



## Fact Sheet

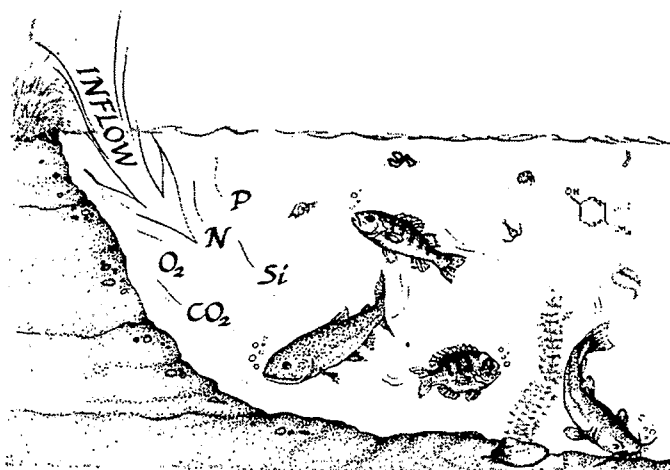
# AQUATOX RELEASE 1: A SIMULATION MODEL FOR AQUATIC ECOSYSTEMS

The U.S. Environmental Protection Agency announces the release of the freshwater ecosystem simulation model **AQUATOX**. **AQUATOX** predicts the fate of various pollutants, such as nutrients and organic toxicants, and their effects on the ecosystem, including fish, invertebrates, and aquatic plants. **AQUATOX** is a valuable tool for ecologists, biologists, water quality modelers, and anyone involved in performing ecological risk assessments for aquatic ecosystems.

### BACKGROUND

A primary goal of the Clean Water Act is "to restore and maintain the chemical, physical and biological integrity of the Nation's waters". One of the biggest challenges is to adequately understand the interrelationships between the chemical and physical environment and the aquatic life. In particular, water quality analysts need tools to predict the effects of chemical pollutants and other stressors on aquatic ecosystems.

**AQUATOX** is a PC-based ecosystem model that simulates the transfer of biomass and chemicals from one compartment of the ecosystem to another. It does this by simultaneously computing important chemical and biological processes over time. **AQUATOX** can predict not only the fate of chemicals in aquatic ecosystems, but also their direct and indirect effects on the resident organisms. Therefore it has the potential to help establish the cause and effect relationships between chemical water quality, the physical environment, and aquatic life.



### WHAT AQUATOX DOES

**AQUATOX** simulates the behavior of numerous inter-related components

- multiple algal species and submerged aquatic vegetation
- benthic invertebrates, zooplankton and fish
- nutrients and dissolved oxygen
- sediments
- toxic organic chemicals

#### SYSTEM REQUIREMENTS

Pentium PC, 16 MB RAM, 30 MB free disk space, Windows 95, 98, NT

#### ACKNOWLEDGMENTS

**AQUATOX** was developed by Richard A. Park and Jonathan S. Clough of Eco Modeling with EPA funding.

**AQUATOX** can represent a variety of aquatic ecosystems

- vertically stratified lakes, reservoirs and ponds
- rivers and streams

**AQUATOX** simulates the fate and effects of multiple environmental stressors

- nutrients
- organic toxicants
- temperature and turbidity
- changing depths and flow regimes

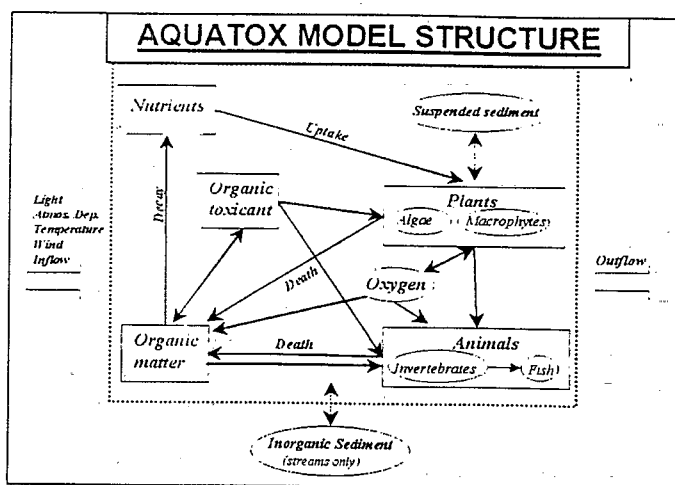
**AQUATOX** simulates and integrates significant ecological processes

Biological effects

- food consumption
- growth and reproduction
- natural mortality
- acute and chronic toxicity
- trophic interactions

Environmental fate

- nutrient cycling and oxygen dynamics
- toxic organic chemical transformations
- partitioning to water, biota and sediments
- bioaccumulation through gills and diet



## POTENTIAL APPLICATIONS FOR AQUATOX

AQUATOX has a myriad of potential applications to water management issues and programs, including water quality criteria and standards, TMDLs (Total Maximum Daily Loads), and ecological risk assessment.

AQUATOX should be considered when the user needs to understand the processes relating the chemical and physical environment to the biological community. AQUATOX can be used to predict ecological responses to proposed management alternatives. It may also help to determine the most important of several environmental stressors, e.g. where there are both nutrients and toxic pollutants.

### Application to nutrient and eutrophication analysis

- Eutrophication endpoints: dissolved oxygen, chlorophyll, nitrogen, phosphorus, Secchi depth
- Suitable for stratified lakes and reservoirs, ponds, streams and small rivers

### Application to aquatic life uses

- Direct and indirect effects throughout food web
- Causes of biological impairment

### Application to organic toxicants and bioaccumulation

- Partitioning to water, sediments and biota
- Bioaccumulation factors
- Direct and indirect effects of toxicants

## AQUATOX FEATURES

- User friendly design
- Automated uncertainty analysis
- Constant or variable environmental loading

### How to obtain AQUATOX

The model, users guide, technical documentation and validation reports are available at [www.epa.gov/ost/models/aquatox](http://www.epa.gov/ost/models/aquatox).

They will be available this fall on CD and in print from NSCEP (800-490-9198 or [www.epa.gov/ncepihom](http://www.epa.gov/ncepihom)).

Be sure to include the document numbers, as follows:

EPA-823-C-00-001: AQUATOX: A Modular Fate & Effects Model for Aquatic Ecosystems-CD-ROM (model & supporting documents)

EPA-823-R-00-006: Volume 1: User's Manual

EPA-823-R-00-007: Volume 2: Technical Documentation

EPA-823-R-00-008: Volume 3: Model Validation Reports

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