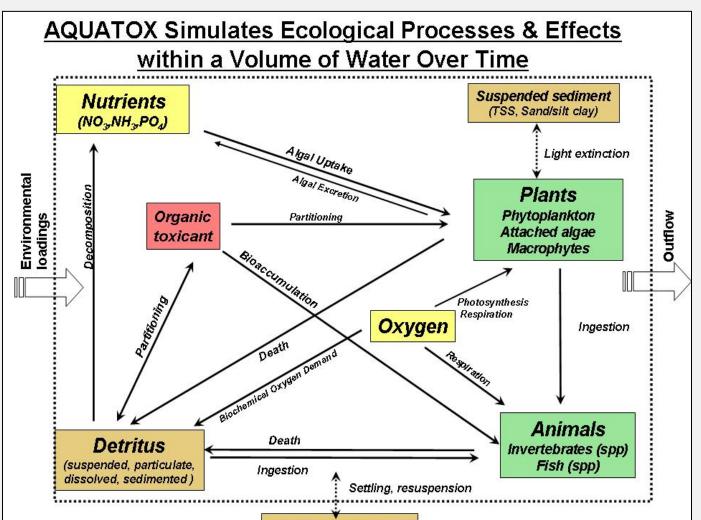
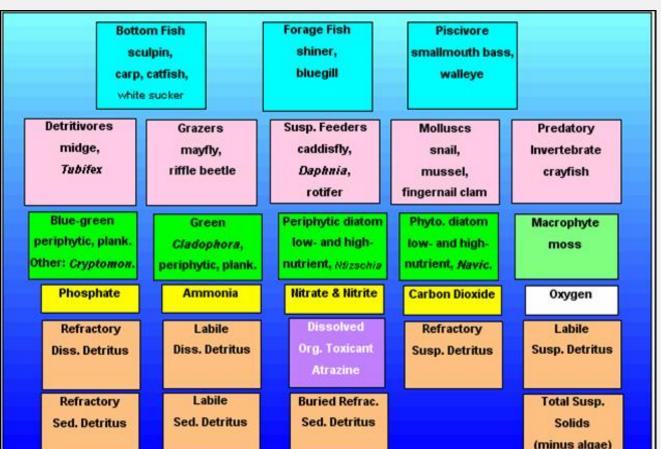
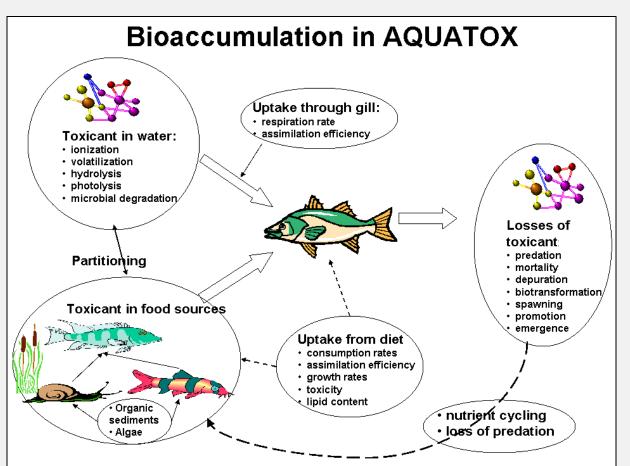
AQUATOX: A TOOL FOR INTEGRATED MODELING OF WATER QUALITY AND AQUATIC LIFE

AQUATOX Link with Watershed Models in BASINS AQUATOX, and Integrated Fate and Effects Model AQUATOX predicts: • Object-oriented programming "AQUATOX fully closes the • Fate of nutrients and organic chemicals • User-friendly interface loop between eutrophication, • Direct/indirect effects on organisms contaminant fate and effects, • Flexible time step • Tissue levels of bioaccumulative organics and, as such, is the most • Easy data input in multiple formats complete model described in • Linked river segments AQUATOX can be applied to: the literature." Stratified lakes, reservoirs and ponds • Toxicity estimation tool (ICE) -- Koelmans, et al 2001 Rivers and streams • Unit conversions Estuaries **AQUATOX Example: DeGray Lake, Arkansas An AQUATOX Simulation Integrates:** Multiple Sources **Multiple Ecological Processes** Atmosphere Reservoir on • Point & nonpoint source the Caddo **AQUATOX Simulates Ecological Processes & Effects** within a Volume of Water Over Time • Inflow, upstream reaches River, Nutrients (NO~NH~PO) foothills of Plants Ouachita **Multiple Stressors** Phytoplankton ttached algae Mountains, loading. • Nutrients large • Organic toxicants, PFOA/PFOS recreational • Flow, temperature Animals area • Sediment spended, particula Settling, resuspension Fate Processes Multiple Ecological Endpoints Nutrient cycling & oxygen dynamics • Partitioning of organic toxics in arp, catfish, water, biota and sediments 40 • Toxic chemical transformations wertebrate iffle beetle Daphnia, crayfish STA. 13 • Bioaccumulation (gills & diet) reservoir 012345 Nitrate & Nitrite Oxygen **Ecological Effects** usp. Detritus ss. Detritus Divided into upstream riverine zone (R), transition Food consumption Buried Refrac. Sed. Detritus Solids Sed. Detritus ed. Detritus zone (T), and lacustrine zone (L) near dam. (minus algae) Growth and reproduction Natural mortality **Bioaccumulation & Toxicity** Tributary Acute and chronic toxicity Inputs: Ungaged Tributary River Inputs (to **Bioaccumulation in AQUATOX** Inputs: Hypolimnion as Trophic interactions Precipitation well) Sediment and salinity effects Úptake through gill respiration rate Eutrophic. Toxicant in water assimilation efficiency ionization volatilization hydrolysis photolysis Primary Withdrawals from Boundary microbial degradati Dam Condition Outputs (Modeled as Losses of Loading Discharge" through toxicant Modeled as "Inflo predation mortality depuration "water volume" • Rates through "water volume" screen. biotransformat spawning promotion Toxicant in food source • Tropic State Index emergence Jptake from die consumption rates







- Biological Indices

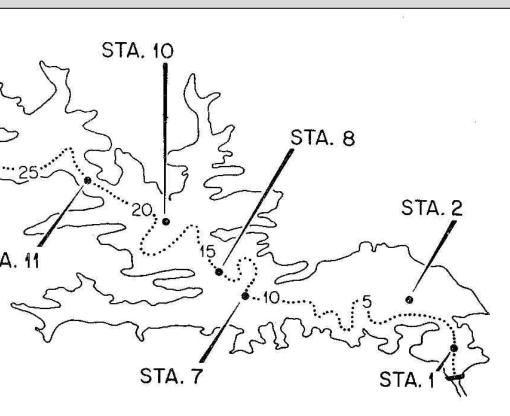
Uncertainty/Sensitivity Analysis

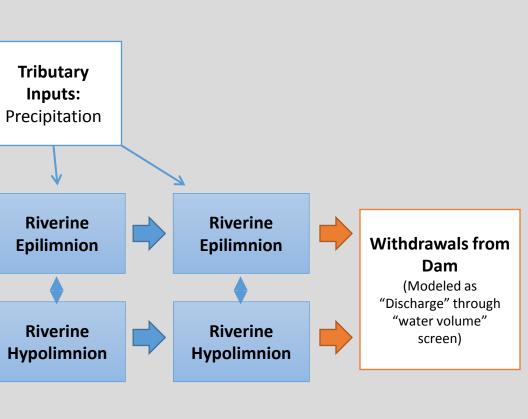
Modeled as six segments fed by seven "tributary" inputs" and precipitation.

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



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





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

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

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

