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No Park Is An Island (Most Have More Than One)

By Ted Gostomski, Network Science Writer

There is a poem by Rachel Field that insists, "if once you have slept on an island, you'll never be quite the same[1]." This encapsulates how islanders feel about the differences between their lives and those of people on the mainland. But is there a similar difference in how park resources are managed when they are on islands? I began this series of interviews with park managers for the spring newsletter because my National Park Service experience began on an island. For a while I thought islands were different, but then I traveled to other parks in our Network, and I found that many of the issues that managers face on a day-to-day basis are the same everywhere you go, but still, each park has its own unique challenges. When asked about challenges, the first word you will hear from Paul Brown at Isle Royale and Julie Van Stappen at Apostle Islands is "logistics," followed closely by "weather."

"There are 42,000 acres of land in the lakeshore boundary," Julie tells me, "but the total area in which we work (counting Lake Superior waters between the islands) is closer to 250,000 acres. That's equivalent to some of the big western parks like Rocky Mountain. So don't forget the equipment you need for the day because it takes a long time (and a lot of fuel) to go back!"

Not to mention the fact that all it takes is a bright, sunny day with 25–30 knot winds pushing four-foot waves across the open lake, and few people are going out into the park. "The magnitude of the challenges we face is perhaps similar to western parks, but the way you deal with the challenge is different. The lake decides what you can and can't do," says Van Stappen. That's the difference between the islands and the places that can be reached by foot and by car.

Paul Brown's first thoughts run in the same direction as Van Stappen's, but with a nod to everyone's biggest concern, "a potential increase in weather-related issues due to climate change, such as fog at different times of the year and more significant storm events, will affect when and how work is accomplished on Isle Royale," he says.

The question of how climate change will change any park is one that all managers are struggling with. How will the park

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No Park Is An Island

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manage the transition of species and communities? For these two island parks, one thing that comes to mind is the northern plant community, specifically arctic disjunct plants such as butterwort (*Pinguicula vulgaris*) and bird's-eye primrose (*Primula mistassinica*). These two species are more commonly found further north in the arctic, but, through the wonders of glaciation and its ability to move soil and seeds, they took up residence in more southern locales such as the cold, wet, and rocky Lake Superior region. Isle Royale is home to 18 arctic disjunct plants, while the Apostle Islands hosts five species[2].

"The predictions for warmer temperatures and an overall dryer climate on the island could present management challenges, as plants and animals try to adapt," says Paul Brown. "Which species disappear will depend on the accuracy of the predictions, but arctic disjunct plants are probably most vulnerable."

Bird's-eye primrose is an arctic disjunct flower found on the rocky shores of Isle Royale and the Apostle Islands. Species such as this are vulnerable to a changing climate and increasingly dryer conditions. *NPS photo/T. Gostomski.*

There are other climate- and human-related issues at work on the island resources. Preventing the introduction and spread of invasive species is a common task in any park. Isle Royale's bat population ranks among Paul Brown's concerns, as the northern long-eared bat (*Myotis septentrionalis*) is likely to be placed on the Endangered Species list. In the Apostles, it's deer and their impacts on Canada yew (*Taxus canadensis*), an uncommon shrub.

"Overabundant deer were a thing of the past," says Van Stappen. Then they appeared on Sand and York islands and the population exploded—estimates put the population at 27 deer/sq. mi. on Sand and 26 deer/sq. mi. on York, compared to 6 deer/sq. mi. on Basswood Island and 5 deer/sq. mi. on Oak Island, two other "inner islands," or those closest to the mainland[3]. The deer had no predators and an abundant food source in the Canada yew, which began to disappear. To protect this native plant from total extirpation, the park developed a Harvestable Wildlife Plan and initiated various management approaches to reduce the deer population.

Brown is facing a similar problem as Isle Royale's wolf population dwindles and the moose population subsequently increases. With no where else to go and no predators to keep them in check, the moose could drastically change the island's plant communities over the next few years.

Island biogeography is a fascinating area of study that the managers at Isle Royale and Apostle Islands are living each day and considering with each decision they make. Climate change presents a new variable that will influence the current balance and, perhaps, what species will appear and which ones will "wink out." These are dynamic places. They are isolated and remote, but they are not untouched. ●

[1] "If Once You Have Slept On An Island" by Rachel Lyman Field. http://allpoetry.com/If-Once-You-Have-Slept-On-An-Island

[2] Emmet J. Judziewicz and Rudy G. Koch. 1993. Flora and vegetation of the Apostle Islands National Lakeshore and Madeline Island, Ashland and Bayfield counties. The Michigan Botanist 32(2).

[3] Frank A. Maragi. 2013. Deer impacts on forested communities and Canada yew populations at Apostle Islands National Lakeshore, Wisconsin. Thesis, University of Minnesota–Duluth.

2015 Field Schedule

Amphibian monitoring is expanding to Grand Portage and Isle Royale this year, as the vegetation monitoring team returns to Voyageurs to revisit plots established there in 2008, and a new and improved breeding bird survey begins at MISS.

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	CONTAM	LB	VEG	WQ
Apostle Islands (APIS)	April–June	(BE, DF) June	June		June–Sept
Grand Portage (GRPO)	April–June*	(DF) June, (F)	June		
Indiana Dunes (INDU)	March–May	(DF) June, (F)	June		May, Jul, Sept
Isle Royale (ISRO)	April–June*	(DF) June, (F)	June		May–Sept
Mississippi River (MISS)	March–May	(BE) May, (F)	June		
Pictured Rocks (PIRO)	April–June	(DF) June, (F)	June		June–Sept
St. Croix (SACN)	April–June‡	(BE) May–June, (DF) June, (F)	June		Apr–Nov
Sleeping Bear Dunes (SLBE)	April–June		June		June–Sept
Voyageurs (VOYA)	April–June‡	(DF) June, (F)	June	June–Sept	June–Sept

AMPH – *Amphibians.* Collection of data recordings will be accomplished by park staff and volunteers. *Sites will be established this year. ‡ Monitoring is being conducted using a U.S. Geological Survey protocol.

CONTAM – *Contaminants.* Bald eagle (BE) sampling conducted by Bill Route and others. Dragonfly (DF) collections gathered by park staff at VOYA and INDU, and by a team from Northland College (Dr. Randy Lehr and student interns) at APIS, GRPO, ISRO, PIRO, and SACN. We are facilitating the collection of fish samples (F) for mercury at GRPO, ISRO, MISS, PIRO, SACN, and VOYA under a joint NPS Air Resources Division and U.S. Geological Survey protocol that will augment the dragonfly monitoring results. Fish collections will be done by park staff at various times throughout the summer.

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

VEG – *Vegetation.* Team of up to five biological technicians led by Suzy Sanders and Jessica Kirschbaum.

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

Welcome!

Mark Romanski, Inland Lakes Aquatic Ecologist

We are thrilled to welcome Mark Romanski to the Great Lakes Network water quality monitoring program. Mark has a Bachelor's degree from the University of Wisconsin–Stevens Point and a Master's degree from Michigan Technological University. He comes to us from Isle Royale National Park, where he was Lead Biological Science Technician for 19 years. As the inland lakes aquatic ecologist, Mark's primary responsibility will be water quality sampling at Isle Royale—a place he obviously knows very well. But his natural resource monitoring and management experience is wide-ranging, and we look forward to his contributions to the other vital signs that we monitor at the nine Network parks. ●

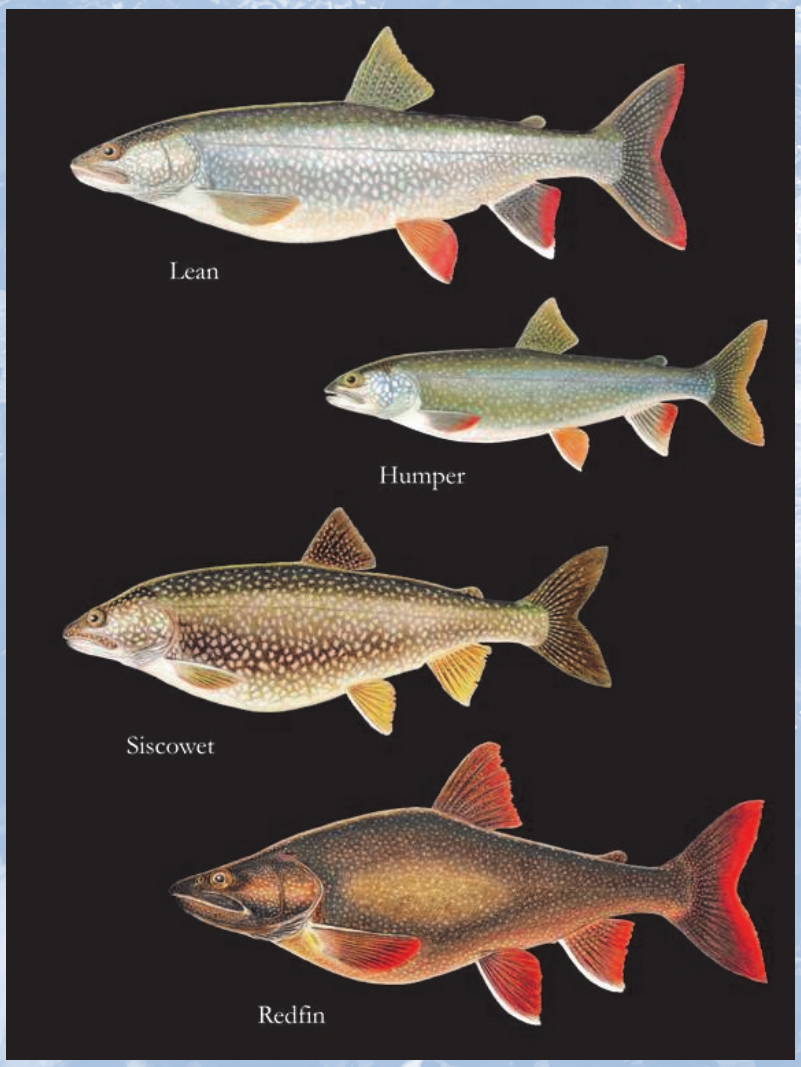
Island Icons: Brook Trout and Lake Trout

Though known for moose and wolves and perhaps loons, two of the original biological icons of Isle Royale w trout (*Salvelinus fontinalis*). Both were harvested by the North Shore Ojibwe who made annual crossings to their own role in encouraging semi-permanent post-European settlements (lake trout) and early tourism to 1900s, respectively. Lake trout are still very popular with anglers who visit the island, as one creel survey re

The island is currently home to three coaster brook trout populations, which is significant given that there are very f basin. Tobin Harbor "coasters" have been used as brood stock for coaster restoration efforts in other parts of Lake the Tobin Harbor population is one of the only known lake spawning brook trout populations in Lake Superior. Wa populations (which likely spawn in nearby streams), but there are fewer fish in those populations than in Tobin Har

The island is the only place in Lake Superior that has all four morphotypes of lake trout found in the lake—leans, h species of lake trout, the morphotypes are physically unique from one another, which is thought to be conducive to conditions found on the island and in Lake Superior.

Lake trout spawning sites have been documented around the island in both nearshore and offshore areas. Habitat a their use by the different morphotypes. For example, the deepwater ***siscowet*** form uses offshore sites to spawn, w more shallow and nearshore sites. There are some reports that "leans" spawn in waters shallow enough to be seen some locations. ***Humpers*** are often found in mid-depth areas, often over "humps" that protrude up from the bott are most abundant in moderate depths (averaging approx. 80 m, or 262 ft); few are caught in water less than 50 m



Lake trout morphs of Isle Royale, Lake Superior. Illustration by P. Vecsei (Golder Associates) for the Great Lakes Fishery Commission.[1]

Redfins spawn over numerous shoals around Isle Royal 49 ft) of water. Redfin Island in Siskiwit Bay is named f morphotype[2].

Though the **Siskiwit River** (*background photo*) flows Lake and Siskiwit Bay (Lake Superior), waterfalls prever lake trout and other fish from Lake Superior to the inla study of how glaciers affected the distribution of fish c Great Lakes region parks reported that Siskiwit Lake w Lake Superior approximately 2,200 years ago, as the gl and the land rebounded. Thus, the lake trout found in do not mix with those in Lake Superior, and no one kn morphotype(s) are swimming in the inland lake. They a of a heritage coldwater fish community composed of c trout-perch, ninespine stickleback, and slimy (spoonhea

[1] Muir, A. M., C. R. Bronte, M. S. Zimmerman, H. R. Quinlan, J. D Krueger. 2014. Ecomorphological diversity of lake trout at Isle Ro Transactions of the American Fisheries Society 143: 972-987.

[2] Parratt, S., and D. Welker. 1999. The Place Names of Isle Royale History Association, Houghton, Michigan.

[3] Gorman, O., L. Kallemeyn, and R. Maki. 2014. Biogeographic pa fish communities at Isle Royale, Voyageurs, and Sleeping Bear Du Natural Resource Technical Report NPS/GLKN/NRTR—2014/893. N

[4] Lockwood, R. N., J. Peck, and J. Oelfke. 2000. A survey of sport No. 2000-1. Michigan DNR, Lansing, Michigan.

were lake trout (*Salvelinus namaycush*) and brook
the island from Grand Portage, and each played
the island (brook trout) in the late 1800s and early
port shows (*below right*).

few populations left in all of the Lake Superior
Superior. Most brook trout spawn in streams, but
shington harbor and Siskiwit Bay also have coaster
bor.

umpers, siscowets, and redfins. Though still one
o survival in the varying and extreme habitat

at these sites differs in depth and substrate, and in
while ***lean*** lake trout are more often observed in
from shore in
om, while ***redfins***
(164 ft) deep[1].
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or this lake trout

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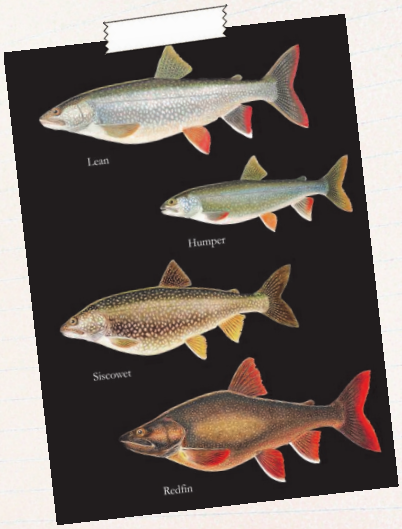
isco, lake whitefish,
ad) sculpin.[3] ●

Brook trout. *NPS photo/Jay Glase.*

1998 Creel Survey: Isle Royale, Lake Superior

Estimates of fishing pressure were based on boat counts conducted from air flights and while aboard the ferry vessel "Voyageur II," and from boating party interviews at Isle Royale ports, at Grand Portage, MN, and while aboard the ferry vessel "Ranger III."

Total angler hours at Isle Royale during June-August was 62,232. Lake trout numerically made up over 90% of the sport catch, with an estimated harvest of 9,612 and an additional 10,760 caught and released.[4]



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nes national park units.
National Park Service, Fort Collins, Colorado.

fishing in Lake Superior waters at Isle Royale, Michigan, 1998. Michigan Department of Natural Resources Fisheries Technical Report

Things We're Learning

From *Mercury in streams at Grand Portage National Monument (Minnesota, USA): Assessment of ecosystem sensitivity and ecological risk* by K.R. Rolfhus, J.G. Wiener, R.J. Haro, M.B. Sandheinrich, S.W. Bailey, and B.R. Seitz. 2015. Science of the Total Environment 514: 192–201.

Scientists at the University of Wisconsin–La Crosse found unusually high concentrations of methylmercury in water, soil, and river sediments collected at Grand Portage relative to other regional lakes and streams. Methylmercury (MeHg) is the toxin created when mercury is subjected to a microbial process known as methylation. As methylmercury moves through the food web, from water to zooplankton and up to higher level predators such as dragonfly larvae and fish, it is biomagnified to increasingly higher concentrations.

What's interesting about the higher concentrations of MeHg at Grand Portage is that it is not bioaccumulating up the food web faster than other places—in some cases it actually accumulates at a slower rate than has been found elsewhere in the region—but there is *more* methylmercury in the environment to be moved.

Grand Portage Creek flows past the stockade on its way to Lake Superior. Methylmercury was found in the soil and water at Grand Portage in significantly higher amounts than in other parks in the region. *NPS photo.*

Though a small proportion of mercury found in northern Minnesota's soil and water occurs naturally in the region's bedrock, most mercury found here is transported from distant sources by rain, snow, wind, and dust. However, it is possible that some of the mercury found in soils and river sediments at Grand Portage National Monument came from vermilion, a synthetic pigment derived from cinnabar ore that was a principal trade item and gift during the 18th century fur trade.

"Vermillion is [composed of] mercury and sulfides, and when mixed together gives a bright, bright red pigment," says Grand Portage superintendent Tim Cochrane. "We think most of the vermillion that came to Grand Portage came from China." What did the Ojibwe use the pigment for? According to the Hudson's Bay Company, the red dye was used for facial decoration, rubbed into soft tanned skins, and mixed with other items for painting various objects (www.hbcheritage.ca/content/281/hbc-trade-map#).

Cinnabar ore and powdered vermilion.
Photos by H. Zell and Wikimedia Commons

Rolfhus and his co-authors found that the supply of vermilion at Grand Portage was voluminous enough that a 1797 inventory of goods left over from a season of trade listed more than 100 pounds in stock. They also learned from research conducted by Laurel Woodruff of the U.S. Geological Survey that deeper soils (C-horizon) at three locations along the Grand Portage trail were found to contain much higher mercury concentrations (in amounts 1.7- to 2.1-fold greater) than concentrations in soil closer to the surface (A-horizon soils), with no apparent local source. This shows that the mercury was deposited there much longer ago and by some other means than natural decomposition of local rock.

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Things We're Learning

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The study's findings indicate that the soil and sediment at Grand Portage contain about 4-fold more total mercury per unit of organic matter than other forested sites in the western Great Lakes region. Further, elevated MeHg concentrations in the lower food web are biomagnified to high levels in dragonfly larvae and prey fish, but the bioaccumulation factors at Grand Portage are similar to or lower than other areas in the region.

What does this mean for people and wildlife who might catch and eat fish from nearby streams?

Mercury concentrations in prey fish were high enough to pose sublethal and reproductive risks to MeHg-sensitive fish-eating predators, but were not high enough to pose significant risks to the prey fish or to fish-consuming humans. ●

See the **full report** at http://www.sciencedirect.com/science/article/pii/S0048969715001011

New Publications

Download natural resource reports at https://irma.nps.gov/App/Portal/Home

Edlund, M. B., J. E. Almendinger, D. R. Engstrom, X. Fang, **J. Elias**, and **U. Gafvert**. 2014. Modeling the effects of past climate change on lakes in Isle Royale and Voyageurs national parks. Natural Resource Technical Report NPS/GLKN/NRTR—2014/909. National Park Service, Fort Collins, Colorado.

Egan, A. T., T. Lafrancois, M. B. Edlund, L. C. Ferrington, Jr., and J. Glase. 2014. Biological studies and mapping of shoreline rock pools in three Lake Superior national parks. Natural Resource Technical Report NPS/MWRO/NRTR—2014/907. National Park Service, Fort Collins, Colorado.

Gorman, O., L. Kallemeyn, and R. Maki. 2014. Biogeographic patterns of inland lake fish communities at Isle Royale, Voyageurs, and Sleeping Bear Dunes national park units. Natural Resource Technical Report NPS/GLKN/NRTR—2014/893. National Park Service, Fort Collins, Colorado.

Rolfhus, K. R., J. G. Wiener, R. J. Haro, M. B. Sandheinrich, S. W. Bailey, and B. R. Seitz. 2015. Mercury in streams at Grand Portage National Monument (Minnesota, USA): Assessment of ecosystem sensitivity and ecological risk. Science of the Total Environment 514:192-201. ●

In Memoriam

Jim Meeker, 1947–2014

Our friend and former co-worker, Joan Elias, lost a loving husband, and national parks and the natural world in general lost a friend when Jim Meeker passed away on December 27, 2014. Jim was a professor of natural resources at Northland College in Ashland, Wisconsin, and he was involved in a number of research projects related to plants and wetlands in the Apostle Islands, on Isle Royale, and at Voyageurs. He worked extensively with local native American tribes, and he and Joan co-authored (with John A. Heim) *Plants Used by the Great Lakes Ojibwa*. Jim's contributions live on through numerous publications, and among his former students who carry on his work in their own right by studying and teaching about what Jim first illuminated for them. ●

Photo by Sarah Johnson

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

Improving park management through greater reliance on scientific knowledge

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.

Editor
Ted Gostomski

Network Coordinator
Bill Route

Webmaster
Mark Hart

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http://science.nature.nps.gov/im/units/glkn

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National Park Service
Great Lakes Inventory and Monitoring Network
2800 Lakeshore Drive East, Suite D
Ashland, Wisconsin 54806

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