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- Office of Research and Development
- National Health and Environmental Effects Research Laboratory
- Mid-Continent Ecology Division, Duluth, Minnesota

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Research Events

MED STAFF ATTEND NORTH AMERICAN BENTHOLOGICAL SOCIETY ANNUAL MEETING

The final annual meeting of the North American Benthological Society (NABS) was held May 22-26 in Providence, RI. After more than 50 years the venerable organization dedicated to life on the bottom conceded that it need to start looking up from the mud. To show that NABS was serious about taking a holistic view of freshwater, a significant outcome of the conference was to change NABS to "Society for Freshwater Sciences" (or SFS). Those finding it difficult to let go of the bottom and drift up towards the light were placated with modest changes to the logo (figure). The meeting dominated the heart of the city at the confluence of rivers and Irish bars. To exercise its new emphasis the SFS used "Responding to the Global Water Crisis" as the theme of the six-day meeting. Numerous concurrent sessions spanned minutia (e.g., exuviae as a research tool) to the massive (e.g., global bioassessment methods).

MED researchers presented five papers and organized a special session. Deb Taylor contrasted the hydrologic conditions of the Ohio and Upper Mississippi Rivers and concluded that great river obligate fish prefer the flow-through pools of the former rather than the chain of lakes of the latter. David Bolgrien described MED's ecosystem services research on the St. Louis River and other Areas of Concern in the Great Lakes. Dave, Ted Angradi, and Brent Bellinger

are relating the value people have for wetlands with the distribution of vegetation and nutrient dynamics. It is assumed that people will protect, conserve, or restore conditions and processes that they value. Brian Hill put a dollar value on the carbon and nitrogen flowing through low order streams across the country. Again, measure for measure is the rule. People want a measure of the service or benefit so they can estimate their measure of value. Brent discussed how ecosystem services of a eutrophic wetland can be enhanced (e.g., get lots of fish and birds) after burning up cattail in the Everglades. Marisa Mazzotta discussed application of a technique for assessing ecological and economic services derived from restored wetlands. The latter four presentations were a part of a special session, "Ecosystem Service Concepts in the Management of Freshwater Habitats," organized by Bolgrien and Angradi, with help from Bellinger. The talks were diverse and informative and, despite being in the afternoon of the last day the session, well attended. **Contact:** Dave Bolgrien (218) 529-5216.



MED ACKNOWLEDGED FOR "INTEGRATED APPROACHES TO TESTING AND ASSESSMENT" SAP PARTICIPATION

Drs. Daniel Villeneuve and Patricia Schmieder were acknowledged by EPA's Office of Pesticide Programs (OPP) Antimicrobial and Health Effects Division for their contribution as part of an ORD team to the May 24-26 Scientific Advisory Panel (SAP) on the "Integrated Approaches to Testing and Assessment (IATA) Strategy: Use of New Computational and

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Molecular Tools.” The consultation sought SAP’s guidance about OPP’s vision, initial efforts, and plans to adopt an integrated approach to testing and assessment with a focus on a paradigm shift from the current toxicity based risk assessment approach to a more streamlined, efficient, and less costly one using the new genomic and bioinformatic tools of toxicity testing. The ORD team developed and presented the scientific basis for the SAP consultation on OPP’s vision. The scientific presentations and underlying research projects were well received; the SAP panel was very complimentary regarding the high quality of science presented by the ORD researchers. Dan and Pat were acknowledged for providing multiple valuable insights during the development of the SAP background paper. They also gave excellent presentations which provided the panel with a detailed understanding of the science and the approach envisioned by the Agency. The rest of the ORD team, Kevin Crofton, Woodrow Setzer, Tammy Stoker, Stephen Nesnow, and Jeffrey Ross, performed the extensive research and data analysis that formed the basis for the two case studies on propiconazole and triclosan that were presented to the SAP. These ORD scientists contributed greatly to the development of the case-study white papers for the SAP, which were used to illustrate the principles of the IATA approach and its implementation, and they developed and gave excellent presentations to the SAP. OPP thanked all these ORD scientists for the support they provided to making the SAP review a great success, and acknowledged the importance of the high quality of the ORD research presented at the SAP review for providing the vital foundation for OPP’s vision. The ORD team received an award for their work on this project; see “Awards” section, page 9.

Contact: Pat Schmieder (218) 529-5161.

IAGLR CONFERENCE HIGHLIGHTS MED AND RELATED SCIENCE

The 54th International Conference on Great Lakes Research – “Big Lakes - Big World” – was held in Duluth May 30-June 3. The conference attracted almost 700 attendees and featured more than 35 scientific sessions exploring large-lakes research, management, policy, and education. The Division was a co-host for this event, along with University of MN Duluth, MN Sea Grant Program, MN Pollution Control Agency, and others. Division ecologist Dr. Anett Trebitz was the program co-chair for the meeting. In addition, Division scientists were authors on over 15 oral and poster presentations, and served as co-chairs for 5 different scientific sessions spanning topics from effects of toxic chemicals to land-water connections. The *Duluth News Tribune* published several articles on Great Lakes science in conjunction with the meeting – including one describing the Division’s research into more rapid detection of exotic species invasions, and another on Lake Superior food webs and their role in nutrient cycling. **Contact:** Anett Trebitz (218) 529-5209, <http://www.iaglr.org/conference/index.php>.



Featured Research

PEATLANDS ECOSYSTEM SERVICES: LINKING CARBON AND NITROGEN DYNAMICS WITH REGIONAL-SCALE AIR AND WATER QUALITY PROTECTION



Figure 1. Boardwalk through Marcell Experimental Forest reference (S-2) peat bog.

This study is part of a larger, multi-laboratory (NHEERL’s Gulf Ecology, Mid Continent Ecology, Western Ecology Divisions; and NERL’s Ecological Exposure Research Division) study of nitrogen (N) removal by wetlands and their effect on ecosystems services. Similar studies will be conducted in coastal wetlands in Florida (Tampa Bay watershed) and Oregon (Yaquina Bay watershed), and in isolated wetlands in Ohio, South Carolina, and Florida. Samples for ecoenzymes, nitrification, and denitrification will be analyzed by our laboratory. There are four primary objectives of this research project. First, as a part of a multi-laboratory research effort to quantify N removal by various classes of wetlands, we will be measuring N uptake, storage, burial, nitrification, and denitrification in peatlands (ombrotrophic bogs, minerotrophic fens), a prominent landscape feature of the Great Lakes region (Figs. 1 and 2).

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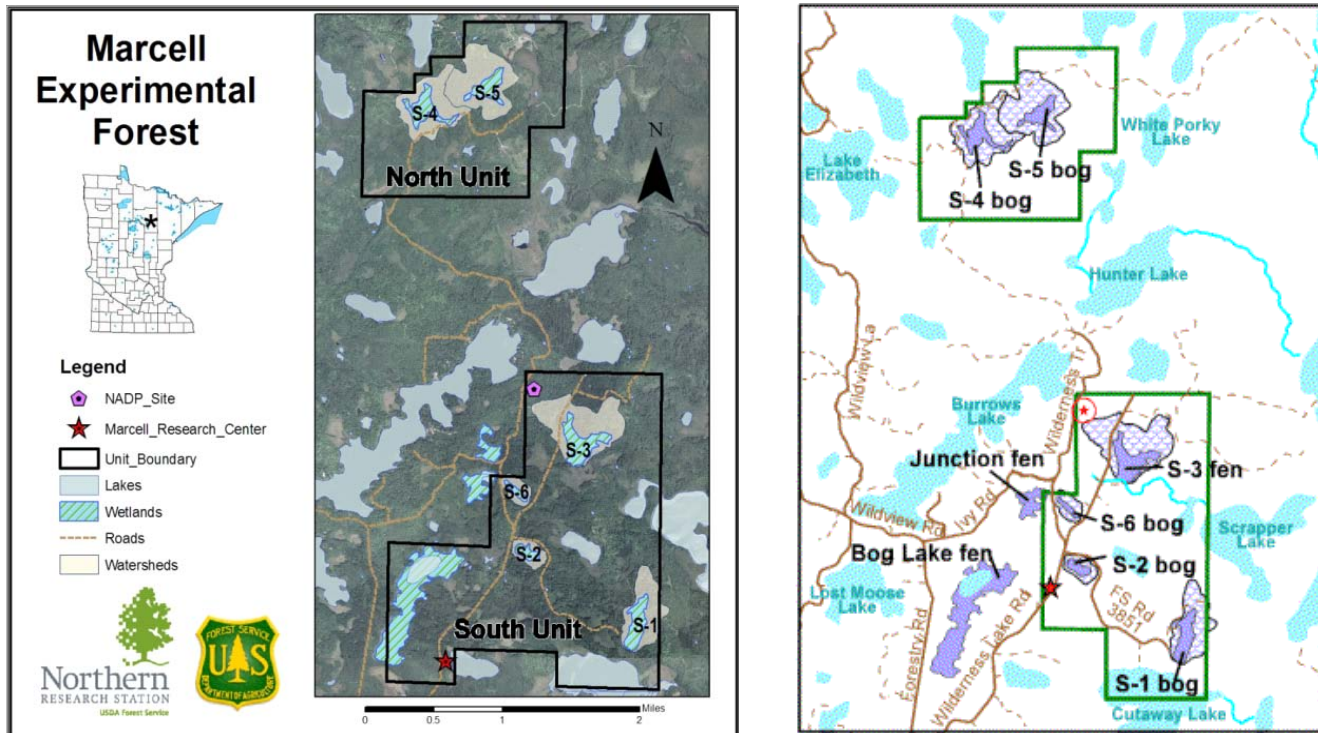


Figure 2. Map of the Marcell Experimental Forest (left) and study watersheds (right). Research is being carried out in paired treatment (S-1) and reference (S-2) bogs, and in a fen (S-3).

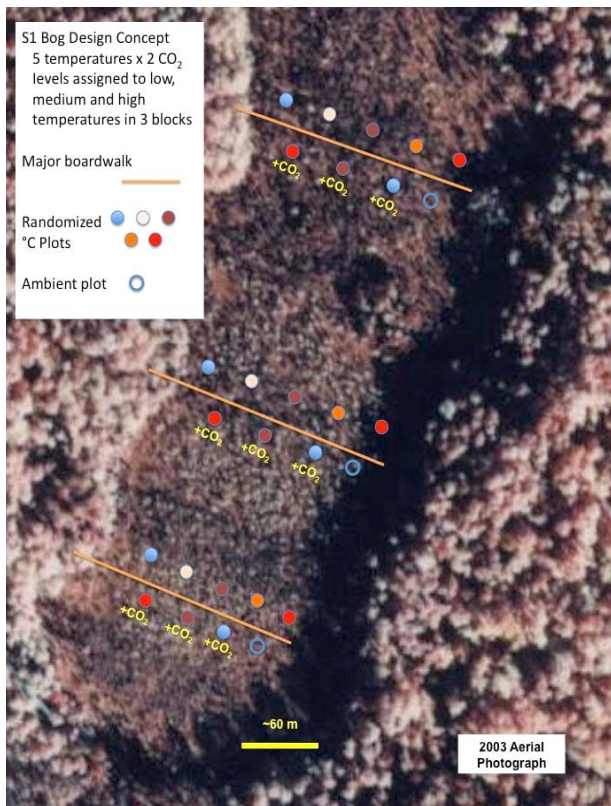


Figure 3. A conceptual representation of the planned 3-block experimental design for testing the effects of soil warming and atmospheric CO₂ enrichment.

Our hypothesis is that, because of their distinct chemistries and hydrology, bogs and fens will differ in their capacity to remove N from wetland waters. Further, the extent of peatlands in the Great Lakes basin will account for a significant amount of N removal from the basin. Second, we are investigating the role of microbial metabolism, specifically coenzymes produced by microbial assemblages in their acquisition of carbon (C), N, and phosphorus (P), in peatland nitrogen removal. Our hypothesis is that C, N, and P cycling in peatlands is constrained by nutrient availability and that release of nutrients will be mediated by microbial coenzymes. This flush of nutrients will result in increased primary productivity (wetland C sequestration), but increased aerobic and anaerobic organic matter decomposition, leading to increased greenhouse gas emissions. This tight coupling of C, N, and P with microbial activity yields robust predictive models of C, N, and P dynamics in peatlands.

Third, in collaboration with our US Forest Service partners, we hope to be involved in a new developing study assessing the effects of soil warming and elevated CO₂ on peatland C, N, and P dynamics (Fig. 3). When the study is implemented, we anticipate assessing N removal (specifically denitrification) and microbial exoenzyme activity. Our hypothesis is that as soils warm and/or atmospheres are enriched with CO₂, there will be a greater demand for available nutrients and a greater governance of C, N, and P dynamics by microbial activity.

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Finally, we will link these peatland ecosystem processes to cumulative ecosystem services derived from peatlands of the Great Lakes basin, including water quality and climate regulation (Fig. 4).

Contact: Brian Hill (218) 529-5224, hill.brian@epa.gov.

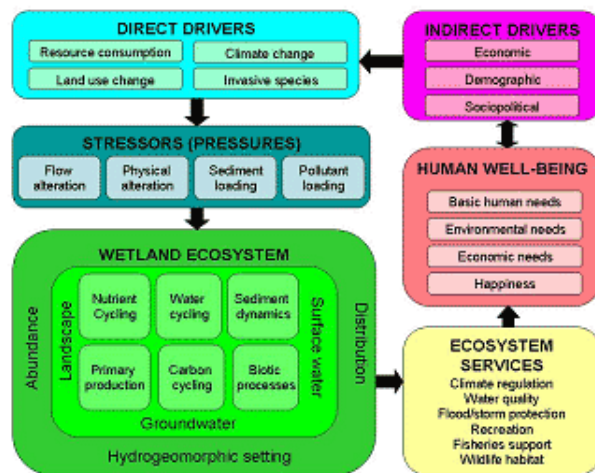


Figure 4. Conceptual model of wetlands ecosystem services.

PHARMACEUTICAL CONCERN AND PRIORITIZATION FRAMEWORK

As environmental analytical techniques have become more sensitive and widely deployed, and pharmaceutical production and sales have increased, there has been elevated concern relative to human and veterinary drugs in the environment. Due to a lack of relevant data for effects of many of these chemicals on non-target species, it is difficult to adequately determine the ecological risk of drugs known or predicted to occur in the environment. This limits the development of effective monitoring programs and/or risk mitigation strategies. The purpose of our work is to develop a framework for prioritizing pharmaceuticals based on their potential (estimated) ecological risk. The intent is to use state-of-the-art techniques to predict possible effects in non-target species, based on existing data regarding basic physico-chemical properties, conservation of biological pathways affected, and relative efficacy (or potency) in target species. This effort is intended to support monitoring/diagnostic assessment of current-use pharmaceuticals (e.g., in the Great Lakes and adjoining water bodies), and prospective assessments for new drugs yet to be released into the environment.

Available ecotoxicity data for many classes of drugs are inadequate for technically-rigorous risk assessments. A “brute force” fix to this problem would be to require an extensive suite of chronic, sub-lethal tests with multiple species for pharmaceuticals routinely detected in the environment, as well as for new pharmaceuticals that may be registered. This could then be accompanied by expanded monitoring programs designed to measure as many pharmaceuticals as possible in environmental matrices. However, this increased monitoring and testing would be set against an existing regulatory framework which provides for categorically excluding many pharmaceuticals from environmental consideration, and a socioeconomic backdrop of limited resources for testing, including a desire to decrease animal use for research. Fortunately, in the case of pharmaceuticals, there exists the potential to develop strategic approaches for collection of toxicity data for chemicals of most concern, in a resource-efficient fashion. These strategic approaches should serve as the basis for identifying and prioritizing needed testing with drugs and help focus both chemical-specific, effects-based monitoring programs.

Unlike many other classes of chemicals, for both human and veterinary drugs, insights as to possible exposure and effects in the environment can be gleaned from a priori knowledge of the class of chemicals, including targeted biological pathways, as well as data routinely collected to determine drug efficacy and safety. Given this, it should be possible to focus pharmaceutical monitoring and testing in two ways: (a) identification of chemicals with the most potential to elicit adverse effects, and (b) identification of which species/endpoints should be used for this testing or monitoring.



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This framework would guide the use of information from existing human and veterinary drug databases to develop compound-specific scores for multiple categories which may be predictive of effects in non-target species. The predictive categories consider: molecular target conservation and potential non-target species sensitivity; absorption, distribution, metabolism and elimination (ADME); MOAs; and potency. The Pharmaceutical Concern and Prioritization

Framework also employs an empirical scoring category derived from reported toxicity data for non-target species, including terrestrial and aquatic organisms, where available. The scoring criteria within each category are based on parameter-specific frequency distributions determined for a subset of pharmaceuticals. The culmination of this effort will result in the design of a web-based computer program that utilizes the available pharmaceutical information to calculate a prioritization score for each pharmaceutical allowing it to be ranked among others in order of their relative likelihood to produce adverse outcomes in aquatic species. This approach will provide a means to guide researchers and inform regulators as to the potential environmental impact of an individual drug. Predictions made using this “framework” would inform the design of in vivo laboratory experiments to test the strategy and the assumptions underlying the Pharmaceutical Concern and Prioritization Framework. **Contact:** Carlie LaLone (218) 529-5038.

CONTAMINANTS OF EMERGING CONCERN - RESEARCH EXPANDS TO GREAT LAKES PORTS

Effects based monitoring studies were conducted in the St. Louis Harbor in the summer of 2010 in support of the Great Lakes Restoration Initiative (GLRI). Development and validation of test methods using caged fish exposures to detect and monitor contaminants of emerging concern (CECs) were the objectives for the test program and the intended expansion in 2011 to Great Lakes ports on Lake Michigan and Lake Erie.

Study Objectives: The goals of the research are directed at the development and validation of methods used to detect and monitor different classes of contaminants in the Great Lakes:

- Develop and document robust effect-based monitoring assays and approaches
- Identify and characterize suites of supporting morphological, histological, biochemical, and molecular endpoints/assays that can help define and establish adverse outcome pathways (AOP)
- Conduct field studies to evaluate performance of the test system(s)/endpoints/approaches
- “Exploratory” genomic tools (microarrays, NMR-based metabolomics) used in conjunction with caged fish samples.

Site Identification: Four sites were chosen for 2010 exposures with caged fathead minnows:

- FDL-Fond du Lac, WLSSD-Western Lake Superior Sanitary District discharge (proximal and distal locations), and SMTP-Superior Municipal Treatment Plant discharge.



Preliminary exposures near the WLSSD discharge detected changes in vitellogenin and estrogen receptor alpha transcription results, suggesting the known estrogenic activity of the effluent is detectable via effects based monitoring, even after dilution following discharge to the harbor.

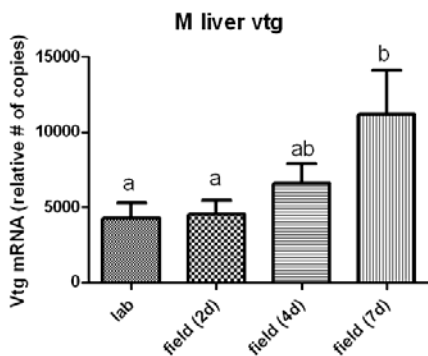


Fig. 1: Vitellogenin mRNA expression in male fathead minnow liver.

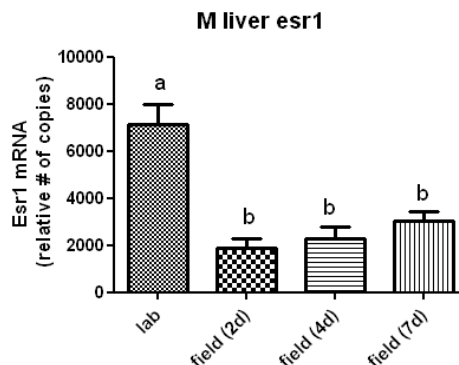


Fig. 2: Estrogen receptor alpha (esr1) mRNA expression in male fathead minnow liver.

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The study conducted in September 2010 with caged fish exposures were sampled at two to eight days of exposure. Live fish were transported back to MED-Duluth where tissues and biofluids were collected for analysis. Lead laboratories for tissue processing are shown in Table 1.

Table 1. Overview of tissue/biofluid samples to be collected and analyzed at part of summer 2010 in situ exposures in the Duluth/Superior Harbor.

Tissue/biofluid ^a	Analysis/Endpoint	Lead laboratory
Urine (optional)	NMR – Metabolomics	US EPA – ERD, Athens
Blood	Vitellogenin, 17 β -estradiol, testosterone	US EPA – MED, Duluth
Gonad (1)	Ex vivo steroid production	US EPA – MED, Duluth
Gonad (2)	Microarray &/or QPCR	Jackson State University, US Army ERDC, US EPA – MED, Duluth
Gonad (3)	NMR – Metabolomics	US EPA – ERD, Athens
Gonad (4)	Histology	US EPA – MED, Duluth
Liver (1)	NMR – Metabolomics	US EPA – ERD, Athens
Liver (2)	QPCR &/or Microarray	US EPA – MED, Duluth, Jackson State University, US Army ERDC
Brain	QPCR	US EPA – MED, Duluth

^a Numbers in parentheses indicates subsamples of the specified tissue will be collected.

Through a key collaboration, the chemical analysis for a large suite of organic and pharmaceutical compounds was conducted on water and effluent samples by USFWS with the assistance of USGS. USFWS has received GLRI funding to work at the same Great Lakes AOCs (areas of concern) where we are focusing our efforts during the 2011 field studies.

The scope of the research expanded in 2011 to include several additional Great Lakes cities which include AOCs. In Late April, reproductively mature fathead minnows cultured at MED-Duluth were shipped to the MED-Grosse Ile, MI, lab for deployment in the Detroit River, Detroit, MI and Maumee Bay, Toledo, OH. Four sites were selected at each of these two locations for caged fish placement. In May and June, the Green Bay Metropolitan Sewage District (GBMSD), Green Bay, and the Great Lakes Water Institute (GLWI) in Milwaukee each received fish shipments for use in the caged fish exposure studies. Four sites in the Fox River in Green Bay and four in the Kinnickinnic, Menominee, and Milwaukee Rivers in Milwaukee were chosen for exposure studies.

The Grosse Ile facility, the GBMSD, and the GLWI served as staging areas and lab space for fish collections post exposure. Exposure sites for these studies were selected as reference sites, or AOCs targeting municipal or industrial discharges. As in 2010, water and effluent samples were sent to USFWS/USGS for chemical analysis.

The projected Duluth Harbor studies will be conducted in August 2011. This year the Harbor sites will be limited to the proximal and distal WLSSD sites with the addition of a far distal location. This should provide a gradient of exposure of WLSSD effluent to the caged fish. Caged fish will be deployed for 4, 7, and 14 days. Concurrently a flow-through test of diluted WLSSD effluent will be conducted at MED-Duluth.

Contact: Michael Kahl (218) 529-5179.



Linnea Thomas, Student Services Contractor, at Fond du Lac site.

Current Events

MED SCIENTIST LEADS LAKE SUPERIOR SCIENCE WORKSHOP

Joel Hoffman, a research biologist in the Ecosystem Assessment Research Branch, served as the principal investigator for the 2011 Lake Superior Shipboard and Shoreline Science Workshop aboard the EPA's 180-foot research vessel R/V *Lake Guardian*. Fifteen fourth- through-tenth-grade teachers and nonformal educators from around the Great Lakes participated in the week-long workshop, from July 20-27, beginning and ending in Duluth. The workshop goal was to provide educators an opportunity to work side-by-side with Great Lakes scientists, supporting ongoing EPA research that examines the connections between human-caused changes to Lake Superior watersheds and resulting changes to lake water quality. Workshop members came from EPA, the University of MN Duluth, the University of WI Extension, the MI Technological University, Lake Superior State University, and the State University of NY College of Environmental Science and Forestry. The workshop was supported by Sea Grant as part of the Centers for Ocean Sciences Education Excellence (COSEE) Great Lakes. EPA Region 5, Great Lakes National Program Office, a COSEE research collaborator, provided use of the vessel and staff and logistical support. This year, planned special events included an interactive "floating classroom" presentation shared live with educators who participated from Chicago's Museum of Science and Industry, as well as a collaboration with a National Science Foundation media team, featuring efforts by Dr. Hoffman and COSEE to achieve broader impacts for EPA's research through education and outreach programs. **Contact:** Joel Hoffman (218) 529-5420, hoffman.joel@epa.gov, <http://coseegreatlakes.net/events/shipboard11>, http://www.cosee.net/engaging_scientists/.



MED TOXICOLOGY EXPERT AT PELLSTON WORKSHOP



The Society of Environmental Toxicology and Chemistry periodically sponsors Pellston Workshops to address high-priority issues and challenges in human and ecological risk assessment. The workshops typically consist of 30-40 international invited experts who work together in a cloistered setting to synthesize existing knowledge and produce one or more strategy documents in focus areas of concern. A Pellston Workshop titled "Influence of Global Climate Change on the Scientific Foundation and Application of Environmental Toxicology and Chemistry" was held July 16-22 in Racine, WI at the Wingspread Conference Facility. Dr. Gerald Ankley of MED's Toxic Effects Characterization Research Branch participated as an expert in mechanistic toxicology. **Contact:** Gerald Ankley (218) 529-5147.

Upcoming Events

DIVISION TO ASSIST REGION 9 LAKE TAHOE NEARSHORE ASSESSMENT

From August 8-16, Division staff will conduct field research using a towed in situ sensor/GIS system developed for Great Lakes coastal assessments, in partnership with Region 9 and UC-Davis scientists from the Lake Tahoe Research Center. A spatially comprehensive water quality/plankton assessment will be conducted by a ~100 km near-shoreline circumnavigation of Lake Tahoe; subsequent data analysis will focus on relationships between regional watershed character and adjacent nearshore conditions, thereby informing implementation of the lake's TMDL for fine sediment and nutrients. (TMDL is the *total maximum daily load*, the calculation of the maximum amount of a pollutant a waterbody can receive and still safely meet water quality standards.) Lake Tahoe is a very large, high-altitude lake in the Sierra Nevada range, on the border of California and Nevada; it is treasured for its clear waters, and threatened by basin/watershed activities. (Coincidentally, the survey ends on the day of an annual Lake Tahoe meeting organized by California/Nevada/EPA Region 9.) **Contact:** John (Jack) Kelly (218) 529-5119, Kelly.johnr@epa.gov.





Drs. Gerald Ankley and Daniel Villeneuve, toxicologists with the Toxic Effects Characterization Research Branch, will attend in the 8th World Congress on Alternatives and Animal Use in the Life Sciences, in Montreal, from August 22-25. They will participate in scientific sessions on advancing the three “R”s (replacement, reduction, and refinement), and Tox 21(a National Institute of Health/EPA collaboration to identify mechanisms of chemically-induced biological activity, prioritize chemicals for more extensive evaluation, and develop more predictive models of in vivo biological response). Gary will present an invited talk titled “Harmonizing and Optimizing Fish Testing Methods: The OECD Framework Project” in which he will provide an overview of the outcome of an Organisation for Economic Co-operation and Development workshop on fish testing that he chaired last year in London. Dan's invited presentation is entitled “Adverse Outcome Pathways and Extrapolation Tools to Advance the Three Rs in Ecotoxicology.”

Contact: Daniel Villeneuve (218) 529-5217.

Awards

2010 SCIENTIFIC AND TECHNOLOGICAL ACHIEVEMENT AWARDS (STAA)

These awards are sponsored by EPA’s Office of Research and Development to recognize publications that demonstrate scientific excellence in support of the Agency’s mission. EPA’s Science Advisory Board, a panel of non-EPA experts, reviews and selects these publications annually. STAA winners represent some of our finest accomplishments and our best products.

Level I

Trebitz, A.S., J.C. Brazner, N. Danz, M.S. Pearson, G.S. Peterson, D. Tanner, D.L. Taylor, C.W. West, and T. Hollenhorst. 2009. Geographic, anthropogenic, and habitat influences on Great Lakes coastal wetland fish assemblages. *Canadian Journal of Fisheries and Aquatic Sciences* 66:1328-1342.

Trebitz, A.S., J.C. Brazner, M.S. Pearson, G.S. Peterson, D. Tanner, and D.L. Taylor. 2009. Patterns in habitat and fish assemblages within Great Lakes coastal wetlands and implications for sampling design. *Canadian Journal of Fisheries and Aquatic Sciences* 66:1343-1354.

Level III

Angradi, T.R., D.W. Bolgrien, T.M. Jicha, M.S. Pearson, D.L. Taylor, and B.H. Hill. 2009. Multispatial-scale variation in benthic and snag-surface macroinvertebrate assemblages in mid-continent US great rivers. *Journal of the North American Benthological Society* 28:122-141.

Angradi, T.R., M.S. Pearson, D.W. Bolgrien, T.M. Jicha, D.L. Taylor, and B.H. Hill. 2009. Multimetric macroinvertebrate indices for mid-continent US great rivers. *Journal of the North American Benthological Society* 28:785-804.

Ankley, G.T., D.C. Bencic, M.S. Breen, T.W. Collette, R.B. Conolly, N.D. Denslow, S.W. Edwards, D.R. Ekman, N. Garcia-Reyero, K.M. Jensen, J.M. Lazorchak, D. Martinovic, D.H. Miller, E.J. Perkins, E.F. Orlando, D.L. Villeneuve, R.-L. Wang, and K.H. Watanabe. 2009. Endocrine disrupting chemicals in fish: Developing exposure indicators and predictive models of effects based on mechanism of action. *Aquatic Toxicology* 92:168-178.

Ankley, G.T., D. Bencic, J.E. Cavallin, K.M. Jensen, M.D. Kahl, E.A. Makynen, D. Martinovic, N. Mueller, L.C. Wehmas, and D.L. Villeneuve. 2009. Dynamic nature of alterations in the endocrine system of fathead minnows exposed to the fungicide prochloraz. *Toxicological Sciences* 112:344-353.

Ekman, D.R., Q. Teng, D.L. Villeneuve, M.D. Kahl, K.M. Jensen, E.J. Durhan, G.T. Ankley, and T.W. Collette. 2009. Profiling lipid metabolites yields unique information on sex- and time-dependent responses of fathead minnows (*Pimephales promelas*) exposed to 17 α -ethynylestradiol. *Metabolomics* 5:22-32.

Villeneuve, D.L., N.D. Mueller, D. Martinovic, E.A. Makynen, M.D. Kahl, K.M. Jensen, E.J. Durhan, J.E. Cavallin, D. Bencic, and G.T. Ankley. 2009. Direct effects, compensation, and recovery in female fathead minnows exposed to a model aromatase inhibitor. *Environmental Health Perspectives* 117:624-631.

In recognition of dedication and service in support of the Nation's response to the Deepwater Horizon Oil Spill, 2010:

- Theodore Angradi
- David Bolgrien
- Anne Cotter
- Patrick Fitzsimmons
- Dale Hoff
- Janet Keough
- David Mount
- Barb Sheedy

SUPERIOR ACCOMPLISHMENT RECOGNITION AWARD FROM THE OFFICE OF PESTICIDE PROGRAMS

OPP's Antimicrobial and Health Effects Division recommended Drs. Patricia Schmieder and Daniel Villeneuve for this award, in recognition of their support as members of an ORD team, for a review by the Scientific Advisory Panel for "Integrated Approaches to Testing and Assessment strategies (IATA): Use of new computational and molecular tools." (See article in "Research" section, page 1.)

New Publications since April 2011

Angradi, T.R., D.W. Bolgrien, T.M. Jicha, M.S. Pearson, D.L. Taylor, M.F. Moffett, K.A. Blocksom, D.M. Walters, C.M. Elonen, L.E. Anderson, J.M. Lazorchak, E.D. Reavie, A.R. Kireta, and B.H. Hill. 2011. An assessment of stressor extent and biological condition in the North American mid-continent great rivers (USA). *River Systems* 19:143-163.

Ankley, G.T., J.R. Hockett, D.I. Mount, and D.R. Mount. 2011. Early evolution of the toxicity identification evaluation process: Contributions from the USEPA effluent testing program. *The Handbook of Environmental Chemistry, Vol. 15, Effect-Directed Analysis of Complex Environmental Contamination*, W. Brack, Ed., Springer-Verlag, Berlin Heidelberg, pp. 1-18

Aust, A.E., P.M. Cook, and R.F. Dodson. 2011. Morphological and chemical mechanisms of elongated mineral particle toxicities. *Journal of Toxicology and Environmental Health, Part B: Critical Reviews* 14:40-75.

Erickson, R.J., D.R. Mount, T.L. Highland, J.R. Hockett, and C.T. Jenson. 2011. The relative importance of waterborne and dietborne arsenic exposure on survival and growth of juvenile rainbow trout. *Aquatic Toxicology* 104:108-115. 5412

Jayaraman, S., M.L. Knuth, M. Cantwell, and A. Santos. 2011. High performance liquid chromatographic analysis of phytoplankton pigments using a C16 -Amide column. *Journal of Chromatography A* 1218: 3432-3438.

Korte, J.J., R.M. Sternberg, J.A. Serrano, K.R. Thoenke, S.M. Moen, K.E. Lillegard, M.W. Hornung, J.E. Tietge, and S.J. Degitz. 2011. Thyroid-stimulating hormone (TSH): Measurement of intracellular, secreted, and circulating hormone in *Xenopus laevis* and *Xenopus tropicalis*. *General and Comparative Endocrinology* 171:319-325.

Li, Z., K.J. Kroll, K.M. Jensen, D.L. Villeneuve, G.T. Ankley, J.V. Brian, M.S. Sepulveda, E.F. Orlando, J.M. Lazorchak, M. Kostich, B. Armstrong, N.D. Denslow, and K.H. Watanabe. 2011. A computational model of the hypothalamic - pituitary - gonadal axis in female fathead minnows (*Pimephales promelas*) exposed to 17 alpha-ethynylestradiol and 17 beta-trenbolone. *BMC Systems Biology* 5(63), <http://www.biomedcentral.com/1752-0509/5/63>.

Porter, K.L., A.W. Olmstead, D.M. Kumsher, W.E. Dennis, R.L. Sprando, G.W. Holcombe, J.J. Korte, A. Lindberg-Livingston, and S.J. Degitz. 2011. Effects of 4-tert-octylphenol on *Xenopus tropicalis* in a long term exposure. *Aquatic Toxicology* 103:159-169.

Skolness, S.Y., E.J. Durhan, N. Garcia-Reyero, K.M. Jensen, M.D. Kahl, E.A. Makynen, D. Martinovic, E. Perkins, D.L. Villeneuve, and G.T. Ankley. 2011. Effects of a short-term exposure to the fungicide prochloraz on endocrine function and gene expression in female fathead minnows (*Pimephales promelas*). *Aquatic Toxicology* 103:170-178.

Wainger, L. and M.J. Mazzotta. Realizing the potential of ecosystem services: A framework for relating ecological changes to economic benefits. *Environmental Management*, online at <http://www.springerlink.com/openurl.asp?genre=article&id=doi:10.1007/s00267-011-9726-0>.

Walters, D., M. Mills, B. Cade, and L.P. Burkhard. 2011. Trophic magnification of PCBs and its relationship to the octanol-water partition coefficient. *Environmental Science & Technology* 45:3917-3924.

MED Seminars

May 4: Don Schreiner, MN Department of Natural Resources

- Update on Lake Superior fisheries management

May 11: Dr. Gary Ankley, MED

- Diagnostic assessment of the ecological risk of endocrine disrupting chemicals in complex mixtures

May 18: MED Research Forum,

Dr. David Bolgrien

- Ecosystem services for Great Lakes communities

Dr. Sig Degitz

- Development of the amphibian growth, development, and reproduction assay

May 18: Special Remote seminar from MED/Grosse Ile: Shu Tao, University of Beijing

- Emission, fate, and respiration exposure risk of PAHs in China

May 25: Nathan Johnson, UM Duluth Water Resources, Dept. of Civil Engineering

- Contaminant bioavailability in the St. Louis River estuary: ongoing initiatives at UMD Civil Engineering

June 8: Dr. John Nichols, MED

- In vitro--in vivo extrapolation of hepatic metabolism data for fish as a means of predicting metabolism impacts on chemical bioaccumulation

July 20: Will Backe, PhD Candidate, Oregon State Corvallis, Dept. of Chemistry

- Large-volume injection: Eliminating chemical redundancy in environmental analysis

August 11: Nathan Mueller, Graduate Research Fellow, Institute on the Environment;

PhD Student, Natural Resources Science and Management, UM

- Opportunities and tradeoffs for global agricultural intensification

September 21: MED Research Forum,

Drs. John Morrice and Anett Trebitz

- Coastal nutrient criteria and condition gradients

Dr. Lawrence Burkhard

- Research in support of EPA Office of Solid Waste and Emergency Response

October 6: Dr. Nancy Langston, UW, Dept. of Forestry

- Historical perspective on pollution in Lake Superior



People

Effective July 31, our Purchasing Agent, **Mark Horngren**, will become an employee of the new OARS-Extramural Management Division. He will continue providing contracting support to MED. Gradually, as OARS-EM becomes fully staffed, there will be changes that will affect the way we do business. Congratulations to Mark on his promotion and “new” responsibilities; we appreciate the excellent work he has provided to MED over the past nine years.



The Division’s new Administrative Officer, **Jodi Stauber**, started July 18. She is taking over a number of duties including timekeeping, administrative support for Grosse Ile, office management, and logistical support for the directorate, among many others. Jodi retired after 23+ years of active duty with the 148th Fighter Wing where she served as the Force Support Squadron Superintendent (civilian equivalent to an HR supervisor) while also serving as the Command Chief Master Sergeant for the Wing. She is married to Pete and they have four children. Jodi is located in Room 142, x5050.

