



The Current

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Where Boundaries Are Fluid

By Ted Gostomski, Network Science Writer



Standing there by the river ..., listening to the flow of the water, I thought: the Old Namekagon epitomizes the interest and the love of people for all wild rivers. Here was the same silence I had known as a boy. ...[H]ow wonderful it would be if others could come back as I had done [after] fifty years or so to hear and see what I saw.¹

Conservationist and writer, Sigurd Olson, was a fervent supporter of the proposed St. Croix National Scenic Riverway when he expressed this hope for its future in 1964. His hope became a reality four years later when all of the Namekagon and most of the St. Croix were brought into the National Park System as well as being one of the first rivers protected under the new Wild and Scenic Rivers Act. The remainder of the lower St. Croix not included in the original wild and scenic designation was added under its protection in the 1970s. Today, the Namekagon and St. Croix rivers, which together make up the 255-mile-long national scenic riverway, can be experienced in much the same way Olson saw it.

Managing a national park that is primarily a ribbon of water creates a variety of challenges for park managers. The influence of numerous tributaries makes the St. Croix a composite of many rivers. From its headwaters to its ultimate confluence with the Mighty Mississippi, the St. Croix's character changes from narrow, intimate, and remote, to wide open and relatively urban. This spectrum is also manifested in the variety of ways people interact with the river.

"We review a lot of proposals from utility companies for power line crossings over the river and from highway departments for repair and reconstruction of bridges," says Jill Medland, Environmental Coordinator and Acting Chief of Resource Management. The trick is that any one project, by itself, may have minimal impact on the river, but cumulative effects are always a concern. Such was the case with campgrounds.

On the upper river (north of St. Croix Falls and including the Namekagon), designated campsites are relatively abundant. Some were even created in the places where cabins once stood so as to minimize new disturbance along the river's edge. But the park owns very little land on the lower river suitable for campsites, and there were few, if any, cabin removals, so there were no designated campsites. Visitors were allowed to camp on NPS land where they could find a dry spot to pitch a tent. As the number of visitors increased, this became a problem, so in 2007, the park finalized a Lower River Camping Management Plan that designated 22 campsites along 23 miles of the lower river. This does not apply to the entire lower river. The last five miles of the "federal zone," which floods annually, still has no designated campsites; overnight

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Three faces of the St. Croix National Scenic Riverway. From top: Namekagon River near Cable, WI; the Namekagon meets the St. Croix; near the confluence of the St. Croix and Mississippi.

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visitors are restricted to camping on islands.

Designating campsites and focusing visitor impacts into particular areas is one way of protecting the ecological integrity of the river. Another is the constant monitoring and occasional management actions that are necessary to keep threats at bay. Major resource issues here are similar to other places (invasive plants, for example), but perhaps a bigger one is the myriad aquatic invasive species that can be inadvertently spread by users or simply by the flow of water. Zebra mussels and Asian carp are just two of the biggest concerns.

Managers have good reason to be concerned about non-native species invasions. The riverway maintains and protects what is believed to be the full complement of 40 mussel species that have been present in the river for hundreds of years. Five species are listed as federally endangered and many more are considered endangered, threatened, or of special concern by the State of Minnesota, the State of Wisconsin, or both.

"This park and the Mississippi National River and Recreation Area to our south together protect one of the most diverse collections of native mussels in the region," says Resource Management Specialist Byron Karns.

Managing the surrounding landscape is different. Much of the land around the river is outside federal ownership, so partnerships play a big role in protecting the river and its resources. Park staff work alongside other federal, state, and county counterparts as well as non-government organizations to improve water quality through an organization called the St. Croix Basin Team. They also work closely with local organizations such as the St. Croix River Association, the St. Croix Scenic Coalition, and the Namekagon River Partnership. Within the National Park Service, the Great Lakes Network office is another partner, one that contributes to monitoring efforts in broader ways. Network monitoring programs — contaminants, vegetation, water quality, land use dynamics, amphibians, landbirds, and weather and climate — are long-term investments rather than short-term answers.

"When the Network presented results from the vegetation mapping project, I could see the usefulness of that information in protecting park resources," says Medland. The Network's long-term vegetation monitoring will build on that information as it tracks changing conditions in park habitats. (The vegetation team returns to the riverway this year to revisit plots established in 2007.)

"We are providing a background of information," says Network Coordinator Bill Route. "The Network's monitoring is building a knowledge base that will be available to the park when they need it. We may not be addressing questions needing immediate answers, but we are definitely providing a lot of information on issues impacting park resources," says Route.

Those resources of the St. Croix Riverway are the ones that Sigurd Olson saw as invaluable to the well-being of society. "The day is going to come when any place of wilderness will be so precious to our people that even to go there and look is enough. ... The important thing is to save places with wilderness quality to which the people of the future can repair for their spiritual well-being."¹ ●



"Landbird" monitoring is done from the water by anchoring a canoe in mid-stream at pre-determined points and conducting the counts from there. NPS photo/Robin Maercklein.

¹Sigurd F. Olson. 1964. "The St. Croix-Namekagon Rivers." Pages 35-39 in G.F. Berquist, Jr., editor. *The Natural Resources of Northern Wisconsin*. Transactions of the Wisconsin Academy of Sciences, Arts, and Letters, volume 53, part A. Text available online at www4.uwm.edu/letscli/research/sigurd_olson/speeches/stcroix.htm.

2013 Field Schedule

Both facets of our contaminants monitoring program—eagles and fish—are on hiatus, but data analysis continues, and the Network is covering the costs of eagle nest occupancy and productivity overflights at MISS, SACN, and APIS. Data collection for amphibian (frog and toad) monitoring begins in eight parks this year. Three of those parks are pilot projects will be done at three other parks. The vegetation monitoring team returns to SACN to revisit plots established there in 2007. River water quality sampling shifts to SACN, while inland lakes sampling continues at seven parks. Here's a summary of where we'll be and when. Contact the people named below or your park resource management staff if you would like to join us in the field for a day. ●

	AMPH	LB	LCLU	VEG	WQ
Apostle Islands (APIS)	April–June*	June			June–Sept
Grand Portage (GRPO)		June	Fall		
Indiana Dunes (INDU)	March–May	early June			May, Jul, Sept
Isle Royale (ISRO)	April–June*	June			May–Sept
Mississippi River (MISS)	March–May*	mid-April-early July			
Pictured Rocks (PIRO)	April–June	June	Fall		June–Sept
St. Croix (SACN)	April–June†	June		May-Aug	Apr–Nov
Sleeping Bear Dunes (SLBE)	April–June	June	Fall		June–Sept
Voyageurs (VOYA)	April–June*†	June			June–Sept

AMPH – *Amphibians*. Collection of data recordings will be accomplished by park staff and volunteers. *Gary Casper of Great Lakes Ecological Services, a Network contractor, will make some site visits for pilot work. † Monitoring is being conducted using a U.S. Geological Survey protocol.

LB – *Landbirds*. Conducted by park staff and volunteers.

LCLU – *Land Cover/Land Use*. Ulf Gafvert and Al Kirschbaum.

VEG – *Vegetation*. Team of three biological technicians led by Suzy Sanders and Jessica Grochowski.

WQ – *Water Quality*. David VanderMeulen (APIS), Josh Dickey (INDU), Rick Damstra (ISRO), Leah Kainulainen (PIRO), Michelle Prosser (SACN), Chris Otto (SLBE), Jaime LeDuc (VOYA).

Staff Insider

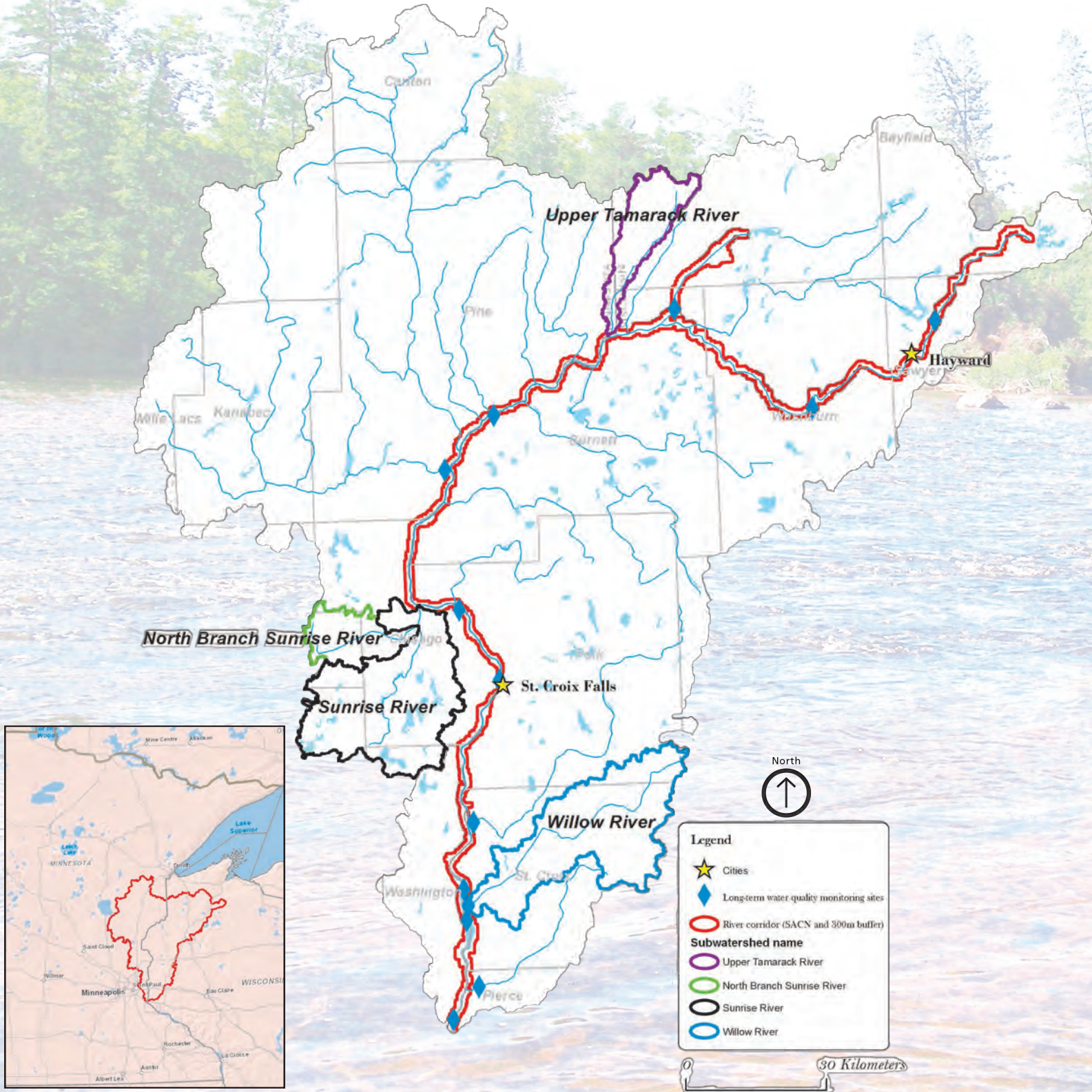
Suzy Sanders, Plant Ecologist

Suzy Sanders completed a B.A. in Botany from Miami University and an M.S. in Plant Science from the University of Idaho. While in Idaho, she studied weed control in cropping systems in the intermountain West. In 2004 she obtained a Ph.D. in Biology from West Virginia University where she focused on understanding causes of rarity in plants. She joined the National Park Service in June of 2004 as an Inventory Specialist and now coordinates the long-term vegetation monitoring program for the network. In her spare time she enjoys hiking, canoeing, and botanizing. ●



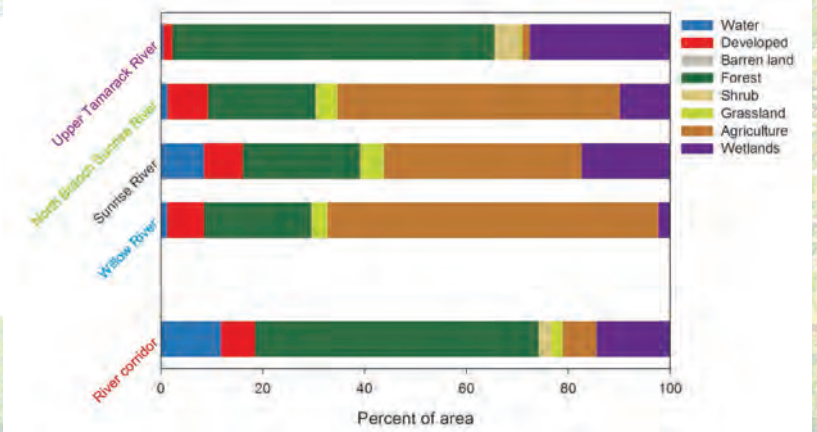
One Riverway, Many Rivers

The St. Croix-Namekagon River watershed covers more than 7,000 square-miles (1.9 million hectares) of land in Wisconsin. A completed analysis of land use and disturbance in four of the St. Croix River's sub-watersheds provides some insight into how the river's character can change. Forests cover the most area in the northernmost sub-watershed (Upper Tamarack River) in the north. Agricultural land dominates the three southern sub-watersheds, but agriculture does not change the southern reaches, land development is creating the most change there. How these changes affect the river itself is something

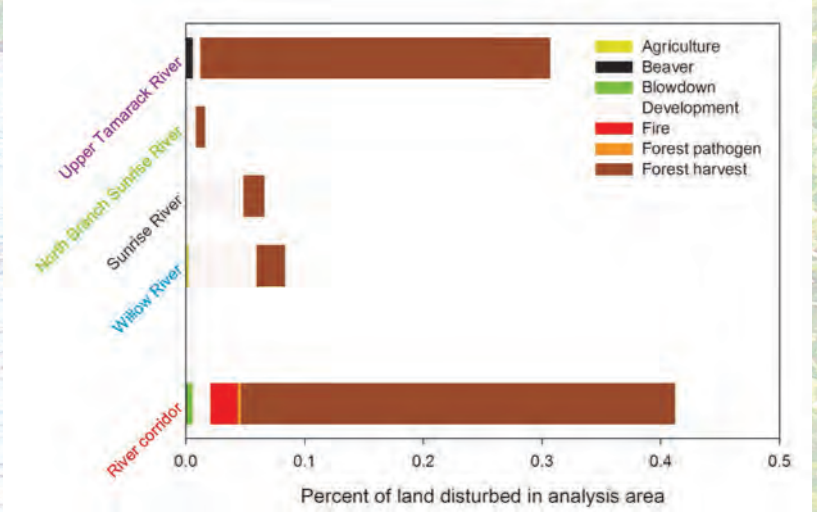


Wisconsin and Minnesota. Numerous rivers join the St. Croix on its way to the Mississippi. The Network's recently developed maps show how adjacent land is used and is changing throughout the larger watershed; it also provides hints of how the land is changing (or not), so it is not surprising that logging (forest harvest) is the most common source of disturbance (change) in the northern landscape in the way that logging does. Instead, because there are more people and roads in the southern part of the watershed, we hope to learn as we continue monitoring both land use and water quality.

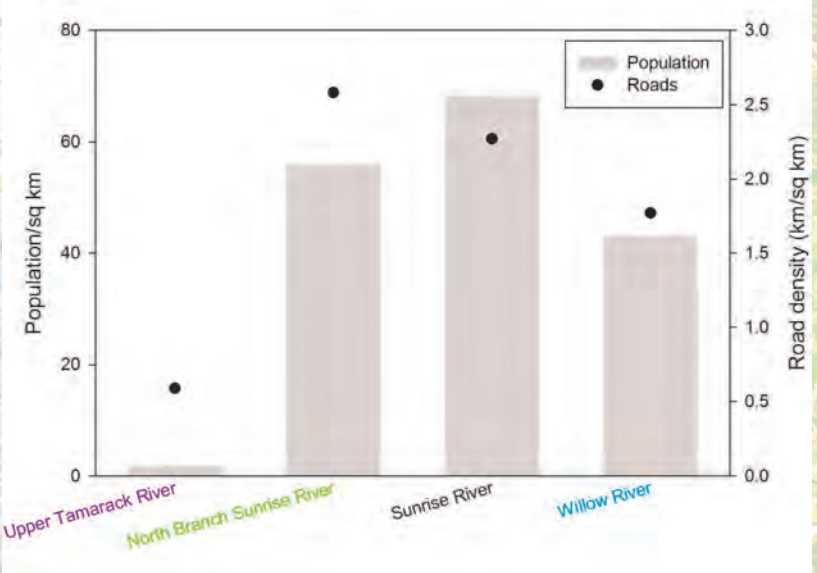
Land Cover Types, 2005–2010



Disturbance Types, 2005–2010



Population and Road Density, 2005–2010



Things We're Learning

From *Bioaccumulation of persistent contaminants in fish and larval dragonflies in six national park units of the western Great Lakes region, 2008-2009* by J.G. Wiener, R.J. Haro, K.R. Rolfhus, M.B. Sandheinrich, S.W. Bailey, R.M. Northwick, and T.J. Gostomski. 2013. Natural Resource Data Series NPS/GLKN/NRDS-2013/427. National Park Service, Fort Collins, CO

During 2008 and 2009, we conducted an initial assessment of selected bioaccumulative contaminants in water bodies at six Great Lakes Network parks: Grand Portage National Monument (GRPO; three streams), Indiana Dunes National Lakeshore (INDU; two lakes), Isle Royale National Park (ISRO; four lakes), Pictured Rocks National Lakeshore (PIRO, five lakes), Sleeping Bear Dunes National Lakeshore (SLBE, four lakes), and Voyageurs National Park (VOYA, four lakes).

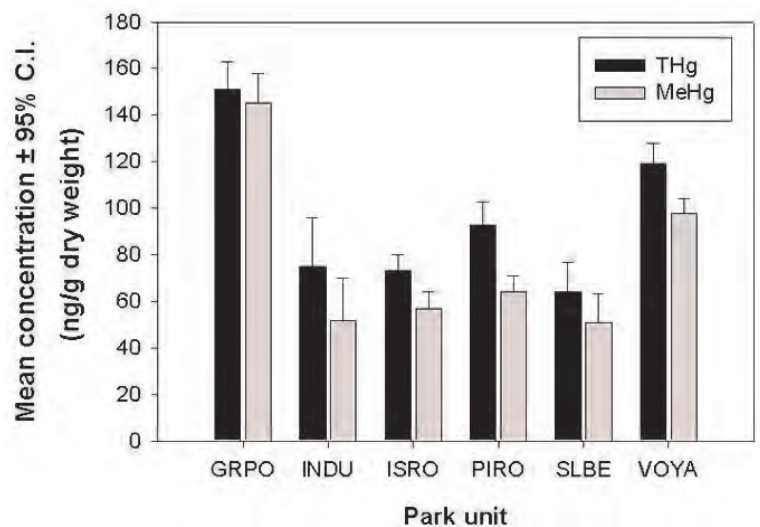
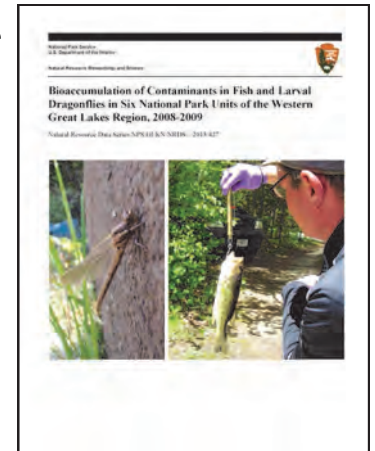
Predator and prey fish and larval dragonflies were collected from each water body and analyzed. Whole prey fish and axial muscle tissue (skinless fillets) of adult predatory fish were analyzed for total mercury. Axial muscle of adult predatory fish was also analyzed for total lead, DDT, PCBs, PBDEs, and PFCs. Larval dragonflies were analyzed for total mercury and methylmercury.

Average mercury concentrations in axial fillets of predatory fish exceeded the U.S. Environmental Protection Agency's (USEPA) tissue residue criterion (300 nanograms/gram wet-weight for methylmercury) in four lakes at VOYA, three lakes at PIRO, two lakes at ISRO, and three lakes at SLBE. This criterion was established to protect the health of humans who eat noncommercial, wild-caught fish.

Mercury concentrations in some predatory fish were high enough to adversely affect fish health and reproduction. An estimated threshold level of 500 ng/g wet-weight has been associated with altered biochemical processes, damage to cells and tissues, and impaired reproduction in fish. Average concentrations exceeded this threshold in predatory fish from three lakes at VOYA, two lakes at PIRO, one lake at ISRO, and one lake at SLBE. No long-lived, predatory fish were obtained from the streams at GRPO, and we caught only one—a small grass pickerel—at INDU in the two field seasons.

Concentrations of total mercury in whole prey fishes and of methylmercury in larval dragonflies from the INDU sites were generally low, while concentrations of total mercury in whole prey fish from GRPO exceeded an estimated dietary threshold (40 ng/g wet weight in prey fish) associated with reproductive effects of methylmercury on predatory fish. Moreover, concentrations of total mercury and methylmercury in larval dragonflies from GRPO were the highest of the six parks (see graph).

Whole larval dragonflies may be useful biosentinels of methylmercury in aquatic food webs in the western Great Lakes region. Our analyses of larval



Total mercury (THg) and methylmercury (MeHg) in larval dragonflies from six park units in the Great Lakes network. Means and confidence intervals (C.I.) were calculated from combined data for all species and water bodies in each park unit.

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Things We're Learning

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dragonflies indicate that methylmercury is bioaccumulating to high concentrations in these insects (see graph). For example, we were able to obtain larvae of the family Gomphidae from 15 lakes in four park units. Most of the mercury in larval gomphids was methylmercury, which averaged 78% of the total mercury load in gomphids across the 15 lakes. Among the lakes sampled, methylmercury concentrations were greatest in gomphid larvae from Voyageurs. Across all six park units, it was greatest in larvae collected from the streams at Grand Portage.

Annual sampling and monitoring of mercury in predatory fish, prey fish, and larval dragonflies—along with other components of the lower food web—continued in these six park units during 2010-2012. Additional information gained from the analyses of those samples will strengthen the evaluation of bioaccumulation patterns and ecological risk, and should support the identification of factors influencing concentrations of methylmercury in aquatic organisms. ●

See the [full report](#) on our website:

<http://science.nature.nps.gov/im/units/GLKN/monitor/contaminants/contaminants.cfm>



The Dragonhunter (*Hagenius brevistylus*) is a member of the Gomphidae family found in lakes at four of the six Great Lakes parks. Photo by R. J. Haro.

New Publications

Reports can be downloaded from the Network website—<http://science.nature.nps.gov/im/units/glkn>.

Edlund, M.B., J. Ramstack Hobbs, and D.R. Engstrom. 2012. Biomonitoring using diatoms and paleolimnology in the western Great Lakes national parks. Natural Resource Technical Report NPS/GLKN/NRTR—2012/644. National Park Service, Fort Collins, Colorado.

Egan, A. T., and **T.J. Gostomski**. 2013. Landbird population trends at Isle Royale National Park, Michigan: 1996-2012. Natural Resource Technical Report NPS/GLKN/NRTR—2013/692. National Park Service, Fort Collins, Colorado.

Elias, J.E., and **R.A. Damstra**. 2012. Monitoring water quality of inland lakes, Great Lakes Network, 2011: Data summary report. Natural Resource Data Series NPS/GLKN/NRDS—2012/363. National Park Service, Fort Collins, Colorado.

Frerker, K., and D.M. Waller. 2013. Comparing and evaluating methods used to assess the impacts of ungulate browsing in the Great Lakes Network national parks. Natural Resource Technical Report NPS/GLKN/NRTR—2013/680. National Park Service, Fort Collins, Colorado.

Kirschbaum, A.A., **U.B. Gafvert**, and W.B. Monahan. 2012. Landsat-based monitoring of landscape dynamics at Apostle Islands National Lakeshore, 2004-2009. Natural Resource Technical Report NPS/GLKN/NRTR—2012/608. National Park Service, Fort Collins, Colorado.

Lafrancois, B. M., S. Magdalene, D. K. Johnson, **D. VanderMeulen**, and D. Engstrom. 2013. Water quality conditions and trends in the Mississippi National River and Recreational Area: 1976-2005. Natural Resource Technical Report NPS/GLKN/NRTR—2013/691. National Park Service, Fort Collins, Colorado.

VanderMeulen, D. 2012. St. Croix National Scenic Riverway water quality monitoring: 2011 summary report. Natural Resource Data Series NPS/GLKN/NRDS—2012/366. National Park Service, Fort Collins, Colorado. ●

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**Improving park management through
greater reliance on scientific knowledge**



Apostle Islands National Lakeshore
Grand Portage National Monument
Indiana Dunes National Lakeshore
Isle Royale National Park
Mississippi National River and Recreation Area
Pictured Rocks National Lakeshore
Sleeping Bear Dunes National Lakeshore
St. Croix National Scenic Riverway
Voyageurs National Park

The Current is published twice a year for Great Lakes Network park staff, our partners, and others interested in resource management at Great Lakes region national parks.

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