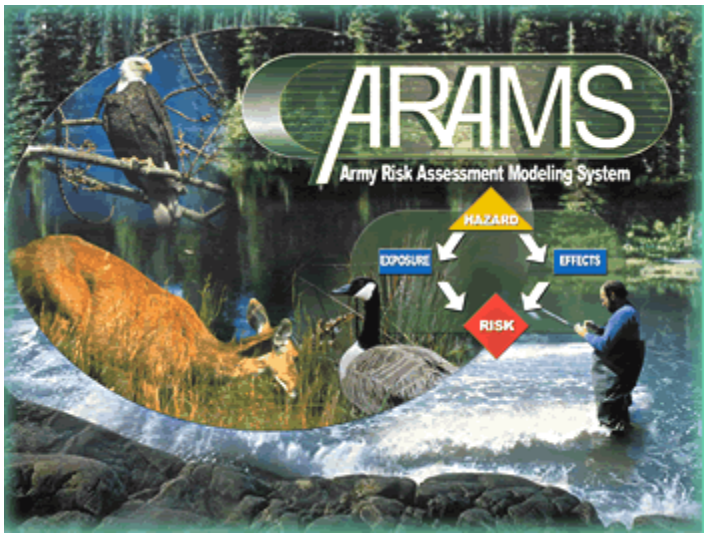
US Army Corps of Engineers®
Engineer Research and Development Center

ARAMS, an Adaptable Risk Assessment Modeling System

Technology

ARAMS is a computer-based, modeling- and database-driven analysis system developed for the Army for estimating the human and ecological health impacts and risks associated with military relevant compounds (MRCs) and other constituents. ARAMS takes various existing databases and models for exposure, intake/update, and effects (health impacts) and incorporates them into a conceptual site-modeling framework. With ARAMS, the user can visually specify multimedia pathways and risk scenarios with objects. The user can also choose which particular model or database to use for each object. Thus, ARAMS is adaptable for assessing various risk scenarios of interest.

The heart of ARAMS is the object-oriented Conceptual Site Model (CSM). The CSM is based on the Framework for Analysis in Multimedia Environmental Systems (FRAMES) developed by Pacific Northwest National Laboratory (PNNL) of the U.S. Department of Energy (DOE). FRAMES provides the common framework for linking disparate models and databases. Objects (or modules) are used in FRAMES to denote different pathways and stages of analysis. Objects also represent the sources of contamination, the intermediate exposure pathways, intake/uptake, and health impact assessment.



Problem

The U.S. Department of Defense and the Army conduct risk assessments to determine safe levels and cleanup target levels for military relevant compounds (MRCs) and to evaluate remediation alternatives to provide the most cost-effective approach to reach target levels. Often cleanup target levels are overly conservative resulting in high remediation costs. Hazard/risk assessment methods are required to: determine appropriate cleanup levels; provide reliable, uniform methods for risk estimates; reduce time and cost to conduct assessments; reduce remediation costs by establishing more reasonable cleanup targets; provide means for risk-based evaluations of remediation alternatives; provide risk information early in the study process to help identify data needs; and aid in evaluating means of managing resources to reduce future risks.

Expected Cost to Implement

ARAMS is available at no cost through the Internet via download from the ARAMS Web site, and the user incurs costs only in time spent learning and using the system. ARAMS is operable for Microsoft Windows-based operating systems. Application of Microsoft Office Excel and Access is required for use of several features.

Benefits/Savings

ARAMS offers more comprehensive information in less time through the following features:

- Can assess human and ecological health risks.
- Can use measured or predicted exposure data.
- Can assess existing or future exposure/risks.
- Can assess time-varying risks.
- Can conduct screening or comprehensive assessments.
- Has an object-oriented, digital conceptual site modeling interface allowing rapid assessment of a wide array of exposure pathways, uptake routes, and risk scenarios.
- Has seamless links to resident and Web-based databases to provide chemical-specific properties, fate parameters, bioaccumulation factors, and toxicity reference values for a wide variety of compounds, including military relevant compounds.
- Has flexibility for selection of modules/databases and use of measured data.
- Can consider uncertainty in the analyses.
- Provides reliable, uniform methods and data for conducting risk assessment.
- Reduces time and cost to conduct risk assessments.

Status

ARAMS (Version 1.0) was released in June 2002 and ARAMS Version 1.1, which uses FRAMES version 1.4, was released in March 2003. Version 1.1 contains corrections to Version 1.0 and some new features, including the addition of an adult blood lead model and a tool for assessing risks from trophic transfer of sediment-associated contaminants (Trophic Trace). Version 1.2 was released in June 2004 and included the capability to conduct terrestrial ecological health assessments. Updated versions of ARAMS with new features are planned for each year. Minor modifications and corrections of the most recent release version may be posted to the Web site intermittently for download as necessary.

Point of Contact

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Distribution Sources

ARAMS is available online to both Corps users and the public at *http://www.wes.army.mil/el/arams/arams.html*.

Available Documentation

Deliman, P. N., Ruiz, C. E., and Gerald, J. A. (2000). "Summary Report, Risk Assessment Modeling Workshop, 14-15 May 1998, New Orleans, Louisiana," ERDC/EL TR-00-6, U. S. Army Engineer Research and Development Center, Vicksburg, MS. View on-line or download part1.exe and part2.exe.

Dortch, M. S. (2001). Army Risk Assessment Modeling System. *Assessment and Management of Environmental Risks, Cost Efficient Methods and Applications*, edt. by Igor Linkov and Jose Palma-Oliveira, published in cooperation with NATO Scientific Affair Division, Kluwer Academic Pub., Amsterdam, Netherlands.

Dortch, M. S., and Gerald, J. A. (2002). Army Risk Assessment Modeling System for Evaluating Health Impacts Associated with Exposure to Chemical, *Brownfield Sites: Assessment, Rehabilitation and Development*, edt. by C. A. Brebbia, D. Almorza, and H. Klapperich, WIT Press, Southampton, UK.

Dortch, M. S., and Johnson, M. S. (2002). "Army Risk Assessment Modeling System (ARAMS): Associated Time and Space Scales," in SETAC 23rd Annual Meeting in North

America Abstract Book, 16-20 November 2002, Salt Lake City, UT. PDF format or JPG format

Sample, B. E., Loveridge, A. R., Arenal, C. A., Bedan, M. E., Miller, K., Go, W., Dortch, M. S., and Johnson, M. S. (2002). "TWEM: An Integrated Model for Estimating Risks to Wildlife within ARAMS," in SETAC 23rd Annual Meeting in North America Abstract Book, 16-20 November 2002, Salt Lake City, UT.

Available Training

Training courses are being considered, but firm dates have not been set at this time.

Available Support

ARAMS has online help and documentation, and tutorials located on the Web site. If users experience problems in applying ARAMS, they are asked to contact Dr. Mark Dortch (601/634-3517, Mark.S.Dortch@erdc.usace.army.mil) or Mr. Jeff Gerald (601/634-3590, Jeff.Gerald@erdc.usace.army.mil).