

Description of Example Study Files for AQUATOX 3.1

Study Name	Site Type	Location	Run time (2.66 GHz Quad CPU)	Notes
Blue Earth R.MN.aps Blue Earth R.MN BMP Criteria.aps	River	Southern MN	0:14 for 2 yr 0:14 for 2 yr	The Blue Earth River drains a watershed, in the Western Corn Belt Plains ecoregion, that is 95% agricultural, planted in corn and soybeans. Suspended sediments are important most of the time; otherwise, algal blooms predominate. Study set up to represent nutrient reduction due to best management practices (BMPs).
Cahaba R AL.aps Cahaba R AL X2 TSS.aps	River	near Birmingham AL	0:47 for 2 yr 0:29 for 2 yr	A shallow stream incised in the southern Appalachians, located in a rapidly urbanizing area and receiving effluent from wastewater treatment plants. Good data on periphyton, invertebrates, and fish for calibration. TSS is doubled to demonstrate embeddedness and impact on zoobenthos; it also decreases periphyton growth and speeds up simulation.
Cheney Res KS.aps	Reservoir	Near Wichita KS	0:01 for 15 mn	The city of Wichita acquires about 70 percent of its daily water supply from Cheney Reservoir. It is believed that objectionable tastes and odors in Cheney Reservoir result from cyanobacteria (blue-green algae), and there is concern with proliferation of algal growth. Both nutrients and suspended solids affect algal growth and may be a concern for taste-and-odor issues (USGS 2008).
Clear Lake CA Fluridone.aps	Lake	Central CA	0:14 (both perturbed & control) for 3 yr	Roughly based on Clear Lake, a large, shallow, eutrophic lake with cyanobacteria blooms. Sonar (fluridone) has been used successfully in Clear Lake to eradicate <i>Hydrilla</i> . Although <i>Hydrilla</i> did not appear until 1994, the study is set up with 1970-1971 ecosystem data. Note that the fluridone loadings are for 1971 but without bracketing the simulation period with 0 loadings, the loadings are repeated in each of the three years. Also note that we are modeling the entire lake for convenience; in reality, <i>Hydrilla</i> spread slowly, so only selected areas needed to be treated; our simulation is, therefore, a worst-case scenario.
Coralville Res IA Dieldrin.aps Coral Res IA Sens.aps	Reservoir	near Iowa City IA	0:13 (perturbed), 0:10 (control) for 9 yr 2:41 for 1 yr	Coralville Reservoir is a large, shallow, eutrophic reservoir. The drainage area is over 90% agricultural, especially corn. Runoff carries large amounts of fertilizer, animal wastes, silt, and pesticides into the reservoir. By the early 1970's, the population of largemouth bass and fish other than buffalofish began to decline and residues of the pesticides aldrin and dieldrin greatly increased in tissue samples (Mauriello and Park 2002). Study set up for sensitivity analyses, 54 parameters.
Crow Wing R. MN.aps	River	north central MN	0:13 for 2 yr	Shallow, relatively low-nutrient river that drains a predominantly forested watershed in the Northern Lakes and Forests ecoregion. Mile 72 is in the headwaters and drains numerous small lakes.
DeGray Res AR.aps	Reservoir	near Hot Springs AR	0:16 for 2 yr	A mesotrophic-eutrophic impoundment of the Caddo River in the Ouachita Mountains ecoregion. Most of the watershed is forested. Study shows transient response to drowned forest shortly after dam construction. Uses sediment diagenesis model.
East Fork Poplar Creek TN PCBs.aps	Stream	Oak Ridge TN	1:09 for 8 yr	A small stream that drains the Y-12 plant at Oak Ridge National Lab with PCB contamination. The simulation runs for eight years to illustrate gradual recovery.

Study Name	Site Type	Location	Run time (2.66 GHz Quad CPU)	Notes
Evers Res FL.aps	Reservoir	Bradenton FL	0:05 for 5 yr (perturbed)	A reservoir with increasing algal blooms, treated with copper sulfate and hydrogen peroxide. Simulated by Dr. Don Blancher, Sustainable Ecosystem Restoration, LLC
Expr Stream Esfenval.aps	Stream	Idaho	0:15 for 10 mn (perturbed)	Based on Lower Boise River, this is a reach with a volume of 400 m ³ and a retention time of 0.1 day; it is set up for constant dosing for a period of time; study uses fixed time step so it can be used for detecting lowest effect levels
Farm Pond MO.aps Farm Pond MO Esfenval.aps	Pond	central MO	0:01 for 1 yr 0:01 for 1 yr	A generic pond built to USDA specifications. Esfenvalerate loadings are the worst-case scenario using runoff from an adjacent corn field predicted by the PRZM model.
Galveston Bay TX Aroclor 1254.aps	Estuary	Near Houston TX	0:24 for 3 yr	A shallow, productive bay that receives runoff from Central TX, including the Houston Ship Channel; poorly calibrated; PCB data are from MA.
HCB Tank.aps	Aquarium	experimental lab	0:00:01 for 2 mn	Represents an experiment in which an aquarium tank containing macrophytes was dosed with hexachlorobenzene (Gobas et al. 1991).
Impact of anadromous fish.aps	Lake	Based on Lake George NY	0:01 for 3 yr	Mesotrophic lake, based on Lake George NY, with Chinook salmon representing anadromous fish; nutrients are imported into lake.
Lake George NY.aps Lake George NY smelt.aps	Lake	Upstate NY	0:01 for 3 yr 0:03 for 13 yr	Mesotrophic end of large, deep lake in Adirondacks. Introduction of smelt changes food web and favors diatom blooms.
Lake Jesup FL.aps	Lake	north of Orlando	0:01 for 7 yr	Lake Jesup is a large, shallow lake. Urban storm water and agricultural runoff impact the lake, as well as historic wastewater discharge. Blooms of the invasive blue-green <i>Cylindrospermopsis</i> have been increasing.
Lake Ontario PCBs.aps	Lake	US-Canada	1:55 for 4 yr	Demonstration of bioaccumulation simulation for numerous PCB congeners compared to data of Oliver and Niemi (1988; see also Burkhard 1998); this implementation uses Barber (2003) k2 estimation.
Lake Pyhäjärvi Finland.aps	Lake	SW Finland	0:04 for 10 yr	Mesotrophic boreal lake simulated by Anne Mäkynen, Jyväskylä University. The Difference between observed and simulated phosphorus concentration corresponds perfectly with that removed by fishing.
Lower Boise R. ID Seg_1-3.als Lower Boise R. ID Seg_1-3 Diel.als	River River	Boise ID Boise ID	2:49 for 3 yr 2:35 for 1 yr	The three upstream linked segments of the lower Boise River, a shallow river with abundant periphyton; flow is controlled by upstream releases and irrigation diversions. Two segments are low-nutrient and the third receives WTP effluent. The same linked segments but with hourly simulation to predict diel oxygen, which is dominated by throughflow except during low flow.
MN Rivers.als	Rivers	North, central, and southern MN	0:40 for 2 yr	The Crow Wing, Rum, and Blue Earth Rivers as linked segments sharing the same parameter set (Park et al. 2005).
Nockamixon Res PA.aps	Reservoir	eastern PA	0:00:30 for 2 yr	The reservoir was heavily impacted by effluent from the Quakertown waste water treatment plant during the period simulated.
Ohio stream Chlorpyrifos constant.aps Ohio stream Chlorpyrifos pulsed.aps	Stream	north central OH	0:07 for 2 yr	A small creek draining agricultural area, used as a generic study for various pesticides. One study has constant exposure and other has pesticide runoff during summer storms.

Study Name	Site Type	Location	Run time (2.66 GHz Quad CPU)	Notes
Onondaga Lake NY Sed Diagenesis.aps	Lake	north of Syracuse, NY	0:01 for 2 yr (steady-state aerobic layer)	"Lake Onondaga is arguably the most polluted lake in the United States" from the preface of a book (Effler 1996), which served as the source of data for this study. The lake has significant nutrient inputs from wastewater treatment plant ("Metro") and combined sewers, successive algal blooms, hypoxia in hypolimnion, build-up of organic sediments in bottom, and high mercury levels and high salinity (the latter two are not modeled at present). Run with sediment diagenesis submodel (Di Toro 2001), with steady-state aerobic layers.
Ponds MN Chlorpyrifos.als	Enclosures	Duluth MN	0:00:15 (perturbed & control) for 3 mn	Pond enclosures dosed with 0.5, 6, and 32 ug/L chlorpyrifos at EPA lab.
Rum R MN.aps	River	north of St. Paul MN	0:13 for 2 yr	Rum River is a shallow river, with moderate nutrients and low suspended solids that drains forests and dairy farms in the North Central Hardwoods Forest ecoregion.
Skensved Denmark TCE.aps Skensved Denmark Atrazine.aps	Stream	Denmark	0:15 for 1 yr (perturbed)	Groundwater with trichloroethene from a leaking tank is polluting a small stream; Simon Funder and Dr. Ursula McKnight, of the Technical Univ. of Denmark, used AQUATOX to show the impacts are probably negligible . The same setup with atrazine does show some direct and indirect ecotoxicological effects; because concentrations are near the no effects level, the option for a fixed dt was taken.
Tenkiller Ferry Lake OK.als	Reservoir	eastern OK	0:51 for 2 yr	Linked segments representing a eutrophic reservoir impaired by nutrients and organics, especially from upstream poultry and swine farms; there are excessive algae, and the hypolimnion is anoxic during the summer. However, it is one of the most important recreational lakes in the state. The sediment diagenesis submodel is necessary to simulate the anoxic hypolimnion.
Zollner Creek OR w chlorpyr dieldrin-pulse.aps	Stream	Willamette Valley OR		The watershed is >90% agricultural, with row crops, orchards and vineyards, grain and grass fields, and large poultry farms. It is a USGS National Water Quality Assessment Program (NAWQA) site, and also a principal TMDL site. State criteria for chlorpyrifos and legacy dieldrin were exceeded (Williams and Bloom 2008).

- Barber, M. C. 2003. A review and comparison of models for predicting dynamic chemical bioconcentration in fish. *Environmental Toxicology & Chemistry* **22**:1963–1992.
- Burkhard, L. P. 1998. Comparison of Two Models for Predicting Bioaccumulation of Hydrophobic Organic Chemicals in a Great Lakes Food Web. *Environmental Toxicology and Chemistry* 17: 383-393.
- Di Toro, D. M. 2001. *Sediment Flux Modeling*. Wiley-Interscience, New York.
- Effler, S. W., ed. 1996. *Limnological and Engineering Analysis of a Polluted Urban Lake*. Springer, New York.
- Funder, S. G. 2009. Risk Assessment of the Skensved Å Field Site: Review and Application of Surface Water Models. Technical University of Denmark, Lyngby Denmark.
- Gobas, F. A. P. C., E. J. McNeil, L. Lovett-Doust, and G. D. Haffner. 1991. Bioconcentration of Chlorinated Aromatic Hydrocarbons in Aquatic Macrophytes (*Myriophyllum spicatum*). *Environmental Science & Technology* 25: 924-929.
- Mauriello, D. A., and R. A. Park. 2002. An adaptive framework for ecological assessment and management. Pages 509-514 in A. E. Rizzoli and A. J. Jakeman, eds. *Integrated Assessment and Decision Support*. International Environmental Modeling and Software Society, Manno Switzerland.

- Oliver, B. G., and A. J. Niemi. 1988. Trophodynamic Analysis of Polychlorinated Biphenyl Congeners and Other Chlorinated Hydrocarbons in the Lake Ontario Ecosystem. *Environ. Sci. Technol.* 22: 388-397.
- Park, R. A., J. S. Clough, M. C. Wellman, and A. S. Donigian. 2005. Nutrient Criteria Development with a Linked Modeling System: Calibration of AQUATOX Across a Nutrient Gradient. Pages 885-902. *TMDL 2005*. Water Environment Federation, Philadelphia, Penn.
- USGS. 2008. The Cheney Reservoir and Watershed Study, <http://ks.water.usgs.gov/studies/qw/cheney/>.
- Williams, K. F. and J. Bloom. 2008. Molalla-Pudding Subbasin Total Maximum Daily Load (TMDL) and Water Quality Management Plan (WQMP) Oregon Department of Environmental Quality, Portland, Oregon.