

CONCEPTUAL MODELS

- ▶ A powerful user-friendly interface for the elaboration of conceptual models of the ecosystem(s) under study
- ▶ Support for three types of aquatic habitats : intermittent pools, watercourses (streams/ivers) and water bodies (lakes/ponds)

▶ Types of ecological receptors considered :

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|--|------------------------------|--------------|
| • Herbaceous vegetation | • Aquatic micro-organisms | • Fish |
| • Shrubbery | • Phytoplankton / periphyton | • Amphibians |
| • Arborescent vegetation | • Zooplankton | • Reptiles |
| • Soil micro-organisms | • Macrophytic aquatic plants | • Birds |
| • Soil invertebrates | • Aquatic invertebrates | • Mammals |
| • Terrestrial and aerial invertebrates | | |

▶ Types of interactions considered in the definition of the conceptual model :

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|----------------------------------|----------------------------------|-----------------------|--------------------------------|
| • Adsorption / desorption | • Diffusion | • Infiltration | • Resuspension |
| • Atmospheric deposition | • Dilution | • Ingestion | • Root absorption |
| • Bioconcentration | • Direct contact | • Inhalation | • Runoff |
| • Competition | • Dispersion | • Parasitism | • Shelter / supporting habitat |
| • Commensalism | • Evaporation | • Predation / feeding | • Sedimentation |
| • Degradation | • Foliar fixation | • Rainsplash | • Symbiosis |
| • Deposition of organic material | • Gas / particulate partitioning | • Resurgence | • Volatilisation |

MODELLING

- Functions for geostatistical treatment of characterisation data, including an interpolation method and a newly-developed stochastic simulation method specifically designed for cases of heterogeneous contamination on urban sites
- Statistical functions for the treatment of characterisation data, including a variety of graphs
- Modelling of multimedia concentrations in all environmental compartments, biotic or abiotic; newly-developed models for the calculation of concentrations and doses in amphibians and terrestrial invertebrates
- Exposure modelling for all types of ecological receptors
- Estimation of risks for all ecological receptors, using reference values definable by the user ; 7 different methods that can be prioritised by the user, including the real-time calculation of reference values from ecotoxicological databases
- Calculation of distinct risk indices for background, additional and total concentrations
- Calculation of statistical distributions of ecotoxicological indicators (sensitivity distributions)
- Calculation of concentration/response or dose/response relationships according to three distinct models (normal, log-normal, Weibull), with calculation of ECx values
- Treatment of biotest data, including functions for the calculation of risk indices, and functions which search for correlations with measured concentrations and with risk indices calculated by the mathematical modelling approach
- "Smart" function for the integration of the results of the mathematical approach with the results of biotests

DATABASES

- Interactive databases of physico-chemical, toxicological and environmental properties of contaminants, covering over 100 common substances ; functions for editing, adding and deleting records, with calculation of numerous parameters using "structure-activity" type equations
- Databases on ecological receptors (aquatic macrophytes, fish, amphibians, reptiles, birds and mammals) covering more than 190 different species; functions for editing, adding and deleting records, with calculation of numerous parameters using allometric equations
- Ecotoxicological databases containing more than 18,000 records, which can be used for the real-time calculation of reference values as defined by the analyst
- Descriptive databases covering the most commonly used biotests for contaminated lands (EPA, OECD, etc.)
- Integrated default values for various soil types

USER ASSISTANCE

- User-friendly interface
- Direct reading of Microsoft Excel™ files containing characterisation data
- Text file editor for the production of reports, with automatic formatting functions configurable by the user
- Numerous text reports : analysis of the conceptual model, geostatistical modelling, multi-media concentration modelling, exposure and risk modelling
- Mapping functions : sampling stations, measured concentrations, calculated concentrations, biotests results, etc...
- Numerous interactive tools for assisting the user
- Extensive graphic functions, including a wide variety of formatting, editing, saving and printing options
- Genuine 3D graphs that can be pivoted in all directions
- Graphs of the distribution of risk indices as a function of the volumes of soil at various concentrations (for direct contact receptors)
- Complete copy functions for data and graphs
- Capacity for simultaneous treatment of 100 different contaminants, 1500 sampling stations, 100 ecological components and 1000 interactions (conceptual model)
- Detailed reference manual / Contextual "Help" system / Technical support

MINIMAL SYSTEM CONFIGURATION:

- Windows® NT 4.0, Windows 2000 or Windows XP™ operating system
- 256 Megabytes of RAM
- Screen resolution: minimum 1024 X 768 (1600 X 1200 recommended)
- Intel® Pentium® processor at 233 MHz or more, or equivalent
- 20 Megabytes of disk space for installation
- At least 100 Mb disk space available for running the software
- Mouse or other pointing device

INFORMATION

SANEXEN
ENVIRONMENTAL SERVICES INC.

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TERRA  **Sys** 1.0



**Ecotoxicological
Risk Assessment
of Contaminated Sites**

Professional Software

What is TERRASys?

User friendly...

The advanced interface of TerraSys incorporates numerous functions which facilitate definition of the conceptual model of the ecosystem, mapping of contaminant concentrations, data entry and consultation of results. TerraSys also includes extended context-related Help functions, which provide appropriate instructions to the user at all times.

A complete tool...

TerraSys brings together all the tools required for the conduct of risk assessments in a single software program. All the stages of an analysis, from data entry to final risk evaluation, are undertaken in a coherent and integrated manner.

TerraSys includes unprecedented new functions which extend its capacities well beyond traditional models. These functions include geostatistical treatment of characterisation data, functions for the calculation of dose/response relationships and sensitivity distributions integrated with ecotoxicological databases, a method of calculating risk indices from the results of biotests, etc...

The principal functions of TerraSys

- functions for the treatment of contaminated soil characterisation data (statistical and geostatistical treatments, mapping, etc.)
- functions for the definition of conceptual models of ecosystems
- functions for modelling multi-media concentrations, for modelling exposure and for the calculation of risk indices for all types of ecological receptors, in terrestrial or aquatic habitats
- functions for the integration of biotest results with the risk indices calculated according to the traditional modelling approach

TerraSys is the first professional software program to combine all the tools required for ecotoxicological risk assessment.

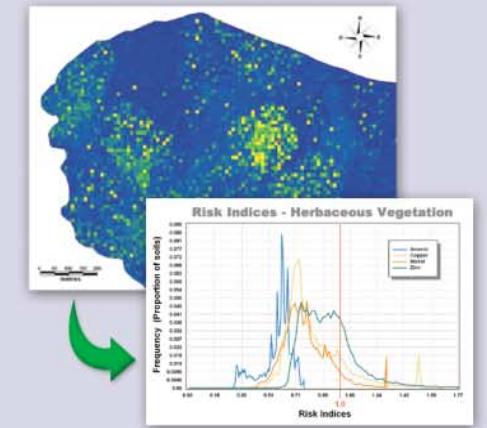
Developed primarily for cases involving contaminated soil, TerraSys possesses the tools necessary to evaluate various situations involving toxic substances in the environment, whether in terrestrial or aquatic habitats. The numerous databases integrated into the software can be edited by the analyst. This gives TerraSys a capacity so far unequalled for performing ecotoxicological risk assessments on combinations of receptors and contaminants for which no reference values are currently available.

The screenshot displays the TerraSys 1.0 software interface. At the top, there is a menu bar with options: Files, Characterisation data, Study zone, Conceptual model, Biotests, Modelling, Results, Tools, Databases, Help. Below the menu bar is the 'TERRASys 1.0' logo and a navigation pane with tabs for 'General Information', 'Conceptual model', 'Study zone', 'Characterisation data', and 'Biotests'. The main window shows a conceptual model diagram with boxes for 'Atmosphere', 'Herbaceous vegetation', 'Subsurface soil', 'Deep soil', 'Short-tailed Weasel', and 'Red-Tailed Hawk'. Arrows indicate interactions between these components. A list of contaminants is visible on the left, including Acenaphthene, Aroclor 1254, Arsenic, Barium, Benzene, Benzo[a]anthracene, Benzo[a]pyrene, Benzo[b]fluoranthene, Benzo[g,h,i]perylene, Benzo[k]fluoranthene, Cadmium, Carbon tetrachloride, Chlorobenzene, Chloroethane, Chromium VI, Chrysene, Cobalt, Copper, Dibenz[a,h]anthracene, Dibenz[a,h]pyrene, Dibenz[a,i]pyrene, Dibenz[a,j]pyrene, Dioxin (2,3,7,8-TCDD), Fluoranthene, Fluorene, Indeno[1,2,3-cd]pyrene, Lead, Manganese, Mercury (inorganic), Molybdenum, Naphthalene, Nickel, Phenanthrene, Pyrene, Selenium, Tetrachloroethylene, Tin, Trichloroethylene, Vinyl chloride, and Zinc. A 'Help for TerraSys 1.0' window is open, showing 'The ecological components palette' which lists various biotic and abiotic elements like Supporting habitat, Soil micro-organisms, Aquatic micro-organisms, Phytoplankton/periphyton, Aquatic invertebrates, Reptiles, Soil invertebrates, Terrestrial and aerial invertebrates, Zooplankton, Aquatic macrophytes, Fish, Amphibians, Mammals, and Birds. A 'Biotest' graph is also visible in the bottom right of the interface.

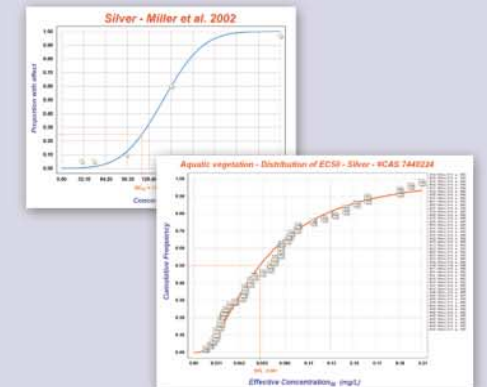
Remarkable analytical power...

TerraSys is mainly based on recognised and well documented models. Its analytical capacity rests on a powerful algorithm permitting the modelling of concentrations and receptor exposure levels even in complex systems composed of multiple trophic levels.

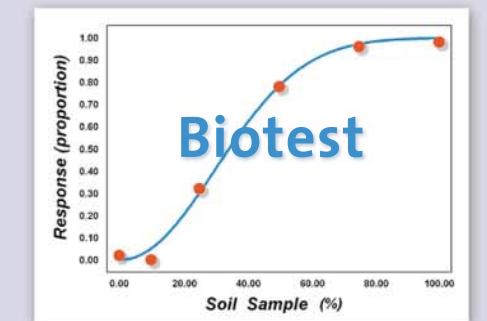
A number of new models are also included, in order to allow the assessment of risks for all types of ecological receptors. Detailed documentation accompanies the software and provides all the technical and scientific information required.



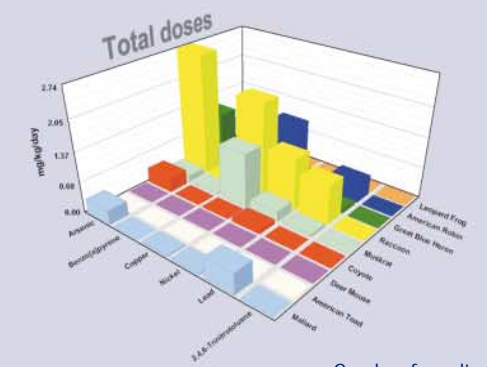
Geostatistical treatment and estimation of the volume of soil presenting a risk



Generation of reference values from ecotoxicological databases



Calculation of risk indices from biotest results



Graphs of results