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In this Issue:

MED in Review Editor
Mary Ann Starus
(218) 529-5075
starus.maryann@epa.gov

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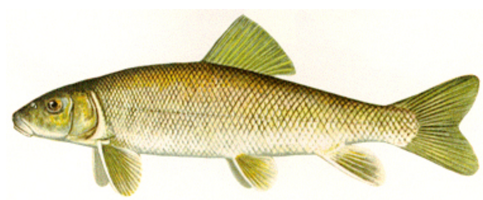
Research Events

ORD Research Partnership Benefits Freshwater Estuary Restoration

Dr. Joel Hoffman, a research biologist in the Division's Ecosystem Assessment Research Branch, is contributing to a research partnership to help restore the Great Lakes' largest freshwater estuary. The scientific issue at stake is whether legacy pollutants in the lower St. Louis River, the second largest tributary to Lake Superior and the world's largest freshwater port, are causing elevated risk of tumors in fish. Dr. Hoffman worked with partners from the US Fish and Wildlife Service (USFWS), the US Geological Survey (USGS), the Fond du Lac Band of Lake Superior Chippewa, the Minnesota and Wisconsin Departments of Natural Resources, and the Minnesota Land Trust. The partnership is funded by the Great Lakes Restoration Initiative (GLRI), with the goal to determine whether fish residence time in the estuary is associated with higher incidence of tumors known to be caused by toxic materials. Sediment remediation projects in the port have been ongoing. If no such risk presently exists, this could be the first major impairment of the nine identified for this Great Lakes Area of Concern (AOC) to be delisted and would mark a major step toward restoring the St. Louis River and its remarkable freshwater estuary.

The St. Louis River AOC is one of 43 US geographic regions in the Great Lakes identified under the United States-Canada Water Quality Agreement to be so polluted that the region's ability to support aquatic life was impaired. The AOC is the nation's largest, encompassing the lower 39 river miles of the St. Louis River and a portion of Lake Superior. Within the AOC are the "twin ports" of Duluth, MN, and Superior, WI, as well as a 12,000-acre freshwater estuary that provides critical fish and wildlife habitat, supports a number of world-class fisheries, and is a regional biodiversity hotspot. This past spring, collaborating agencies collected 250 white suckers, a benthic-feeding fish, from across the AOC. Biologists gathered skin and liver samples for histology, as well as dorsal tissue plugs for biomarker analysis. Using data from the dorsal tissue plugs and a method developed by ORD scientists, Dr. Hoffman used a food-web-based biomarker to determine the amount of time each fish sampled spent feeding in the estuary to quantify relative exposure to sediments in the AOC. Researchers from the USGS currently are analyzing histological samples to collect data on tumor incidence in these fish. The datasets, taken together, will be used to determine if there is an increased risk of tumor incidence associated with longer residence time in the AOC or whether no such elevated risk presently exists.



White Sucker, Catostomus commersonii – MI DNR

The USFWS has highlighted this GLRI partnership, among a number of efforts, in a video posted at http://www.youtube.com/watch?v=kPFm5iSQ1mQ&feature=related.

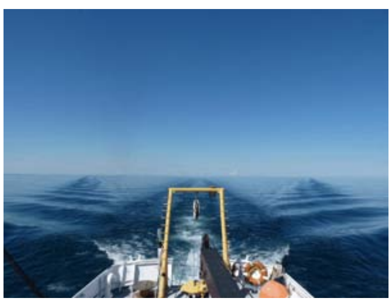
Contact: Joel Hoffman (218) 529-5420, hoffman.joel@epa.gov.

NHEERL Scientists Lead International Partnership to Complete Lake Superior Assessment

Lake Superior, shared by the US and Canada, is the world's largest freshwater lake by area and holds more than 9% of the world's fresh surface water. Lake Superior is so vast that conducting a full lake-wide assessment requires significant resources, so coordinating and conducting an assessment has not been feasible for decades. ORD scientists at NHEERL's Mid-Continent Ecology Division (MED) and Western Ecology Division (WED) have been leading development of efficient sampling designs to assess the condition of Lake Superior to demonstrate effective solutions for monitoring large aquatic systems. Based on a successful pilot assessment in 2006, MED scientists were asked to lead a multidisciplinary, multiagency, international assessment of the lake in 2011, with funding from the Great Lakes Restoration Initiative. This effort was requested by the Great Lakes Binational Program, which coordinates monitoring and resource management activities pursuant to the Great Lakes Water Quality Agreement. This 2011 Coordinated Science and Monitoring Initiative was led by MED and involved active partnerships with the US Geological Survey (Fisheries), EPA's Great Lakes National Program Office/Region 5, Environment Canada, the Division of Fisheries and Oceans Canada, and several academic institutions.

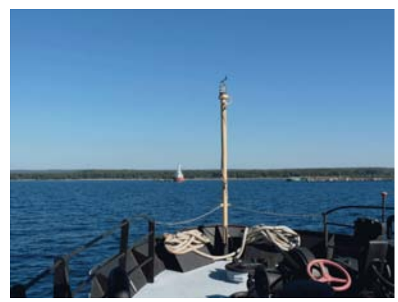
MED's *R/V Lake Explorer II* with Region 5's *R/V Lake Guardian*, Houghton, MI

The MED/WED statistically based design was comprehensive yet efficient, enabling partners, for the first time ever as a major coordinated and fully-integrated effort, to sample the entire lake, using measurements of all aspects of the ecosystem, from water quality to fish, and across all depths, from inshore to deep offshore. Sampling at 56 core stations was completed in September, including water quality and chemistry, major food web biota in the water and sediments, inclusive of pelagic and benthic fish populations. A number of supplementary studies and measurements, involving spatially synoptic, new in situ and acoustic technologies, were fully incorporated in this effort. The Binational Program, which establishes Lakewide Management Plans, is eagerly awaiting overall results, due within the next year. The assessment will be a true integrated benchmark to establish the current state of Lake Superior. It is expected to become a model for coordinated monitoring of other Great Lakes and large lakes in terms of its design and innovative technological sampling elements, as well as its use of resource agency partnerships to achieve a common vision and provide information for sound management.



R/V Lake Explorer II

R/V Lake Explorer II moored at the Keweenaw Waterway upper entry



Keweenaw Waterway

This effort supports EPA's responsibilities under the Clean Water Act and the Great Lakes Water Quality Agreement. **Contact**: Jack Kelly (218) 529-5119, kelly.johnr@epa.gov.

Division Hosts Japanese Scientists to Discuss the Medaka Multigeneration Test (MMT)

From September 13-15, the Division hosted six Japanese scientists, including two members of the Japanese Ministry of the Environment, to discuss and compare results from various fish test protocols performed in US and Japanese labs on the effects of endocrine disruptor chemicals on medaka (*Oryzias latipes*). The results from these tests are being used to finalize a Tier 2 Fish Reproduction Test protocol for the endocrine disruption screening program (EDSP). In addition, the US and Japan are sponsoring a harmonized fish reproduction test protocol as an Organisation for Economic Co-operation and Development (OECD) test-guideline for possible endocrine disruptor chemicals. **Contact**: Rodney Johnson (218) 529-5117, johnson.rodney@epa.gov.

Fish Embryo Test Training Workshop

From September 13-15, the Division hosted a practical laboratory workshop on the zebrafish and fathead minnow (FHM) fish embryo tests (FET) and 7-day FHM survival and growth assay. The workshop originated through an international collaborative project with the International Life Sciences Institute, Health and Environmental Sciences Institute, Animal Alternatives in Environmental Risk Assessment Project Committee. Globally, wastewater dischargers are under regulatory pressure to reduce environmental impacts of their effluents by using biological testing to assess effluent toxicity. While the European Union (EU) requires the use of fish embryos, the US requires the use of larval fish for the testing. Therefore, there is a need to understand the similarities and differences between the various methods to reach a more consistent and cost-effective approach to effluent monitoring. In the US, familiarity with the zebrafish and fathead minnow FET methods is limited.

The workshop focused on the technical procedures of the OECD embryo and EPA larval methods, with particular emphasis on identifying and understanding the various developmental effects used as endpoints in the FET test. The Mid-Continent Ecology Division in Duluth was the logical choice for the workshop as both fish species are cultured in-house, and Division researchers have extensive experience with the acute/chronic testing for EPA regulations. Attendees had the opportunity to gain hands-on experience with the FET test from EU experts. This workshop helped define the protocol for the fathead minnow FET test and highlight where further method refinements are needed. Workshop participants included researchers from EPA-Duluth, University of Heidelberg, Miami University (OH), Procter & Gamble, Exxon Mobil Biomedical Sciences, and SC Johnson. Following this workshop, Miami University conducted comparative studies using zebrafish and fathead minnow in standard 96 hour acute tests, the 96-hour FET tests (OECD method), and the standard 7-day larval growth and survival tests (EPA method).
Contact: Teresa Norberg-King (218) 529-5163, norberg-king.teresa@epa.gov.

Symposium: Pesticides and Metals in Raptors

Raptors are integrative sentinels of chemical exposure to wildlife because of their mobility and position atop both terrestrial and aquatic food chains. As such, these birds of prey played a key role in the dawn of public understanding of the potential dangers of pesticides during the DDT era.

With financial support from EPA's Office of Pesticide Programs (OPP), Division (MED) researchers and EPA risk assessors presented a symposium with scientists from academia and nongovernmental organizations on "Pesticides and Metals in Raptors" at the 2011 Annual Conference of the Raptor Research Foundation, October 5-9, in Duluth, MN. Dr. Matt Etterson/MED helped to organize the symposium, which summarized chemical threats to the world's raptors. More specifically, the symposium included a poster presentation by Dr. Rick Bennett/MED, *Effects of methylmercury on reproduction in American kestrels and comparison to effects observed in other avian species*, (Bennett, Albers, Koterba, Rossmann, Link, French, Bauer, Sappington), and a platform presentation by Dr. John Nichols/MED, *A physiologically-based model for methylmercury uptake and accumulation in female American kestrels* (Nichols, Bennett, Rossmann, French, Sappington). Dr. Steven Bradbury, OPP Director, gave a keynote address on *Raptors and the regulation of pesticides*. MED researchers are working with symposium participants to explore the production of a current review and synthesis of chemical threats to raptors for publication in the *Journal of Raptor Research*. This work supports the ORD Administrator's priorities of Assuring the Safety of Chemicals and Protecting America's Waters. **Contact**: Matt Etterson (218) 529-5158, etterson.matt@epa.gov.

Featured Research

Coastal Wetland Ecosystems and their Lake and Watershed Linkage

Coastal wetlands have been a research focus at the Division for a number of years. In 2002-2004, we (Ecosystem Assessment, and Watershed Diagnostics Research Branches, in collaboration with the EPA-STAR funded Great Lakes Ecological Indicators project) conducted an extensive survey of coastal wetlands across all five Great Lakes. We obtained detailed hydrology, habitat, water quality,

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and biotic composition data for ~60 wetlands spanning a broad gradient of landuse-intensity, using watershed landuse/landcover characterization as the basis for site selection. Early publications arising from this data demonstrated that on a broad scale, patterns in water quality and biological condition of the wetlands were strongly associated with levels of human activity in their watershed. Recent research has worked to refine this general understanding towards better support of ecosystem assessment and management.

One ongoing area of research involves resolving the importance of hydrology in dictating water quality responses and the spatial scales over which such responses are best assessed. Our sampling design deliberately contrasted two wetland hydromorphic types, riverine vs. protected, that we thought would capture some of the variability in nutrient-response relationships (because riverine wetlands would be more strongly linked to watershed effects than protected wetlands, which receive only very small tributary inputs). When this rather coarse classification proved to have little explanatory power, we began examining the magnitude of water inputs in more detail. A defining feature of Great Lakes coastal wetlands is a surface connection to the adjacent lake – which means they receive water inputs from the "downstream" lake via seiche as well as from the "upstream" watershed via tributaries (seiche is a wind-driven day-scale water level oscillation phenomenon functionally analogous to tides). Our recently published research demonstrates that classifying wetlands according to the quantity of seiche vs. tributary water inputs helps to explain the noise in the relationship between watershed agricultural intensity and wetland water quality (Fig. 1). In wetlands dominated by tributary inputs, wetland water quality essentially matched that in the tributary (Fig. 2), and thus landuse influenced wetland at the spatial scale of the tributary watershed. However in wetlands where seiche inputs dominated, wetland water quality matched that in the adjacent lake (Fig. 2), and landuse on a much broader spatial scale (for the embayment or coastal region on which the wetland was situated) was the best predictor of wetland water quality. We also found a group of wetlands that exhibited low hydrologic connection to either the terrestrial landscape or the adjacent lake. This research emphasizes the importance of quantifying rather than just delineating water sources to coastal wetlands, and the importance of assessing and managing landuse on a variety of spatial scales.

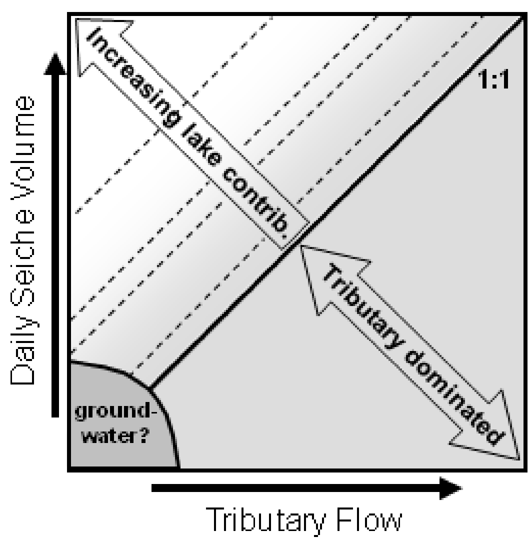

Fig. 1. Diagram of coastal wetland showing water inputs from both lake and tributary.

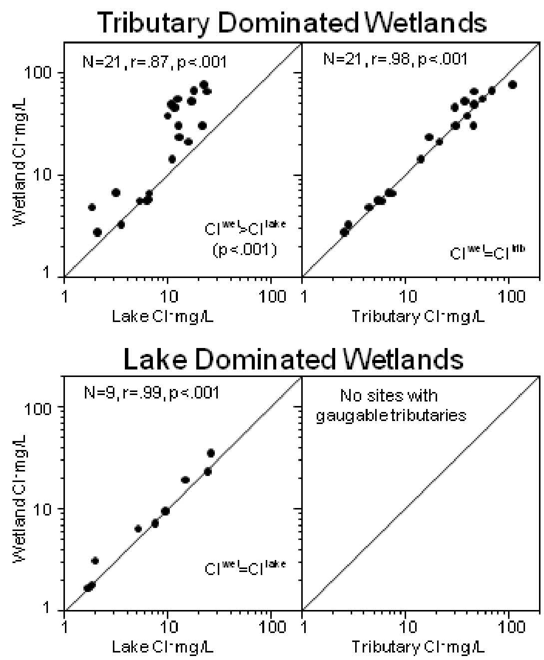

Fig. 2. Mean chloride concentrations in wetland water (y-axis) plotted against concentrations in potential lake and tributary source waters (x-axes).

Another ongoing area of research involves refining our understanding of how effects of landuse and other human stressors cascade through wetlands. Increasing levels of agriculture and urban development in watersheds lead predictably to increased levels of nutrients (and other stressors such as suspended sediments), but pathways for subsequent ecosystem effects are more complicated (Fig. 3). Nutrients stimulate phytoplankton growth, resulting in shading of submerged vegetation and benthic algae (important habitat elements for macroinvertebrates and fish), a light climate which is more suitable for tactile than visual-feeding fishes, channeling of energy flow through pelagic (water-column) rather than benthic (bottom) pathways, buildup of organic matter, and higher oxygen demand. Nutrients also favor proliferation of plant species with poor habitat value (e.g., densely-growing cattails and giant reeds, canopy-forming submerged vegetation). Ultimately, these nutrient-induced changes interact and combine with other stressor effects to affect higher trophic levels in complex ways. What does all this mean for detecting and managing ecological effects? Ecological

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endpoints that are "closer to the source" in the effect cascade are typically ones over which we have greater management control, whereas higher-level ecological endpoints such as fish typically have greater economic and social relevance (Great Lakes coastal wetlands are recognized as spawning and nursery grounds for many game and pan fishes). This research confirms a steadily decreasing correlation to landuse for endpoints further down the response "cascade" along with a tendency for the response to become progressively noisier and less linear (Fig. 4). This does NOT mean that higher trophic levels are insensitive to human activities, but that we cannot expect to cleanly partition effects among stressors and that we need to contend with nonlinearity and considerable variability for such endpoints.

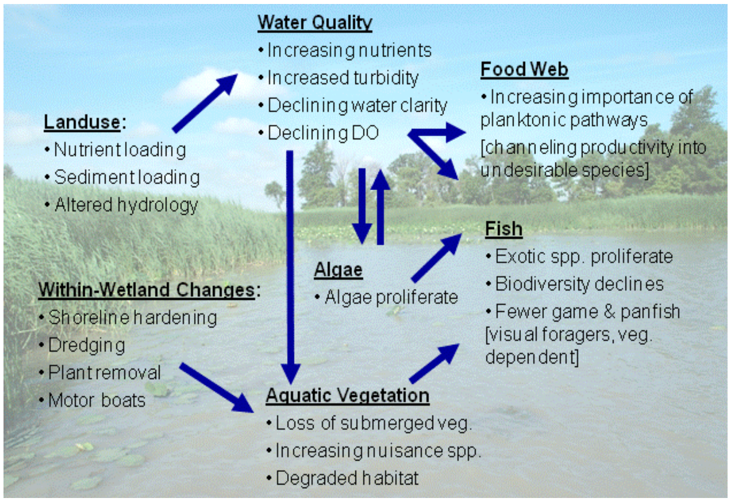


Fig. 3. Conceptual model of stressor effects on coastal wetlands, superimposed on a photograph of a wetland in an agriculture-dominated watershed having turbid water, degraded submerged vegetation, and dense growth of invasive emergent plants.

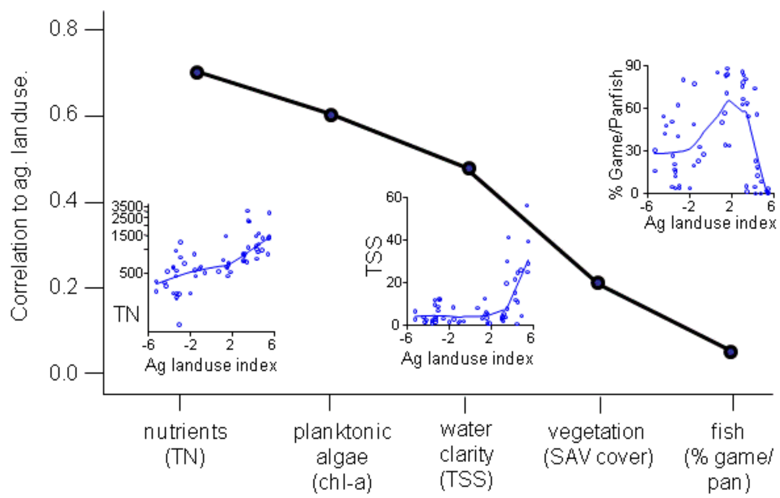


Fig. 4. Plot showing the strength of the correlation between an index of landuse agricultural intensity at various points in the coastal wetland response cascade, with inset graphs showing the shape of the relationship for three of the endpoints.

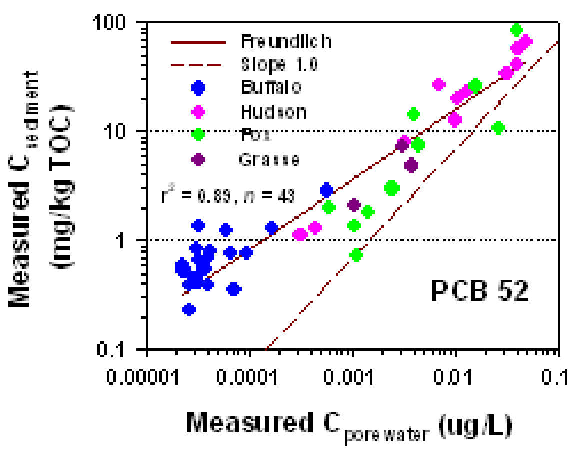
Wetlands are just one element of the Great Lakes "coastal mosaic" that also includes terminal river reaches, embayments, and the nearshore. Elements of this mosaic are linked to each other and to watersheds and offshore zones through complex hydrological and biological connections. Our future research will tackle the challenge of characterizing this suite of interacting systems with an eye towards more effective monitoring, assessment, and management. Research themes will include broader hydrologic classification, resolving responses for broader-relevance endpoints, more refined stressor characterization (e.g., position within watershed), and development of tools to visualize and predict responses to landuse patterns and management actions.

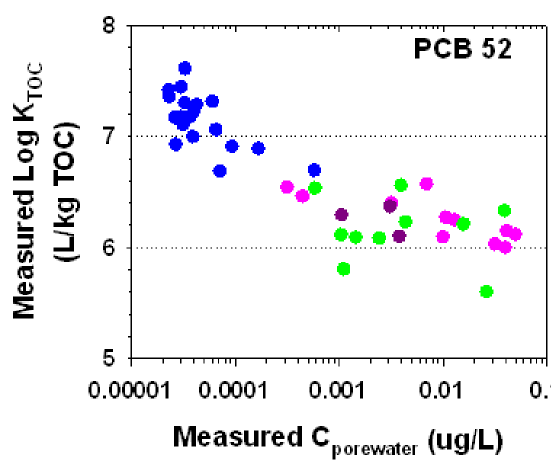
Contact: Anett Trebitz (218) 529-5209, trebitz.anett@epa.gov, John Morrice (218) 529-5210 morrice.john@epa.gov.

A fundamental assumption of both empirical and mechanistic bioaccumulation modeling approaches for predicting chemical residues in fish and shellfish is that the accumulation of chemical at the base of the benthic food chain (benthic invertebrates; lipid normalized) shows a 1:1 relationship with the properly normalized (e.g., organic carbon normalized) concentration in sediment. When this is true, the biota-sediment accumulation factor (BSAF) is constant across a range of contaminant concentrations in sediment. When this is the case, the bioavailability of the chemical to the benthic invertebrates and sediment (organic carbon normalized)-interstitial water partition coefficient (K_{OC}) are independent of concentration of the chemical in the sediment. The constancy of the biota-sediment chemical and K_{OC} relationships is very important, because most predictions of sediment remedy effectiveness rely on these relationships to predict what level of sediment remediation will be necessary to decrease bioaccumulation of sediment contaminants to an acceptable level.

Recent analyses of sediment and tissue data from a few Superfund sites and reports in the scientific literature have shown empirical relationships that don't indicate the expected 1:1 relationship between concentrations in tissue and sediment, for a variety of organic chemicals including PCBs. Specifically, the plots of chemical in tissue sediment show slopes of markedly less than 1; in other words, if one doubles the chemical concentration in sediment, the tissue concentrations increase by considerably less than a factor of 2. This can also be expressed as having the BSAF vary with sediment contamination, such that lower BSAFs are observed at higher sediment contamination. Some of this variation has been attributed to the presence of carbon phases derived from non-plant materials (e.g., anthropogenic materials like black carbon from soot, chars, and coke; coal; tar balls; pitch; and oil/lubricant/NAPL) in the sediments, and it is well documented that the sorptive behavior of these anthropogenic materials is often nonlinear, i.e., concentration dependent. Examination of the underlying sediment-interstitial water partitioning behavior using the two carbon phase partitioning model with amorphous (plant-based) and black carbon phases in the sediments reveals that concentrations in the sediment (organic carbon normalized) against concentrations in sediment interstitial water should have slopes less than 1, and that the sediment K_{OC}s should increase with decreasing concentration in the sediment interstitial water. Further, theory predicts that the BSAFs should decrease with decreasing concentrations in the sediment interstitial water.

To investigate this behavior, samples with a wide range of PCB concentrations from Hudson, Fox, and Grasse River Superfund sites were collected, analyzed, and subjected to sediment bioaccumulation tests using *Lumbriculus variegatus*. These samples along with samples from the Buffalo River were also analyzed using a passive sampling technique (polyoxymethylene [POM] samplers) to determine the concentrations of the PCB congeners in the sediment interstitial water.





Across all samples from the Grasse (●), Fox (●), Hudson (●), and Buffalo (●) Rivers, the partitioning behavior in the sediments between the sediment and its interstitial water demonstrated concentration dependent behavior for the individual PCB congeners, illustrated by PCB 52 (2,2',5,5'-tetrachlorobiphenyl). Similarly, the K_{OC}s were concentration dependent with increasing K_{OC} values with decreasing concentrations in the sediment. When the sites are examined individually, the data are much less conclusive in demonstrating that partitioning behavior is the concentration dependent given the variability in the individual measurements. The overall behavior of the field data mimics that predicted by theory; i.e., slopes less than one for concentrations in sediment against concentrations in the sediment interstitial water and K_{OC}s increasing with decreasing concentrations in the sediment interstitial water. Sediment bioaccumulation tests with *Lumbriculus variegatus* (see Figure) were performed on the sediment samples from the Fox,

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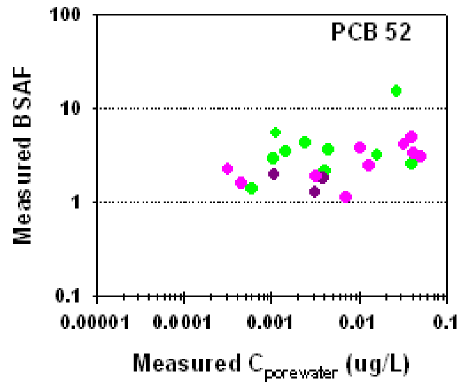
Grasse, and Hudson Rivers. The resulting BSAFs demonstrated no appreciable dependence upon concentration of the chemical in the sediment as illustrated by the data for PCB 52. However, when one compares the measured K_{OC}s and BSAFs, it appears that sediment bioaccumulation tests need to be performed on samples with concentrations much lower than those from the Fox, Grasse, and Hudson River sites in order to determine if BSAFs decline as predicted by theory. Consequently, efforts are under way to obtain samples with lower concentrations (potentially, from the Buffalo River) and from different sites to determine if BSAFs decline as predicted by theory.



The ultimate goal of this research effort is to understand and quantify the effects of contaminant levels (if any) upon bioaccumulation such that uncertainties associated with remedial decisions and actions are lowered.
Contact: Lawrence Burkhard (218)-529-5164, burkhard.lawrence@epa.gov.

INCORPORATION OF PREDICTIVE POPULATION MODELING INTO THE AOP FRAMEWORK: A CASE STUDY WITH WHITE SUCKERS EXPOSED TO PULP EFFLUENT

Background and Research Objectives

This research represents a collaboration between the Division, the EPA Great Lakes National Program Office (GLNPO), Environment Canada, and the University of New Brunswick, Ontario, Canada, and is funded via GLNPO as part of the Great Lakes Restoration Initiative (GLRI). Further, this research is being conducted within the EPA, Office of Research and Development, Chemical Safety and Sustainability Integrated Research Program.

The research goal is to develop and apply a population modeling framework based upon a large amount of field collected data that has the ability to predict population-level effects for fish species exposed to stressors, using relationships between biochemical endpoints and fecundity. The modeling framework is designed for broad application providing population-level ecological risk assessments based upon individual-level responses that reflect toxicity and adverse outcome pathways associated with specific classes of chemicals of concern. Our initial model development and application concern impacted white sucker (*Catostoumus commersoni*) populations along the northern shore of Lake Superior. However, the modeling construct developed and applied at these study sites will be utilized in combination with predictive relationships from these sites (i.e., predicting fecundity from plasma steroid measurements) in order to examine ecological risk (project fecundity and population trajectories) for other species and at other exposure sites that are less data rich. Of particular interest, bullheads have been the focus of monitoring at select Great Lakes US Areas of Concern (AOCs) for a number of years, and effects-based monitoring work conducted by USGS/USFWS through the GLRI will also be focusing on bullheads (among other species). In addition, the modeling framework will be designed to allow for inclusion of other perturbations (e.g., invasive species, habitat alterations) in addition to risk from chemical stressors.

Current Progress

A population-level analysis of white sucker is being conducted based upon a large amount of effects-based monitoring of individual level responses of white sucker exposed to pulp mill effluent located at a study site in Jackfish Bay (JFB), Lake Superior. There was

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also a reference study site at Mountain Bay (MTB) that was considered uncontaminated. Both the Jackfish Bay and Mountain Bay study sites are located along the north shore of Lake Superior. The JFB site is unique in that it is an isolated, unpopulated bay and the pulp mill effluent is the only source of contamination in the area. The reference site at MTB is located 60Km west of JFB and has minimal municipal or industrial input. It was chosen due to its proximity and similarity of fish community structure (See Fig. 1, with map).

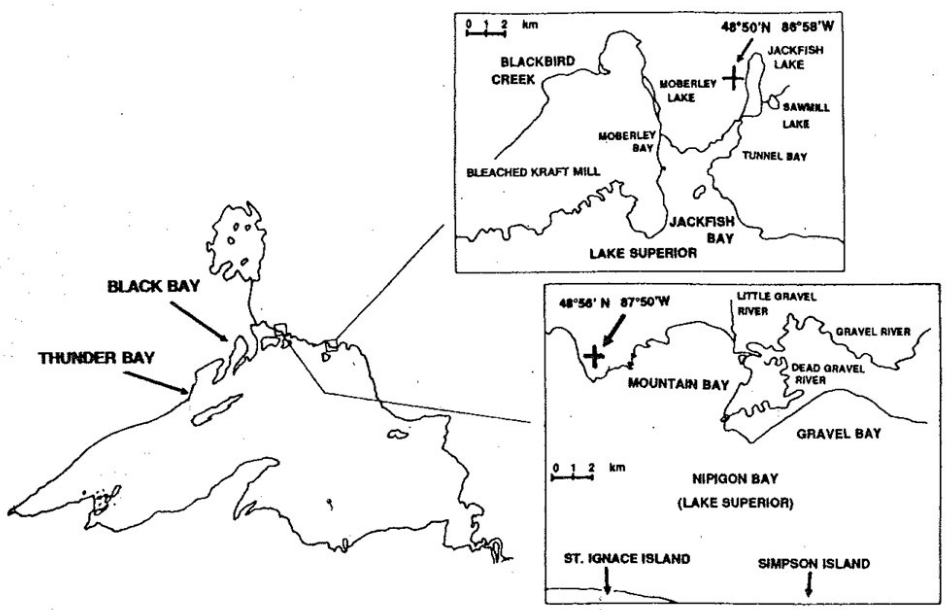

Fig. 1

As a first step, we have investigated differences in field measurements of several variables between the JFB and MTB sites, specific to given age classes of white sucker. We have formulated a density dependent population model for white sucker capable of forecasting population trends resulting from exposure to chemical stressors at the JFB site (Miller et al. 2011). The JFB study site also has monitoring data for biochemical endpoints of interest collected for white sucker, including steroid measurements amenable to interpretation through different Adverse Outcome Pathways (AOPs) for reproductive effects. In implementing the population model in conjunction with the AOP framework, our initial analysis has focused on the biomarker testosterone. This biomarker was chosen because of our understanding of the pathway in which it is linked to 17β-estradiol and plasma vitellogenin within the Hypothalamic-Pituitary-Gonadal (HPG) axis, and because it is linked to an apical endpoint, egg production, and thus fecundity.

We are applying the AOP framework as an organizing principle that portrays existing knowledge concerning the linkage between a direct molecular initiating event and an adverse outcome at a biological level of significance relevant to inclusion in the population model. We observed decreased testosterone for white sucker at JFB Bay relative to MTB (Bowron et al., 2009); see Figure 2, Frame A. We have documented in laboratory studies that decreased testosterone is correlated to decreased estradiol (Ankley et al., 2008); see Figure 2, Frame B. We have shown in laboratory studies that decreased estradiol is correlated to decreased vitellogenin (Ankley et al., 2008); see Figure 2, Frame C. We have demonstrated in laboratory studies that decreased vitellogenin is correlated to decreased fecundity (Miller et al., 2007); see Figure 2, Frame D. Decreased fecundity is observed for white sucker at JFB relative to MTB (Munkittrick et al., 1991); see Figure 2, Frame E.

In utilizing the AOP framework in conjunction with the population model, we are developing a predictive relationship between testosterone levels in female white sucker and fecundity based upon field data collected at the JFB and MTB study sites. Then, we are linking the predictive relationship between testosterone and fecundity with a population model to forecast population dynamics for a white sucker population at the impacted site. We can use the AOP framework in combination with the population model to answer the question: Given a reduction in testosterone equal to a given percentage, what is the resulting effect on the fecundity of breeders and thus population dynamics over time? For example, a 50% reduction in testosterone was expected to result in an approximately 16% reduction in fecundity using a simple linear regression model, Relative Fecundity = 0.246 (Relative Testosterone) + 0.721, $R^2 = 0.41$. This scenario is illustrated by the Trajectory B in Figure 3. whereby a population that is initially at carrying capacity with exposure resulting in a 50% reduction in testosterone for breeders at the JFB site relative to the MTB site results in an equilibrium population size of approximately 73% of carrying capacity.

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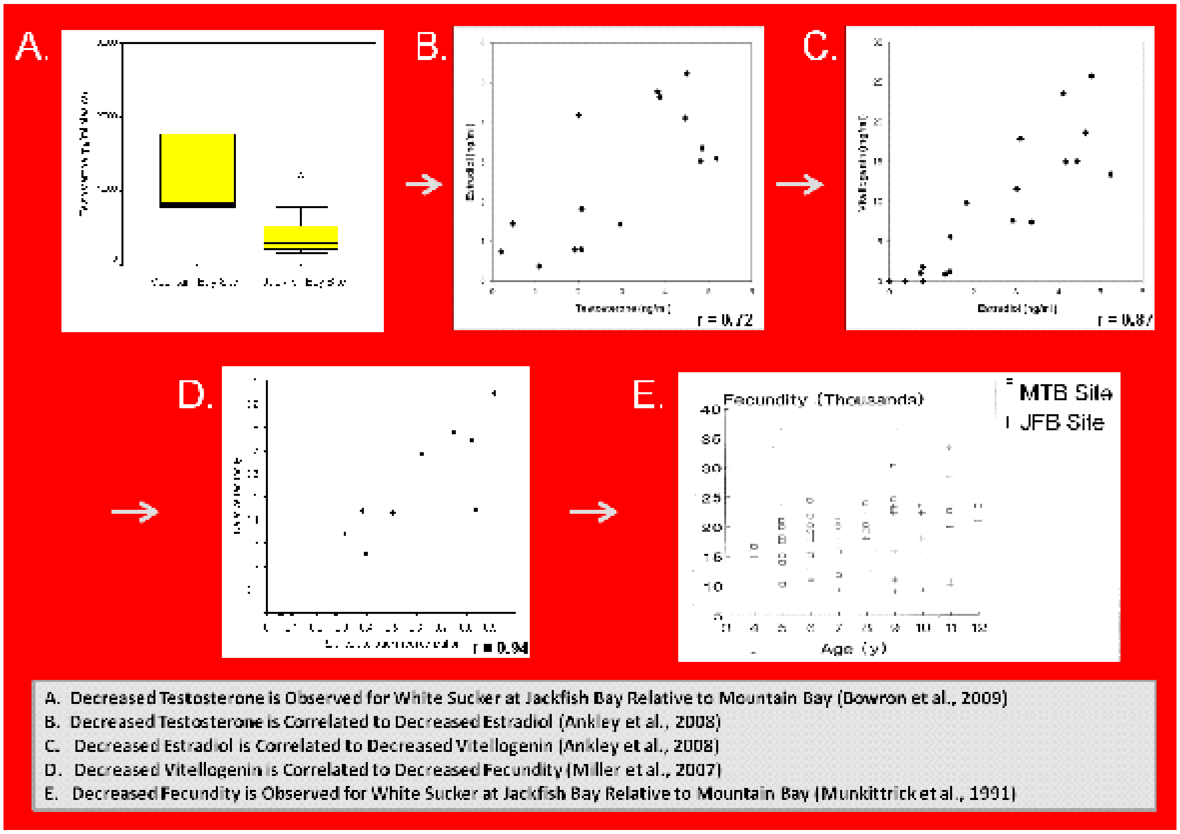

Fig. 2

Future Research Direction

Several subsequent steps are currently in progress. We are focusing on formulation of relationships between biochemical endpoints and fecundity for white sucker at the JFB site using additional data sets. Data for biochemical endpoints of interest (i.e., estradiol in addition to testosterone) collected for individual fish at JFB are being summarized and included for potential combination with population assessment. In terms of broader application, the modeling construct was designed as to be developed at the JFB site with two decades of monitoring data and then applied to other study sites that are less data rich. In addition, the modeling construct can be applied to other species. Application of the modeling construct presented here for white sucker to bullhead populations in the Great Lakes is important, as bullheads have been the focus of monitoring at select Great Lakes AOCs for a number of years. This would entail revising the Leslie projection matrix accordingly, but the model construct will remain unchanged.

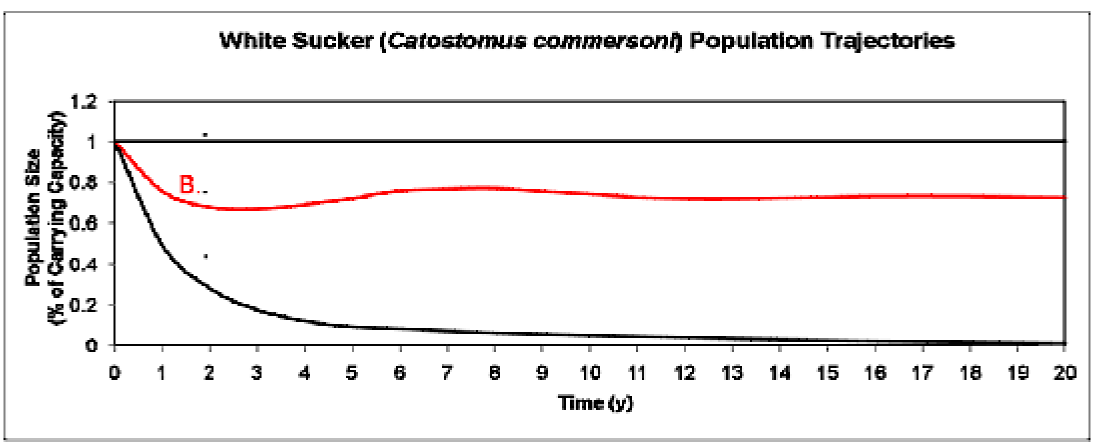

Fig. 3

Contact: David H. Miller, Ph.D., Large Lakes & Rivers Forecasting Research Branch, Grosse Ile, MI, (734) 692-7613, miller.davidh@epa.gov.

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MED Seminars

September 14: Dr. Taisen Iguchi, Okazaki Institute for Integrative Bioscience, National Institute for Basic Biology, National Institutes for Natural Sciences, Okazaki, Japan

- Estrogens and sex determination: cross-species investigations with alligators, medaka, and Daphnia

September 21: MED Research Forum
Dr. Anett Trebitz and Dr. John Morrice

- Coastal ecosystem condition and connectivity: Transitioning to research under SSWR

Dr. Lawrence Burkhard

- Bioaccumulation of PCBs across concentration gradients in sediments

September 28: Dr. Donald Mount, Director (Retired), EPA Environmental Research Laboratory, Duluth

- Revisiting the early history of aquatic toxicology, water pollution control, and the EPA Duluth laboratory

October 6: Dr. Nancy Langston, Department of Forest and Wildlife Ecology/ Nelson Institute for Environmental Studies, University of WI

- Toxic bodies: A history of hormone disruption

October 12: Dr. Russ Erickson

- Beyond species sensitivity distributions: More completely using ecotoxicological data in assessing the risk of atrazine to aquatic plant communities

October 19: MED Research Forum
Dr. Mary Moffett

- Functional assessment of Alaska peatlands for EPA Region 10

Dr. Steve Diamond

- Nanomaterials ecotoxicology: Current findings and future directions under CSS

October 26: Dr. Carlie LaLone, Federal Post-doc, EPA/MED

- Pharmaceutical concern and prioritization framework for aquatic life effects

November 2: Dr. Shon Schooler, Research Director, Lake Superior Estuarine Research Reserve/NOAA and University of WI

- Science, education, and stewardship: The role of the new Lake Superior NERR in ecosystem management

November 9: Dr. Dalma Martinovic, University of St. Thomas

- Evaluating potential of omic technologies to assess biological effects of complex environmental matrices: MN wastewater effluent case study

November 30: Dr. Jason Berninger, NRC Post-doc, EPA/MED

- Leveraging available data for contaminants of emerging concern to develop an understanding of environmental hazard

December 5: Dr. Janet Silbernagel, Nelson Institute for Environmental Studies, University of WI-Madison and Dr. George Host, Natural Resources Research Institute, University of MN Duluth.

- St. Louis River Estuary: Connecting stories and science for spatial literacy and stewardship

December 7: MED Poster Social, MED Federal and non-federal staff, co-hosted with the Twin Ports Freshwater Folk

- Poster social: Over 20 posters presented in the past year

NOTE: For current seminar, see: http://www.epa.gov/med/events.htm.

Awards

EPA Honor Awards: for Exceptional Assistance to EPA Regions/Program Offices

Gerald T. Ankley

For helping to ensure that OPPT's regulatory action on the testing of bisphenol-A was based on sound science.

Russell J. Erickson

For the development of methodology for specifying atrazine levels of concern for protection of plant communities in freshwater ecosystems.

Bronze Medal

Adverse Outcome Pathway Team:

Gerald T. Ankley, Richard S. Bennett, Russell J. Erickson, Dale J. Hoff, Michael W. Hornung, Rodney D. Johnson, David R. Mount, John W. Nichols, Christine L. Russom, Patricia K. Schmieder, Jose A. Serrano, Joseph E. Tietge, and Daniel L. Villeneuve

For outstanding contributions to the Adverse Outcome Pathway, a conceptual framework to link exposure to effects using a systems-based approach.

People

Mark Horngren Retires

Mark Horngren, Contract Specialist, retired after 39 years of combined military and federal service. Mark joined the Division in December of 2002 as a Purchasing Agent and later promoted to a Contract Specialist. Out of all the contracting and purchasing responsibilities, he especially enjoyed working with the students on their student services contracts. Mark and his wife of 37 years have moved to warmer weather in Texas.