EXAMS

Model Uses EXAMS is a computer modeling program that evaluates the fate, transport and exposure of pesticides, industrial materials and other leaching materials from disposal sites.

Major Categories Water Quality; Decision Support

Subject Knowledge Level
Advanced

Minor Categories Pesticides; Transport; Concentration; Ecological Risk Assessment

Technical Difficulty Level
Advanced

Model Type Physical Model

Geographic in Nature?
No

Abstract
The Exposure Analysis Modeling System, first published in 1982 (EPA-600/3-82-023), provides interactive computer software for formulating aquatic ecosystem models and rapidly evaluating the fate, transport, and exposure concentrations of synthetic organic chemicals - pesticides, industrial materials, and leachates from disposal sites. EXAMS contains an integrated Database Management System (DBMS) specifically designed for storage and management of project databases required by the software. User interaction is provided by a full-featured Command Line Interface (CLI), context-sensitive help menus, an on-line data dictionary and CLI users' guide, and plotting capabilities for review of output data. EXAMS provides 20 output tables that document the input data sets and provide integrated results summaries for aid in ecological risk assessments.

EXAMS' core is a set of process modules that link fundamental chemical properties to the limnological parameters that control the kinetics of fate and transport in aquatic systems. The chemical properties are measurable by conventional laboratory methods; most are required under various regulatory authorities. EXAMS limnological data are composed of elements historically of interest to aquatic scientists world-wide, so generation of suitable environmental data sets can generally be accomplished with minimal project-specific field investigations.

EXAMS provides facilities for long-term (steady-state) analysis of chronic chemical discharges, initial-value approaches for study of short-term chemical releases, and full kinetic simulations that allow for monthly variation in mean climatological parameters and alteration of chemical loadings on daily time scales. EXAMS has been written in generalized (N-dimensional) form in its implementation of algorithms for representing spatial detail and chemical degradation pathways. The complexity of the environmental description and the number of chemicals is fully user-controlled. This implementation allows for direct access file (UDB) storage of five interacting chemical compounds and 100 environmental segments; more complex configurations can be created and subsequently stored using EXAMS' write command. EXAMS provides analyses of

Exposure: the expected (96-hour acute, 21-day and long-term chronic) environmental concentrations of synthetic chemicals and their transformation products,

Fate: the spatial distribution of chemicals in the aquatic ecosystem, and the relative importance of each transformation and transport process (important in establishing the acceptable uncertainty in chemical laboratory data), and

Persistence: the time required for natural purification of the ecosystem (via export and degradation processes) once chemical releases end.

EXAMS includes file-transfer interfaces to the PRZM3 terrestrial model and the FGETS and BASS bio-accumulation models; it is a complete implementation of EXAMS in Fortran 95.

Future Developments
Unknown

Model Limitations
Unknown

Model Features

- Database Management Systems (DBMS) for storing and maintaining data required by the model program
- 20 different output tables that document input data and provide integrated results
- Linking of chemical properties to limnological parameters associated with fate and transport in aquatic systems
- Provides analyses for Exposure, Fate and Persistence
- File transfer interfaces for the PRZM3 terrestrial model, FGETS and BASS bio-accumulation models
- Command Line Interface
- Context-sensitive help menus
- Online data dictionary
- Plotting capabilities for output data

Required Data Types
Through a fully-featured command line interface, users input data pertaining to chemical types, aquatic parameters and desired output types.

Model Outputs
Approximately 20 different tables documenting input data sets and integration and interaction between them. Plotting capabilities are also built into the program.

Source
US Environmental Protection Agency

Source (URL)
http://www.epa.gov/ceampubl/swater/exams/

Hardware Requirements
None noted.

Supported Platforms

DOS	☒	**UNIX**	☐
Windows	☐	**Macintosh**	☐

Software Requirements
None noted.

Cost, Licensing and Availability
Free, available from the link above.