AQUATOX: A TOOL FOR INTEGRATED MODELING OF WATER QUALITY AND AQUATIC LIFE

For More Information, or to Obtain AQUATOX
Web Site: www2.epa.gov/exposure-assessment-models/aquatox/
Email to: Rashleigh.brenda@epa.gov

AQUATOX, and Integrated Fate and Effects Model

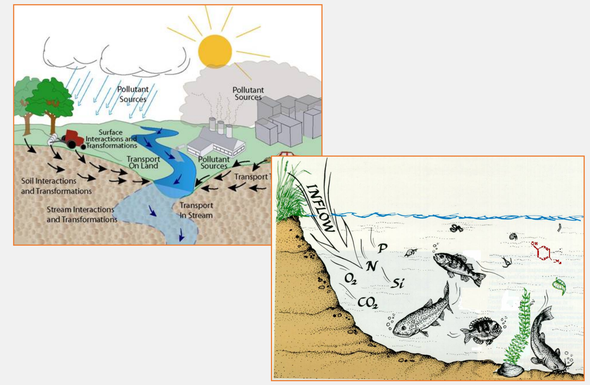
AQUATOX predicts:
- Fate of nutrients and organic chemicals
- Direct/indirect effects on organisms
- Tissue levels of bioaccumulative organics

AQUATOX can be applied to:
- Stratified lakes, reservoirs and ponds
- Rivers and streams
- Estuaries

"AQUATOX fully closes the loop between eutrophication, contaminant fate and effects, and, as such, is the most complete model described in the literature."
-- Koelmans, et al 2001

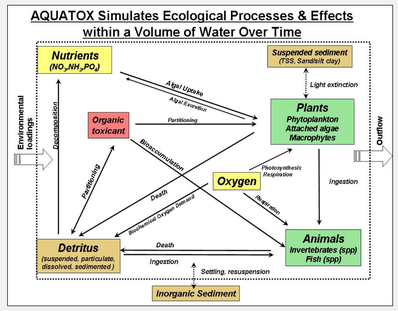
AQUATOX Link with Watershed Models in BASINS

- **Object-oriented programming**
- **User-friendly interface**
- **Flexible time step**
- **Easy data input in multiple formats**
- **Linked river segments**
- **Toxicity estimation tool *(ICE)***
- **Unit conversions**

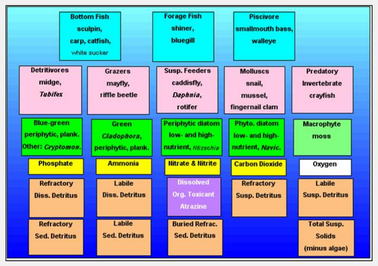


An AQUATOX Simulation Integrates:

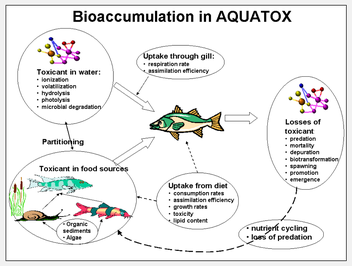
Multiple Ecological Processes



Multiple Ecological Endpoints



Bioaccumulation & Toxicity



Multiple Sources
- Atmosphere
- Point & nonpoint source
- Inflow, upstream reaches

Multiple Stressors
- Nutrients
- Organic toxicants, PFOA/PFOS
- Flow, temperature
- Sediment

Fate Processes
- Nutrient cycling & oxygen dynamics
- Partitioning of organic toxics in water, biota and sediments
- Toxic chemical transformations
- Bioaccumulation (gills & diet)

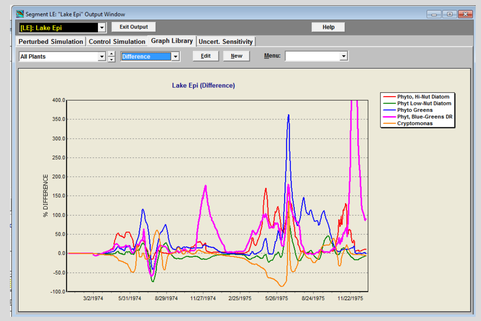
Ecological Effects
- Food consumption
- Growth and reproduction
- Natural mortality
- Acute and chronic toxicity
- Trophic interactions
- Sediment and salinity effects

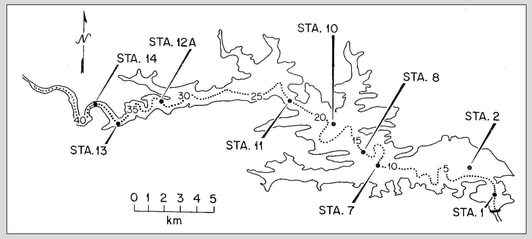
Outputs
- Rates
- Tropic State Index
- Biological Indices
- Uncertainty/Sensitivity Analysis

AQUATOX Example: DeGray Lake, Arkansas

Reservoir on the Caddo River, foothills of Ouachita Mountains, large recreational area

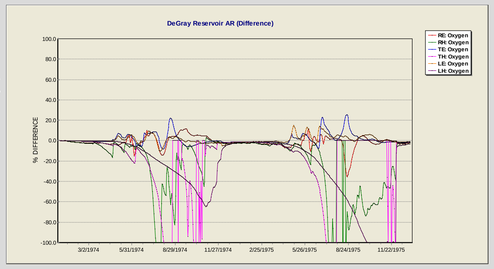
Plants in Lake Epilimnion: several blue-green algae blooms from increased nutrient loading.

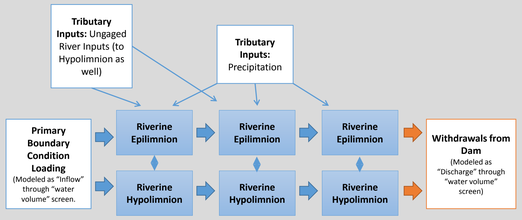




Divided into upstream riverine zone (R), transition zone (T), and lacustrine zone (L) near dam.

Doubling the nutrient input will reduce the oxygen levels in the majority of the reservoir





Modeled as six segments fed by seven "tributary inputs" and precipitation.

Based on the range of Trophic State Index (TSI) (40.7 to 63.5), the riverine epilimnion is Eutrophic.

TSI(CHL) > TSI(SD), so large particulates, such as *Aphanizomenon*, dominate.