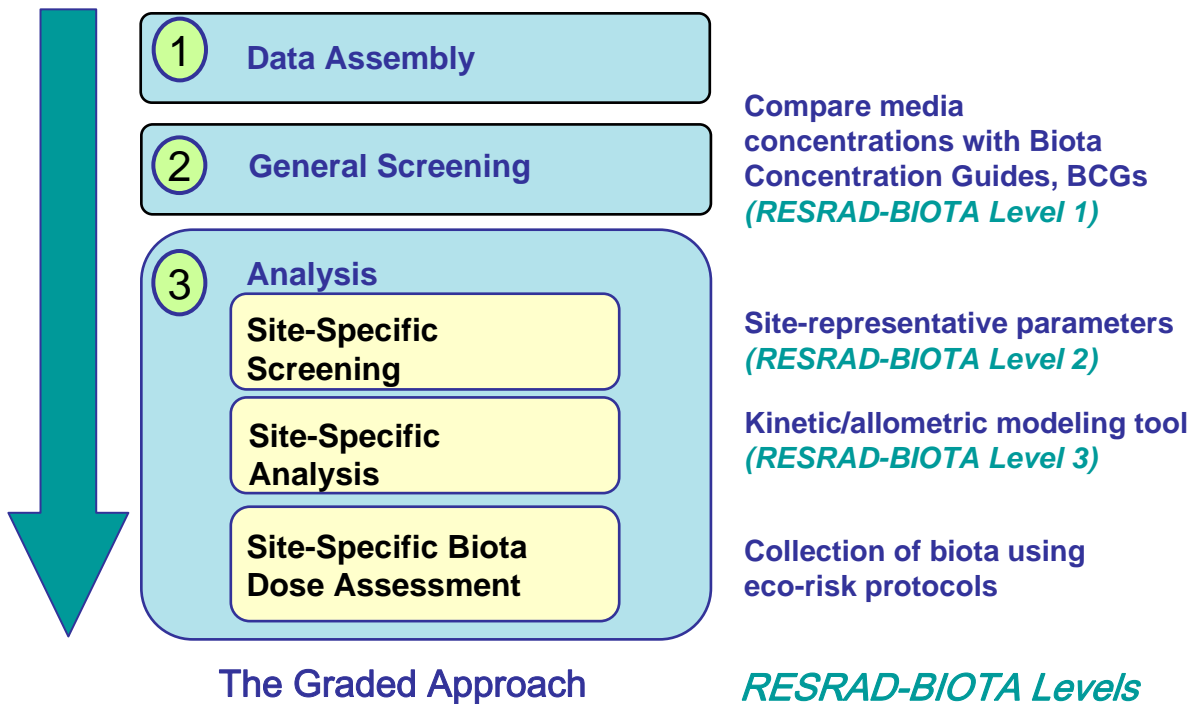


What media, organisms, and radionuclides are considered in RESRAD-BIOTA?

RESRAD-BIOTA analyzes radiation exposures to biota in a terrestrial system and in an aquatic system. Radiation exposures are considered to result from contaminated soil, water, and sediment, which subsequently result in contamination in air and in different food sources.

A range of organisms were evaluated to develop default exposure parameter values. These reference organisms are categorized into terrestrial animals and terrestrial plants for a terrestrial system, and aquatic animals and riparian animals for an aquatic system.



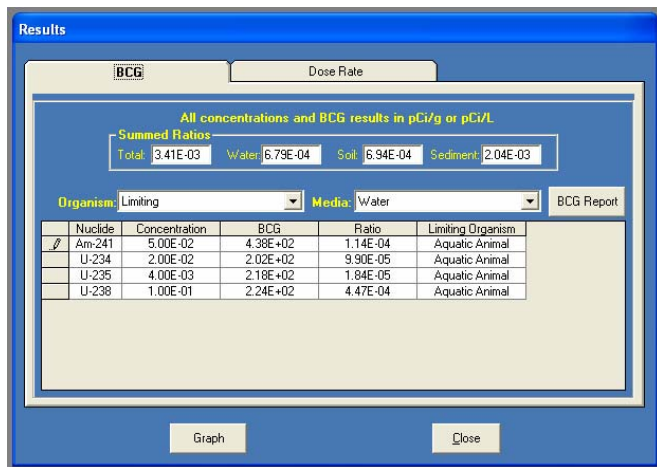
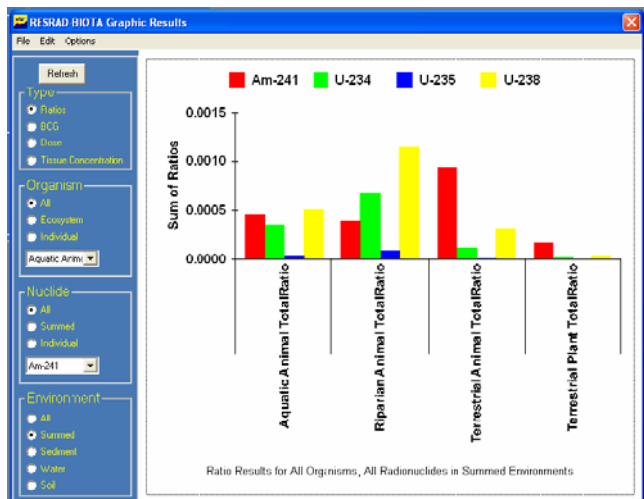


What is the method of analysis used by RESRAD-BIOTA?

Potential radiation exposures of biota are evaluated following a graded approach that consists of three tiers of analysis. At Level 1, conservative assumptions are made through provision of a general screening process employing DOE's Biota Concentration Guides (BCGs, radionuclide concentrations in environmental media that would not exceed recommended dose rate guidelines) and few inputs are required. The BCGs provide users with "a place to start" and an "analysis path forward." As the user progresses to Levels 2 and 3, fewer assumptions are made a priori but more site- or receptor-specific input data are required; greater user flexibility is offered at Levels 2 and 3. Analysis can start at the general screening level (Level 1) and proceed through Level 2 to Level 3 if screening values are exceeded or receptor-specific evaluations are desired. The code is based on an independently peer-reviewed and user-tested methodology.

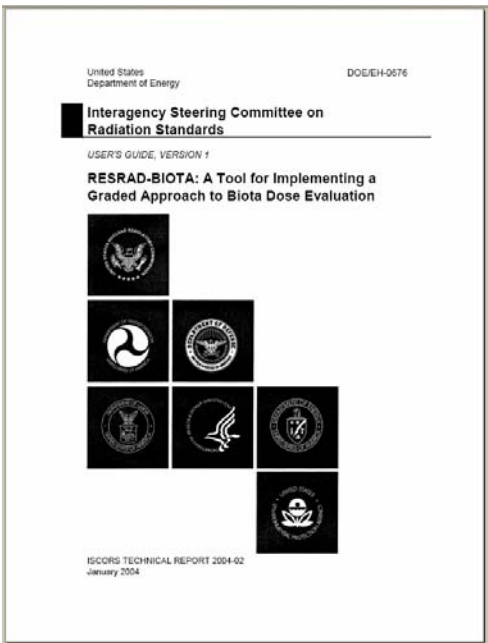
What are the main features of RESRAD-BIOTA?

- On-line general and context-specific help
- Sensitivity analysis to study the influence of parameters
- Tabular and graphic output for easy interpretation of data
- Dose conversion factors for eight specific organism geometries
- Organism Wizard for configuring user-defined organisms and constructing input data
- Options for utilizing measurement data or allometric equations for dose modeling
- Food source specification for considering food-web relationships in real situations
- Flexibility and ease of modification regarding exposure assumptions, environmental transfer parameters, and dose rate guidelines and modifiers
- User-friendly and easy to install
- Capabilities to save and retrieve evaluation data and user-configured organisms
- BCGs for screening assessments



Where is RESRAD-BIOTA being used?

- Widely implemented by DOE sites and programs
- Used by Federal agencies and several state environmental agencies
- Used by international organizations and regulatory agencies
- Participated in the International Atomic Energy Agency's Environmental Modeling for Radiation Safety (EMRAS) program for model comparison, verification, & validation



Where can I get RESRAD-BIOTA?

RESRAD-BIOTA is available free of charge and can be downloaded from the RESRAD Web site (<http://web.ead.anl.gov/resrad>) or the Biota Dose Assessment Committee Web site (<http://homer.ornl.gov/oepa/public/bdac>) after completing the on-line registration.

Who can provide additional information?

For additional information on DOE's regulatory and evaluation framework for demonstrating radiation protection of biota, and for information on the RESRAD-BIOTA training workshops, please contact:



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