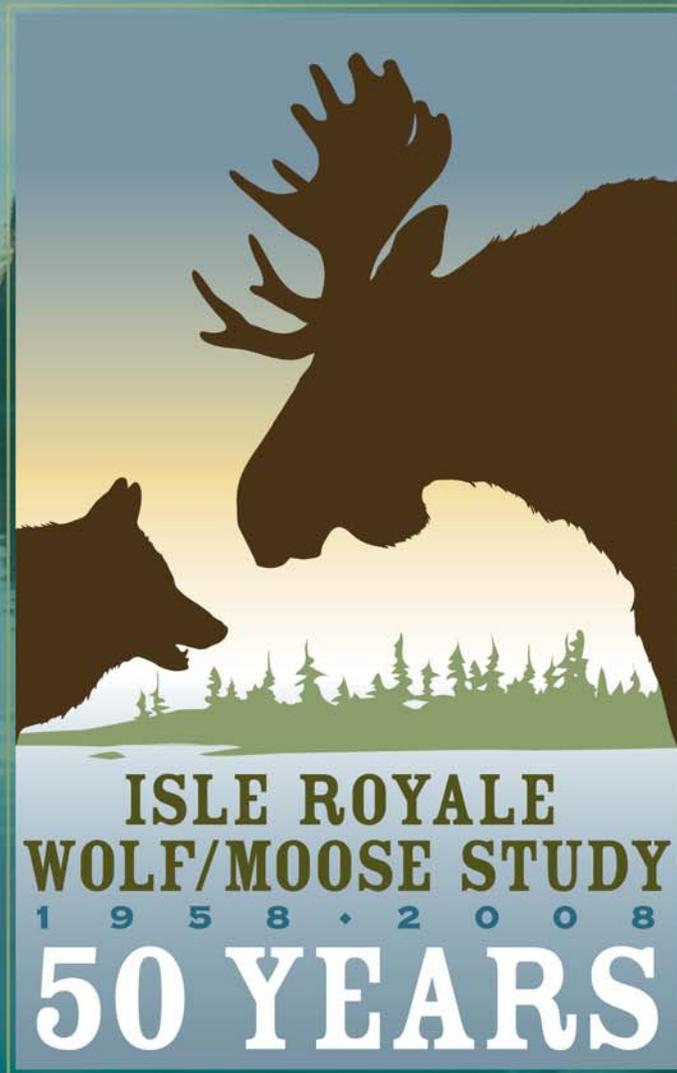


INTERNATIONAL WOLF

A PUBLICATION OF THE INTERNATIONAL WOLF CENTER
SUMMER 2008



■ SPECIAL ISSUE ■

INTERNATIONAL WOLF

THE QUARTERLY PUBLICATION OF THE INTERNATIONAL WOLF CENTER
VOLUME 18, NO. 2 SUMMER 2008

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A research study celebrates its golden anniversary. Scientists have been studying the interactions and interdependence of wolves and moose at Michigan's Isle Royale National Park for half a century.

Photo of trees: Ann Mayo-Kiely.
Photo of wolf: International Wolf Center.



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Publications Director

Mary Ortiz

Magazine Coordinators

Neil Hutt, Sharon Reed

Graphics Coordinator

Carissa L. Winter

Consulting Editor

Mary Keirstead

Technical Editor

L. David Mech

Graphic Designer

Tricia Austin

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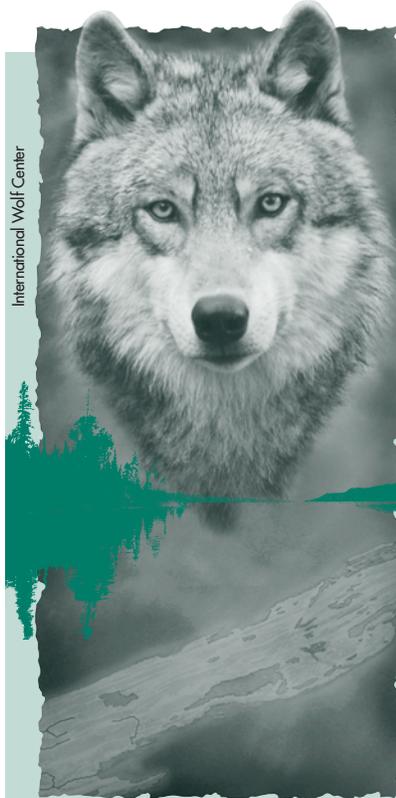
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The Official Roster of Participants in the Isle Royale Wolf-Moose Study

Pioneers

When one has sojourned in the wild outdoors he tends to tell about the great adventures. But behind each idyllic moment in the field there is a hard-earned back-up of routine unexciting days less well remembered because there were so many of them. And one must understand that the closer he gets to the primitive system, the more he must live by its unforgiving tenets.

—Durward L. Allen, *The Wolves of Minong*

Durward L. Allen, 1958–76: Professor of wildlife ecology at Purdue University, Allen conceived the idea of the wolf-moose study, enlisted the funds, supervised the research and assisted with fieldwork.

Donald E. Murray, 1959–79: Murray was the winter field pilot and an excellent wolf observer.

Lead Researchers

In a sense, trusting oneself to the caprice of natural events is a retreat from responsibility. You cannot plan far ahead because you do not know how the sky will look in the morning. You know what the job is, but you do not know just how you will get it done, or when. One cannot work on Isle Royale or any comparable place unless he can accept, even enjoy, this kind of uncertainty. After all, who is to blame if it rains?

—Durward L. Allen, *The Wolves of Minong*

L. David Mech, 1958–62: Charged by Dr. Durward Allen with starting the wolf-moose study in 1958, Mech spent four years in pursuit of his Ph.D., gathering data on the wolf-moose system on Isle Royale.

Philip C. Shelton, 1960–64: Following Mech, Shelton studied wolves, beavers and moose at Isle Royale National Park.

Peter A. Jordan, 1963–66: Jordan was a postdoctoral research associate, coming to Purdue from the University of California at Berkeley.

Wendel J. Johnson, 1966–69: A Ph.D. candidate from Purdue, Johnson studied the Isle Royale red fox and its principal prey species.

Michael L. Wolfe, 1967–70: With a Ph.D. in game management, Wolfe joined the Purdue research on Isle Royale as a postdoctoral associate.

Rolf O. Peterson, 1970–present: Initially a Ph.D. student working under Allen at Purdue, Peterson has been director of the research program on Isle Royale since 1975.

John A. Vucetich, 2001–present: A professor at Michigan Technological University, Vucetich is co-director of the Isle Royale research program with Peterson.

Donald E. Glaser, 1979–present: An Alaskan bush pilot, Glaser is the field research pilot. ■



From the Founder of the International Wolf Center

A Half Century of Wolf-Moose Research on Isle Royale

by L. David Mech, U.S. Geological Survey, Northern Prairie Wildlife Research Center

This year we celebrate a half century of wolf-moose research on Isle Royale, that special national park in Lake Superior. Little did I know on June 30, 1958, when first my boot touched that isolated ecosystem, that my initial year of graduate study would lead to another 50 years of research—and hopefully to many more. Possibly my professor, Durward L. Allen of Purdue University, didn't even envision that.

As Durward's first student, I was tasked with starting the project and cutting out a swath for my Ph.D. I knew most of the hard data would come in winter. Because this was long before radio-tracking, molecular genetics and the like, the available technology boiled down to a light ski plane, a notebook and a pen. Important also was an empty coffee can kept close in the back seat of the aircraft.



L. David Mech

After a few gut-wrenching days of dizzily circling around in the little plane deciphering strings of wolf tracks below, I learned that when finally comfortable, one could count the wolves and moose on the island quite well. Thus was born the backbone of the study, monitoring wolf and moose numbers each winter. Continuing these surveys and observing the relationship between wolves and moose have occupied countless students, scientists, assistants and technicians on Isle Royale ever since I completed my three-year stint. Durward's last student, Rolf Peterson, inherited the project when Durward retired in the early 1970s. Rolf then made Isle Royale his primary work. He has applied all the new technologies and has added John and Leah Vucetich, population and conservation-genetics biologists, to his team.

Meanwhile, the backbone of the study goes on; over the 50 years, wolves have fluctuated between 12 and 50, and moose between 385 and 2,500. Now some four books and more than 100 scientific, popular and news articles later, the Isle Royale studies continue to hold the interest and wonder of the scientist and wolf enthusiast alike.

What have we learned from all this? Far more than can be covered here, of course. General highlights, however, include the findings that (1) wolves do not necessarily limit their prey; (2) wolf numbers depend on the number of old moose (which form most of the adults they kill); (3) wolves must make many attempts to kill moose for each success; and (4) a wolf population can survive for many decades despite intensive inbreeding.

This last finding is especially important. Isle Royale wolves are thoroughly inbred, having all been derived some 60 years ago from a single female. The obvious question, of course, is how long the population can last. Accenting this problem is the moose herd's current all-time low. Is this 50th anniversary the beginning of the end for this wonderful experiment?

Hopefully another 50 years of interesting study will tell. ■

L. David Mech

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Ann Mayo-Kiely

International Wolf Center

Leah Vucelich

An Enchanted Island

by ANN MAYO - KIELY

Isolated from the rest of the world by the deep, cold waters of Lake Superior, Isle Royale National Park is located 45 miles north of Michigan's Upper Peninsula. Isle Royale, the largest island in Lake Superior, is 45 miles long and 9 miles wide. The Ojibwa called it *Minong*, meaning "place of blueberries." The park boundary extends 4.5 miles into Lake Superior and encompasses hundreds of small islands and 572,000 acres, 80 percent of which are under water.

A history of billion-year-old lava flows, glaciers and fires is evident in the park's inland lakes, wetlands, rock ridges and forests, but Lake Superior's ongoing strong winds and cold temperatures are the primary forces shaping the natural and

cultural history of the park. People and wildlife that reach the islands must cross at least 15 miles of open water or unstable winter ice. The relatively few species that have colonized the island and the few visitors to the park are a hearty and determined lot.

Isle Royale has a rich human history that includes prehistoric hunting, gathering and copper mining, as well as brief periods of historic logging, mining, commercial fishing and resort-style vacationing. Remnants of human influences are evident to a well-trained eye, but to many visitors, the park appears a pristine wilderness, a unique gem of the eastern United States. Thanks to the foresight of those who fought to establish Isle Royale as a national park in 1936 and then to further

protect the park with wilderness designation in 1976, Isle Royale has become a haven for adventurous hikers, boaters, paddlers, anglers and wildlife watchers.

The list of wildlife species found on Isle Royale currently includes 18 mammals, one-third the number found on the adjacent mainland. Resident mammals include snowshoe hare, red foxes, deer mice, weasels, beavers, and six species of bats, along with the renowned wolves and moose. Bears, deer, coyotes, felines and most small mammals are noticeably absent. Rare plants are uniquely abundant for this region, particularly in exposed areas that mimic arctic and alpine conditions. Loons and other bird species well suited to protected island areas are abundant as well, and Isle

Royale waters protect the most intact native fisheries of the Great Lakes. For many people, the island's wildlife populations and their conservation are the essence of Isle Royale's wilderness character.

Wildlife ecologist John Vucetich explains that Isle Royale's size and distance from the mainland make it ideal for ecological studies in a natural laboratory. It is close enough to the mainland for a few of just the right combinations of predators and prey to reach the island, yet it is far enough away to contain them, thus leading to long-term isolation of populations. Isle Royale is large enough to maintain these populations, while small enough for researchers to study them effectively. In contrast to many protected areas, there are no adjacent land uses such as agriculture, hunting, industrial use or other high-impact activities along the park's boundaries. These conditions, combined with fortuitous events starting 100 years ago, have given Isle Royale worldwide acclaim as home to ground-breaking ecological research.

In the early 1900s, moose swam from the mainland and first reached Isle Royale to colonize the island. In the late 1940s, at least two wolves crossed the ice from Ontario. The wolves found favorable conditions with an abundant and widespread moose herd, and little to no competition for prey (at the time there were coyotes on the island, but they would soon disappear). With no hunting, poaching or mortality from vehicles, Isle Royale was then, and remains today, one of the few places in the world where naturally contained populations of wolves and their prey are free from direct threats from humans. In addition, the National Park Service has taken measures

**Isolated in a
tempestuous lake...**

**Isle Royale has
clearly been left
to nature, not man.**

**Who would care to
change that?**

— Rolf O. Peterson,
*The Wolves of Isle Royale:
A Broken Balance*



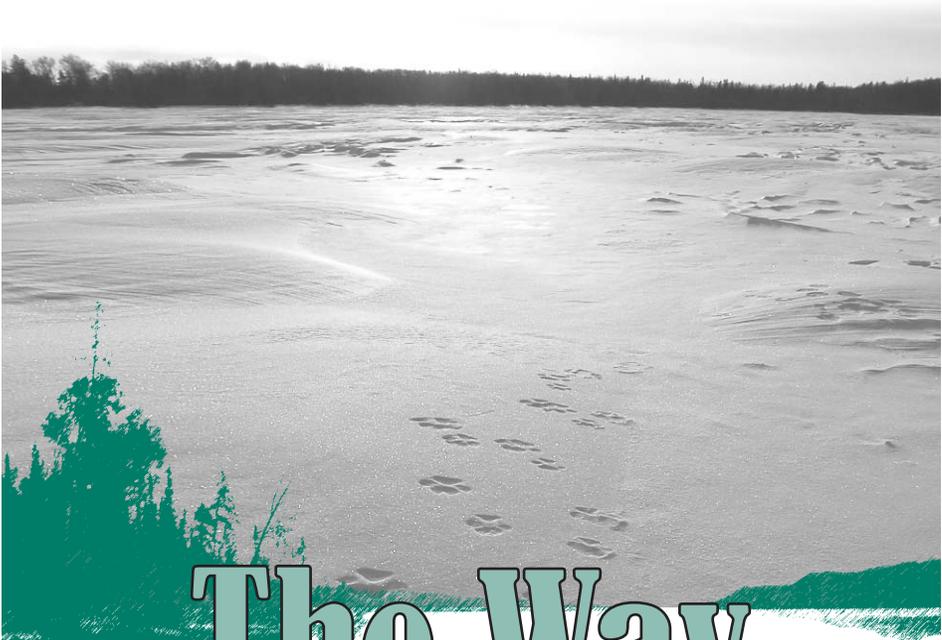
throughout the years to reduce human impacts on these populations, including limiting research that involves handling the wolves and moose, closing the park in winter, and temporarily closing individual campgrounds to reduce visitor conflicts with wolves. These measures, in combination with the certainty that wolves and moose rarely, if ever, risk the frigid waters of Lake Superior to come and go from Isle Royale, allow a high confidence that changes in wolf and moose populations can be attributed to births and natural causes of death.

The relatively low number of species with one top predator and one prey combined with isolated, contained populations created unusually simple conditions for studying wildlife. Thus, an ideal natural laboratory existed for studying predator-prey interactions, and in 1958 Durward Allen of Purdue University, working with a graduate student, L. David Mech, had the foresight to establish what would become the world's longest-running,

uninterrupted predator-prey study. The study continues today, led by Michigan Technological University's Rolf Peterson and John Vucetich, with funding, personnel and infrastructure support from the National Park Service.

2008 marks the 50th anniversary of this seminal research project, which has grown to include investigations of ecosystem-level interactions, global climate change, bioaccumulation of pollutants, genetic inbreeding and other critical global conservation issues. Researchers observe wolves and moose from a distance; collect and preserve bones, scats and browse samples; and investigate new issues that come to light. The wolves and moose of Isle Royale and the insights they offer continue to captivate visitors and students of all ages. ■

Ann Mayo-Kiely is the director of the Isle Royale Institute, based at Michigan Technological University in Houghton, Michigan (www.iri.mtu.edu). She has been involved with Isle Royale since 1994.



The Way We Were

Remembering the Early Days

by TRACY O'CONNELL

Editor's note: As L. David Mech noted in his introduction to this issue, the Isle Royale project started when he accepted the opportunity to study the relationship of wolves and moose. These early days are fondly recalled a half century later by Mech; by Doug Smith, a former Isle Royale researcher who is today program manager for the Yellowstone Wolf Project; and by Don Murray, a pilot for the project for 21 years.

In 1958, as a senior at Cornell University, David Mech met Durward Allen, a visiting Purdue professor who described a grant from the National Science Foundation to study wolves and moose on Isle Royale. "I had never heard of the island; it sounded very exotic," Mech recalls. "He told me, 'I'd like you to do it,' and I jumped at the chance."

That summer Mech visited the island so Allen and other wolf researchers could guide him in what he should do. "Then they turned me loose," Mech recalls. "I hiked all summer, looking for wolves, scats, tracks, and things like that."

He returned in February 1959 to continue his work with the use of an airplane. There was much to learn and overcome. "I didn't have the right perspective, looking down on things," he recalled, and he would have the pilot land so he could study what he was seeing from the air, up close. Airsickness was a problem at first.

Mech recalls, after days spent following tracks, "I will never forget, out ahead of us was the first view I had of wolves, nine of them; I could not believe it. . . . It became a routine: get in the plane, go where we last saw wolves, and follow their tracks." He would note how far the wolves traveled, how long it took them, and whether they made a kill. He watched how often the prey got away, and whether it was from running or standing its ground. The plane allowed him to watch the moose and wolves before either species knew of the other's presence.

Mech had concerns with early pilots, experiencing carburetor icing and a couple of near crashes. Then the firm supplying pilots sent Jack Burgess, now living in Tower, Minnesota. Mech says, "He was part of the controls; it was beautiful to watch him fly. A former wolf hunter, he helped me understand tracks." Burgess could only work a few weeks, so Don Murray soon began a 21-year stint. "Don had hunted wolves in Minnesota. We were a good pair. It was easy for him to pick up what we were doing," Mech says.

Murray recalls the early days. "I can feel the island as I talk, 'cause Isle Royale is a special place. I consider myself one of the luckiest people in the world." Murray flew in the winters and drove for Century Motor Freight the rest of the year, retiring in 1981 after an auto accident injured his legs.

Murray recalls, "The first year we watched the wolves kill moose, and I thought, geez, this isn't very nice, wolves tear moose apart. Finally I got to look forward to it. We watched them kill a moose just off Siskiwit Bay and decided to land. . . . There were 15 wolves, one with a bloodied face—Mech has a picture of this—and the wolves took off. People say if you go near them when they are feeding, you're in trouble, but they never came back until three days later. I found that interesting. They portray the wolf as such a vicious animal."

“We watched them kill more moose, and it got interesting. Sometimes they would separate a cow and calf; a couple [of wolves] would keep the cow busy, and the rest would jump the calf because it was the weakest one. I am sure the wolves understood that. It was like watching a movie. It made me enjoy the job. You had to or you’d freeze; we didn’t have heat in the airplane.”

Mech sees using a plane to watch wolves hunting as one of his biggest contributions. “Nobody had seen this before, and I watched wolves interact with 130 moose over three years.”

Murray’s memories encompass a stream of college students and the camaraderie of his colleagues. “At first the power lines were always down, the radio didn’t work; we’d start the generator and go out to repair the lines,” he said. Fellow pilot Don Glaser would climb the tree through which the power lines were strung, and others on the ground would poke him with sticks, saying to climb higher.

There were late-night card games, and Allen’s sourdough bread. “It wouldn’t rise; you could use it for a hammer,” Murray says. “But Doc Allen kept experimenting. After he retired, he had organic wheat shipped in to

grind his own flour. He was making real good bread and sent me two loaves every month.”

Murray also recalls the foxes that slept under his bunk. “Camp foxes, the tourists fed them all summer. I would go snowshoeing, sit and talk to them, and put food on a stick to feed them. If they got out of line, they wouldn’t get any.”

The arrival of Rolf Peterson was a fond memory for Murray. The last of Allen’s students to study on the island, Peterson returned in 1975 after completing his doctorate to head the effort after his professor’s retirement. Doug Smith, who today manages the Yellowstone Wolf Project, credits Peterson for giving him his start and has modeled his life after his mentor. “He hired me as a technician when I was 18, in 1979. I was on the island nine summers and two winters; that was the big break I needed. Because of that I ended up in



John Vuceitch

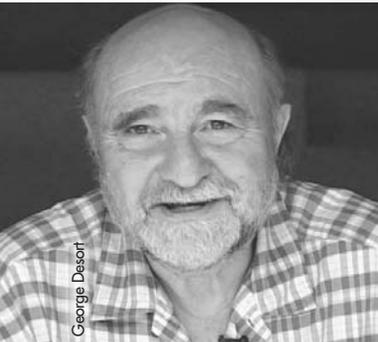


George Desort



Dave Mech

Recalling his days on Isle Royale, Don Murray said, “I can feel the island as I talk, ‘cause Isle Royale is a special place.” Murray spent 21 years flying a plane for Isle Royale scientists.

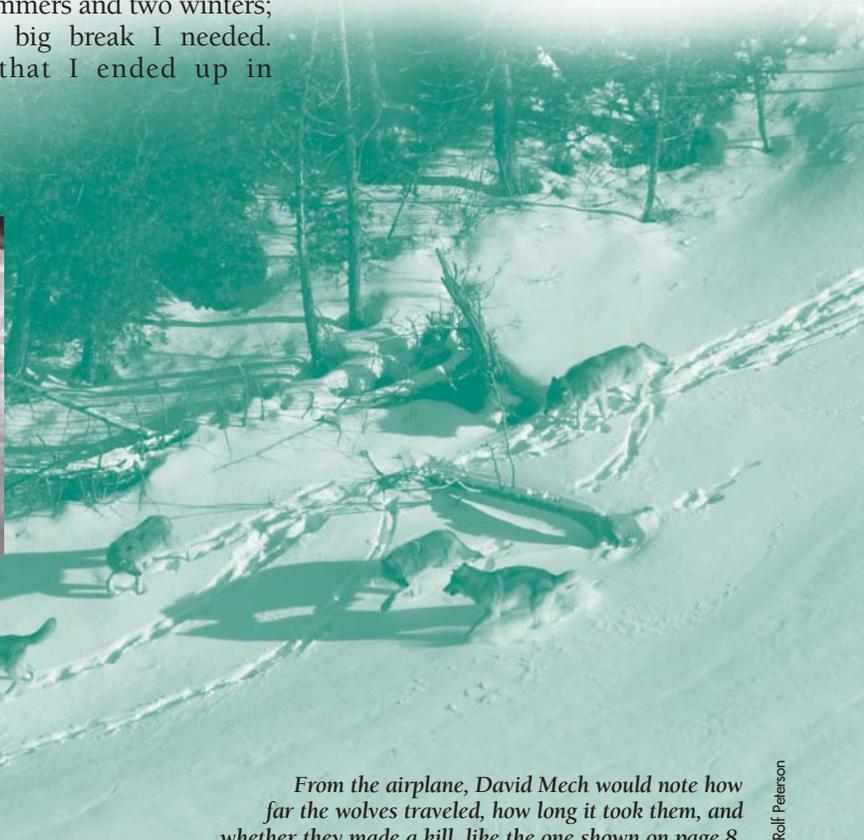


George Desort



Dave Mech

David Mech, left and shown on the right with moose jaws, jumped at the chance to study wolves and moose on Isle Royale when Durwood Allen offered him the opportunity in 1958. He would like the study “to continue for another 50 years.”



From the airplane, David Mech would note how far the wolves traveled, how long it took them, and whether they made a kill, like the one shown on page 8.

Rolf Peterson

Yellowstone, and what I learned from Rolf I used to pattern the Yellowstone project.”

“I’ve been interested in wolves since I was 12,” Smith recalls. One Christmas his brother gave him Mech’s book *The Wolf: The Ecology and Behavior of an Endangered Species*. Smith wrote to Mech when he was 15, “and amazingly, he wrote back,” Smith recalls. He wrote again, looking for work, when he was 18, and Mech referred him to Peterson, among others. Smith says that his connection to Isle Royale “started a series of events that led me to where I am now.”

Smith describes the excitement he still experiences in sighting wolves after, like Mech, he had his first sighting on the island. “My goal was to hike 500 miles off trail and see a wolf a summer,” he said of that first job. “It doesn’t sound like much,” he adds, but having to move quietly through the island’s dense brush made sightings very difficult. He recalls pranks played by pilot Don E, as he called Glaser, and the realization that when Glaser and Peterson were flying, he was the only person on the island. Like Mech, Peterson and Smith learned tracking from pilots—Murray taught Peterson, and Glaser taught Smith.

“Isle Royale showed that a short study does not give the detail or subtlety needed to understand the complexity you find in nature today,”

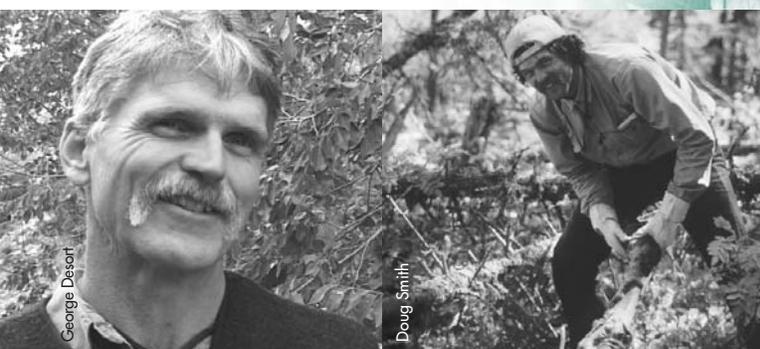
I often wonder how much the wolves understand about our operation. Generations of Isle Royale wolves have observed the annual cycle of researchers coming in January, flying around in a small plane, and leaving abruptly a few weeks later. . . . Our occasional low passes are similar to the teasing of low-flying ravens, and I suspect that the wolves would like to catch us.

— Rolf O. Peterson,
*The Wolves of Isle Royale:
A Broken Balance*

Smith says, an argument he continues to make in support of his work at Yellowstone. “We need long-term data so we know how it is rapidly changing. . . . I cannot imagine the science of ecology without Isle Royale.”

Mech, considering the study more recently, notes, “Folks, particularly starting with Rolf, are more detailed, and follow leads much farther. Rolf started detecting arthritis in moose and consulting with experts, pushing that realm of knowledge farther. He started working with canine parvovirus. Each scientist who approaches the project adds a unique perspective. I would like to see this study continue for another 50 years.” ■

Tracy O’Connell teaches marketing communications at the University of Wisconsin-River Falls and volunteers for the International Wolf Center. Previously she worked for 30 years in journalism, public relations and advertising. She lives in Spring Valley, Wisconsin.



Doug Smith says, “Isle Royale showed that a short study does not give the detail or subtlety needed to understand the complexity you find in nature today. . . . I cannot imagine the science of ecology without Isle Royale.” Smith first worked on Isle Royale as a technician when he was 18, in 1979. He was on the island nine summers and two winters.



Over the years, the Isle Royale wolf-moose project has contributed important understanding of the question “How do wolves affect prey?”



What Have We Learned from Isle Royale Wolf-Moose Research?

by JOHN A. VUCETICH

Two great concerns for wolf managers are “How much human-caused mortality can a viable wolf population sustain?” and “How do wolves affect the prey populations that humans also want to hunt?” Though humans do not exploit wolves or moose on Isle Royale, the wolf-moose project has provided important insight into both questions.

Isle Royale is the only place where humans have monitored, for any serious length of time, the mortality rates of wolves not exposed to human causes of death. This knowledge is valuable for promoting wolf viability and for maintaining human-caused mortality at appropriately low levels. Ironically, knowledge about natural rates of wolf mortality is also valuable for the efficient reduction or over-exploitation of wolf populations.

One of the primary reasons humans kill wolves is because many people believe that wolves threaten their ability to enjoy the highest possible rates of hunting success—for deer, elk, moose and caribou, the species on which wolves’ survival depends. Consequently, “How do wolves affect prey?” is considered a critical management question. Over the years, the Isle Royale wolf-moose project has contributed important understanding on this topic. Early on, we discovered wolves are selective predators, tending to kill old, sick or young moose. Subsequently, we found that wolves tend to kill more when winters are severe and when moose are abundant. These discoveries suggest wolves are the direct, but not ultimate, cause of most moose deaths; that is, wolves seem to have relatively little impact on moose abundance.

Then, quite by accident, we obtained a very different impression. In the early 1980s, wolves declined substantially due to a disease. Shortly afterward the moose population increased dramatically, only to soon crash due to the combined effects of severe winters, a tick outbreak, and a severe food shortage. Most recently, we learned that of all the factors affecting short-term fluctuations in moose abundance, wolves are the least important factor. Climatic factors (such as summer heat and winter severity) seem much more important. Most importantly, most fluctuations in moose abundance are due to factors we have yet to identify. These observations highlight the limitations of our knowledge about how wolves affect moose on Isle Royale, despite their being well studied. To some, these limitations suggest that our ability to control

many wildlife populations is less precise and reliable than commonly thought. To these people, the suggestion is not unjustified pessimism but a reasonable conclusion to draw from 50 years of research.

Though we are grateful for opportunities to contribute to science, I think there may be two ironies about better understanding how wolves affect prey. First, expecting an ecologist to study how predators affect prey for the purpose of better understanding how to control them may be like expecting an astronomer to study how the stars move for the purpose of better controlling their movement. Learning to better live with and appreciate how nature is unpredictable and uncontrollable

Scientists have learned that the most important events in the history of Isle Royale's wolves and moose are severe winters, disease and tick outbreaks.



may deserve more attention than being fixated with controlling nature. The second irony is that how wolves affect prey abundance is important for justifying two management interests that are, to say the least, oddly juxtaposed. The justification of wolf control—killing wolves to maximize hunting of ungulates such as deer, moose and elk—requires demonstrating that wolves have a profound effect on prey. However, to justify that wolf predation is a critical component of healthy ecosystems also seems to require demonstrating that wolves have a profound effect on prey. Adding to the confusion, many argue that wolves should be recovered or left unexploited because they have little impact on prey abundance. Scientific facts alone cannot tell us how we should relate to nature.

In this context, I think that the Isle Royale project has also offered knowledge of quite a different kind.

To understand what we mean by “different kinds of knowledge,” first ask yourself what is the purpose of science. Is the role of science primarily to control nature for the purpose of “easing man’s estate,” as the famous philosopher René Descartes suggested more than 350 years ago? Or is the purpose of science primarily to generate wonderment about the natural world—the kind of wonderment that can transform and enlighten our understanding about how we ought to relate to the natural world—a view roughly held by the famous 20th-century philosopher Karl Popper? If this latter statement better identifies the purpose of science, the Isle Royale wolf-moose project has, we hope, contributed valuable knowledge.

The Isle Royale wolf-moose project began 50 years ago during the darkest hour for wolves in North America. The extermination of wolves required vilifying them. The subsequent and quite phenomenal improvement in conditions for wolves required an antidote for our vilification. That antidote is knowledge. In the early years, the project gave people reason to replace destructive myths with real knowledge that portrayed wolves as they are: predators, a natural part of ecosystems, not villains. For example, the Isle Royale wolf-moose project helped people see that wolves are not gluttonous, wasteful killers. Instead most wolves die young, and they die of starvation or fighting for food. And what wolves do not eat, scavengers—foxes, ravens and other resident birds—depend on for

Most recently, scientists have learned that of all the factors affecting short-term fluctuations in moose abundance, wolves are the least important factor. Climatic factors (such as summer heat and winter severity) are much more important.



One of the mandates of national parks is to preserve their natural ecosystems.

What if the Isle Royale wolves become extinct? Should the National Park Service replace them? This is not an easy question to answer. . . .

— L. David Mech, foreword to *The Wolves of Isle Royale: A Broken Balance*, by Rolf O. Peterson

their own survival. Ultimately, the Isle Royale wolf-moose project created awareness that contributed to a sea change in attitude, allowing wolves to begin their recovery.

More recently, we discovered a special relationship between wolves and ravens. Specifically, a critical advantage of group living is that wolves lose substantially less food to scavengers such as ravens. Ravens may be an important reason why wolves live in packs—a trait otherwise uncommon among carnivores. This discovery grabbed much press attention. But, why? This knowledge is certainly not valuable for controlling anything in nature. Rather, the work is appreciated, I think, because it highlights a beautifully unexpected and intricate ecological connection. Our work also grabbed press attention when we described connections describing how wolves and moose are affected by moose ticks, which in turn are influenced by climate. Connections like these are important because they can generate wonderment, awe and respect.

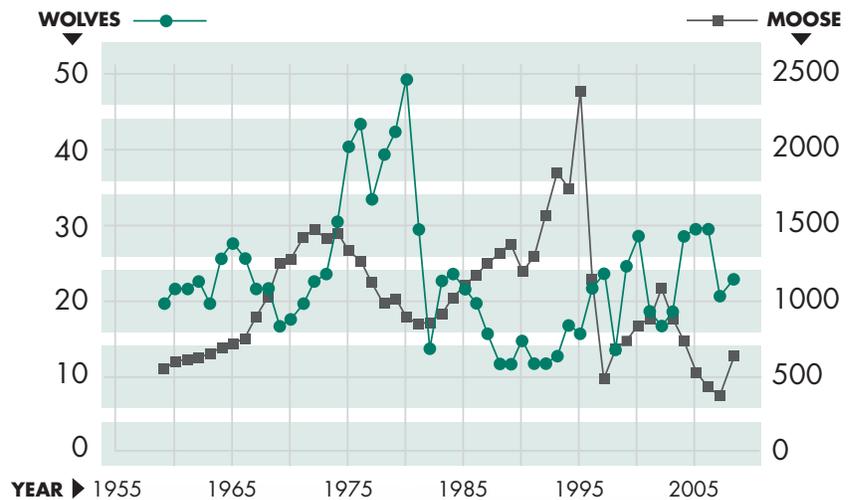
Over the years, our awareness of Isle Royale's complexity and unpredictable nature has continued to

grow and deepen. We know the most important events in the history of Isle Royale's wolves and moose are severe winters, disease and tick outbreaks. These events are essentially unpredictable. Moreover, every 5-year period in the wolf-moose chronology seems to differ from every other 5-year period. This seems true even after 50 years of observation (see graph). Going further, the first 25 years of the study were profoundly different from the second 25 years of the study. Although we can expect the next 50 years to differ substantially from the first 50 years, we are strangely in no position to say how. These and related observations suggest the futility of trying to reli-

ably predict nature's responses to our intense exploitation.

The Isle Royale wolf-moose project has generated many scientific facts about wolves and moose. In doing so, we have also developed and shared with others a deep sense of place about Isle Royale's ecology. From this, I think, comes a knowledge that generates wonderment—the kind of knowledge we may need most. ■

John Vucetich is an assistant professor at Michigan Technological University. He began working on the Isle Royale wolf-moose project in 1990 as a field technician. In 2000, he began co-leading the project with Rolf Peterson.



Fluctuations of wolves and moose in Isle Royale National Park for the past years, 1959–2008.



John Vucetich

In the early years of the study, scientists discovered that wolves are selective predators, tending to focus their predation on moose that are old, sick or young. Subsequently, they learned that wolves tend to kill more when winters are severe and when moose are abundant.



The Challenges of Long-Term Wolf Research

by MICHAEL P. NELSON

The Isle Royale wolf-moose study is the longest continuous study of a predator-prey relationship in the world. The project's success is easy to take for granted, but it is naive to think that an achievement of this magnitude just happens by good fortune and is prolonged by sheer momentum. In fact, sustained success takes much more. But what are the specific conditions that allow for long-term research and enable it to succeed? There are three critical underappreciated, but necessary, conditions—conditions so undependable they explain why long-term research is rare.

The first requirement of a successful long-term study is *interest*. A 1986 Institute of Ecology study indicated that the only important factor that limits the success of a long-term project is the researcher's enthusiasm. This kind of interest is required for any study, long- or short-term; however, long-term study requires a

researcher to make her or his entire life's focus the study of a single ecological relationship at a single location. Not only is such intense



Rolf Peterson

The Isle Royale researchers have been wildly successful in impressing both the scientific community and the public, and the story of the wolf-moose study continues to capture a broad interest.

focus rare among researchers, but this kind of sustained effort is not typically rewarded by government funding agencies.

It is a sad irony, then, that environmental research rarely manifests a strong “sense of place.” One of the great lessons that Aldo Leopold, who decades ago helped shape the science of wildlife research and management, offered the world is that a powerful “sense of place” is required for a mature environmental ethic. According to Leopold, whose ecological wisdom continues to influence American attitudes toward wildlife, we only extend moral consideration to those things that we consider members of our social community. Leopold wrote that “all ethics so far evolved rest upon a single premise: that the individual is a member of a community of interdependent parts.” In this way, the Isle Royale study takes on an unanticipated yet profound moral significance. But even a lifetime focus can carry a research project just 20 or 30 years. In this way the Isle Royale wolf project is quite literally a phenomenal accomplishment, “an extraordinary occurrence.” It represents the sustained interest of not one person but a lineage of people, from Bob Linn to Durward Allen to Rolf Peterson to John Vucetich.

Ultimately the researcher's enthusiasm must also transfer to and spark the public's enthusiasm. This can be difficult, especially when the study is largely about an animal with which we have both a troubled past and a controversial present. The Isle Royale researchers have been wildly successful in impressing both the scientific community and the public, and the story of the wolf-moose study continues to capture a broad interest for two reasons. First, the research has yielded unusual findings, such as the impact of scavengers on wolf pack size and the surprising role of parasites in the dynamics of the system. Second, extensive public outreach has sparked and sustained public involvement. Isle

Royale researchers maintain an interactive Web site (isleroyalewolf.org), which has 17,000 visitors annually. Descriptions of the researchers' work appear every year in hundreds of media outlets, and the researchers personally present their work to over 5,000 scientists and members of the public annually as well.

The second necessary condition for a successful long-term study is *money*. Scientific research is an expensive endeavor, and long-term research is "expensive multiplied by long-term." The annual budget of the Isle Royale study is a fraction of other important scientific studies, yet its contributions to society are comparable to those of other significant research projects. Despite its relatively high return, however, the Isle Royale wolf project remains financially limited. If funded at a higher level, the Isle Royale project would undoubtedly produce even more valuable information.

But money is fickle. The \$30,000 that the National Park Service (NPS) originally committed annually to the project in 1976 has remained essentially unchanged, though inflation makes its worth today less than \$15,000. Federal sources of funding can change (that is, "shrink") given the fancy of an administration not interested in environmental research generally, or more interested in funding nonenvironmental activities. However, since critical insight about living sustainably (a long-term proposition we currently confront) comes in part from long-term studies, the real tragedy of underfunded long-term science is for society. Given the financial constraints on long-term projects, we should never assume that because a study has lasted for 50 years that it will last for 50 more, or even one more.

Third, successful long-term study requires the ability to weather the periodic threat of zealous ideologies and tyrannical administrators. There have been at least two close calls for the Isle Royale project on these grounds. In the early days of the

study, funding was mysteriously canceled by a high-level administrator willing to quash scientific research in the name of a mythology suggesting wolves are some sort of evil incarnate. Later there was an attempted NPS "takeover" of the project that, by all appearances, was simply a raw abuse of power. More recently, immature ideologies about the nature of wilderness can and have interfered with environmental research in this study and elsewhere. The final chapter of Rolf Peterson's book *The Wolves of Isle Royale: A Broken Balance* chronicles how a certain wilderness ideology held by the NPS might have allowed the wolves of Isle Royale to die out during the 1990s. The Isle Royale wolf project is not alone in this way. Other long-term research projects have failed, or their continuation has been threatened, by tyrannical administrations and ideologies that are opposed to certain kinds of knowledge about the environment.

Of course, ideology coupled with intellectual honesty allows for reconciliation, for the recognition that other ideologies and actions can also be motivated by, and result in, the care and the protection of nature. But we have all learned recently that ideological righteousness coupled with power knows no limits and is not subject to negotiation. The antidote here can only be a public that is aware and prepared to support what is valuable to them.

Regionally, Isle Royale is known for fishing and boating. Nationally, Isle Royale is a wilderness-backpacking destination. However, on the international scene, Isle Royale is

mainly known for one thing: its long-term study of the wolf-moose system. But such a study is at the mercy of many burdens: creative, ideological, logistical and financial. So, in addition to being precious (from the Latin *pretiosus*, meaning "costly, valuable"), it is also *precarious* (from the Latin *precarius*, meaning "obtained by asking or praying"). And anything possessing these qualities should not be taken for granted. ■

Michael P. Nelson is a professor of environmental ethics at Michigan State University. He is co-author of American Indian Environmental Ethics: An Ojibwa Case Study and co-editor of The Great New Wilderness Debate and The Wilderness Debate Rages On: Continuing the Great New Wilderness Debate. To learn more about Nelson and his activities, visit www.conservationethics.org.

The Isle Royale wolf project represents the sustained interest of not one person but a lineage of people, from Bob Linn to Durward Allen to Rolf Peterson (pictured) to John Vucetich.



“The Best Place on Earth”: Isle Royale’s Bob Linn

by Rolf Peterson

The 50-year study of wolves and moose in Isle Royale National Park has survived and thrived because of the skill and devotion of many supporters. One name, however, arises repeatedly throughout the project’s history: Robert (Bob) M. Linn. For almost 60 years, Bob never missed a summer visit to the island. A man of few words, he preferred to stay out of the spotlight. Although his professional career with the National Park Service (NPS) spanned almost 30 years, his initiative on behalf of Isle Royale was quite personal, and he often found himself at odds with the power brokers in his own agency.

The wolf research at Isle Royale had already been up and running for 12 years when I began work there as a graduate student of Durward Allen, professor of wildlife ecology at Purdue University. Durward frequently mentioned Bob and repeated the observation that the research would have ended without Bob’s help. As the first naturalist for Isle Royale National

Park, Bob had to deal in 1952 with the aftermath of a private effort to introduce wolves to Isle Royale. Four semi-tame wolves from the Detroit Zoo quickly became uncooperative pests, and Bob led the efforts to remove them. He knew by then that wild wolves had crossed the frozen surface of Lake Superior and made it to the island on their own.

In the mid-1950s there was growing concern that the newly arrived wolves would increase, threatening the moose population and posing a danger to humans (including some longtime residents of Isle Royale, whose efforts had helped establish the national park). A top-level request from Washington was directed to Minnesota: Would the state accept wolves that might be live-captured at Isle Royale? The answer? “No, thanks.” Bob, however, managed to convince his own agency that wolves were not a threat to humans on Isle Royale and they should simply be left alone.

Serious research would soon begin, aided by Bob’s timely assistance, when Durward Allen launched an ambitious 10-year study of wolves and moose on the island. Allen sent his first graduate student, Dave Mech, to Isle Royale in 1958, without a boat or an adequate base for fieldwork. Bob donated his own boat to the project and arranged for Dave to use the deteriorating fishing cabin recently vacated when commercial fisherman Jack Bangsund died. The Bangsund cabin has served a valuable research role ever since, long exceeding its tenure as a commercial fishery.

When the study hit its 10th year, Bob was chief scientist for the National Park Service. Allen related to me that Bob was told by the director of the NPS to wrap up the Isle Royale work; quietly, Bob ignored this directive and instead helped fund

In the mid-1950s Bob Linn convinced the National Park Service that wolves were not a threat to humans on Isle Royale and they should simply be left alone.



the continuation of the study from his own science budget. Just a few years later, Bob had to fend off another scientist from the NPS, who was intent on stealing the study for himself.

In 1981, newly inaugurated President Ronald Reagan approved the appointment of G. Ray Arnett as an assistant secretary of the interior, a position making him responsible for America's national parks. A geologist from the petroleum industry, Arnett had gained distinction in 1956 for the discovery of oil in Alaska—on the Kenai National Moose Range, a national wildlife refuge, no less! It was not long before Arnett, no fan of wolves, crossed swords with the wolf-moose research at Isle Royale. He refused to approve a contract for the \$30,000 needed to carry out the winter counts of wolves and moose. I was already on the island for the 1983 winter study, and the superintendent of Isle Royale agreed to let me stay. But all NPS personnel would have to leave. In addition, money was cut off. We would no longer have NPS funds for the work.

Bob stepped in and started making phone calls. Soon the National Audubon Society and Defenders of Wildlife began pressuring Arnett through strategies of their own, and Arnett backed down. A period of bureaucratic track-covering followed, and Isle Royale National Park Superintendent Don Brown flew to Washington for a personal audience with Arnett. Brown later reported that Arnett's office walls were lined with trophy mounts of animal heads, and a wolf skin lay on the floor. After the meeting, Superintendent Brown emerged with the \$30,000 needed for the winter counts. This was a significant victory. Other national park superintendents had not fared so well with their own requests, including one Yellowstone National Park superintendent, who was told prior to his confirmation that he was

not to raise the matter of wolf restoration to Yellowstone.

For Bob, Isle Royale was quite simply the finest place on Earth. His final 25 years of professional activity found him establishing and supporting the George Wright Society, a nonprofit organization dedicated to encouraging scientific research, resource management and education in parks and other protected areas around the world. But Bob always tried to be as close as possible to Isle Royale, which explains why the office of the George Wright Society is located in Hancock, Michigan, a few city blocks from the mainland

headquarters of Isle Royale National Park. The island was never far from Bob's thoughts. I never asked Bob, who passed away in 2003, what he thought was so special about Isle Royale. I didn't need to ask. Once you know the place, it's obvious. ■

Rolf Peterson is a research professor at Michigan Technological University in Houghton. He has been involved in the study of wolves and moose in Isle Royale National Park for the past 38 years and currently serves as secretary of the board of directors of the International Wolf Center.



John Vucetich



Ann Mayo-Kieley



Robert Linn

In the history of the Isle Royale study of wolves and moose, one name arises repeatedly: Robert (Bob) M. Linn. For almost 60 years, Bob never missed a summer visit to the island. For Linn, Isle Royale was quite simply the finest place on Earth.



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Tracking the Pack

Viruses: A Risk in Pup Management

by Lori Schmidt, Wolf Curator,
International Wolf Center

As we prepare for the arrival of pups in 2008, the top priority for the wolf care staff is assessment of disease risk to the pups. Two of the biggest disease risks are canine parvovirus and canine coronavirus. Parvovirus is a highly contagious virus that can be spread by physical contact with infected dogs, shed cells in dog feces (possibly after a vaccination), and can become airborne, surviving in clothes, pores of walls and on the soles of shoes for several months. Isle Royale wolf researchers identified

parvovirus on the island in the early 1980s as a cause of pup mortality. The virus was likely brought to the island by shed cells in dog scats. Coronavirus infections are contagious as well but, unlike parvovirus, are not generally associated with high death rates. The primary symptom associated with both diseases is diarrhea, which can rapidly cause pups to become dehydrated.

Since the Center's first wolf exhibit in 1989, the pup management plan has specified that pups be acquired between 10 and 14 days of age to socialize them to wolf care staff

and the sights and sounds of the resident wolf exhibit. This initial period with their mother is long enough for pups to gain nutrients and antibodies from the mother's milk, called colostrum, to protect against diseases. But allowing a pup to nurse may not guarantee that a pup is protected. Protection from the mother is based on the level of antibodies she has gained from a vaccine, and response to the vaccine varies among individuals. Even if the mother does have good antibodies, she may leak colostrum early in the whelping period, leaving little available to the pups. In a large litter some pups may be more vulnerable. It is possible to have one pup with good protection against viruses, while another has little or no protection. The Center's policy is to vaccinate at approximately 4 to 6 weeks of age, but even with the best vaccination protocol, all pups can be at risk.

Since protection against viruses is such an unknown factor, the Center's pup protocol includes rigid standards when the pups are handled at a young age, such as bleaching shoes,



The International Wolf Center is pleased to announce that Marc B. Anderson has been selected as the Center's executive director. Anderson was chosen from among a group of strong and talented candidates. Dr. L. David Mech, chair of the search committee, remarked, "The decision to select Marc Anderson as the executive director who could lead the International Wolf Center to the next level followed a rigorous search process. Marc has more than twenty-five years of a proven track record of success as a nonprofit leader, entrepreneur and conservationist. We're thrilled to have him on board."

avoiding unvaccinated dogs and minimizing contact with people who may have been exposed to infected or recently vaccinated dogs. These policies are in the best interest of the pups and will help ensure that they are healthy and robust as they grow into our newest Exhibit Pack members. ■



The Center's pup management plan includes rigid standards to minimize the risk of exposing the pups to diseases while they are being socialized to the wolf care staff and the sights and sounds of the resident wolf exhibit.

Johanna Goering

Personal Encounter

with great surprise I realized what was looking at me. My eyes were staring back at me from 100 feet away. And then, I heard a muffled half-bark followed by a deep, smooth, heavy sound rising into the air. None of the other...

The Rest of the Story

by Carolyn C. Peterson

My husband, Rolf Peterson, likes to refer to Isle Royale as an outdoor laboratory, but I have always felt excluded by that image because I am not a scientist. For me, the island is more like the best circus imaginable, one in which nature runs the show. We in the audience are not all watching the same thing, and since 1969, the first time I visited the island, I have come to love the place for a variety of reasons. Also, after 37 summers, I believe the best way to honor the performers, especially the wolves, is to get along with the other members of the audience.

Rolf and I met and fell in love on Isle Royale while backpacking with friends. I noticed right away how observant he was of small things and that his nature was unusually gentle and humble. At the time, neither of us had an inkling of what the future would hold, but the next year un-

folded miraculously as we followed our hearts. Rolf discovered, applied and was accepted to Durward Allen's research project, and I gave up my Peace Corps assignment to be with him.

At first I was not sure I could handle the cross-country backpacking, so while Rolf and his assistant explored the island, I stayed behind at the cabin once occupied by commercial fisherman Jack Bangsund. In that brief period, I was lonely, bored and even frightened at times. Living with no control over which animals shared my space (bats, mice, garter snakes and spiders) was new and unpleasant. Fortunately, we had neighbors a quarter mile away, and I resurrected a trail made 50 years earlier in order to visit Pete and Laura Edisen. This dear old couple had none of the trappings of "successful" folks—no college degrees, no permanent home, no car

and no children. But they were happy, and they taught me to see the light that came through the cracks in the walls of the old cabin. Laura taught me to bake bread and drink coffee, and Pete's love of just about everything was contagious. I have never forgotten the kindness I received at the Edisens' table.

For a few summers Rolf and I hiked, off-trail, looking for moose bones and wolf dens, and the fieldwork took all my time and energy. It was physically difficult, but I was young and proud of my strength. Surrounded by the beauty and vitality of wilderness, I began to feel that I, too, was part of the wonder of creation. We generally had the help of a second team of field assistants,



Rolf and Candy Peterson

The Petersons lived in the cabin once occupied by commercial fisherman Jack Bangsund. In 1996 while they were repairing the cabin floor, a wild otter that lived under the cabin wandered in the open door, apparently curious about the activities taking place above his home.



Rolf and Candy Peterson

Above and right: Candy Peterson's life on Isle Royale changed dramatically when she and her husband, Rolf, had children, but after the first difficult summer with a newborn and a three-year-old, she enjoyed introducing their boys to nature.



and their enthusiasm and adventurous spirits lightened my job as chief cook. The lack of plumbing and electricity was never a burden—it was a great excuse when my recipes didn't turn out well!

My life changed dramatically when we had children, but after the first difficult summer with a newborn and a three-year-old, I found that introducing our boys to nature was as much fun as fieldwork. Even washing diapers in a pot over a fire was not a hardship because we did laundry only on sunny days. Jeremy enjoyed turning the wringer, and Trevor liked to play hide-and-seek behind the diapers hanging on the clothesline. Children have a natural affinity for nature, and with Rachel Carson's *The Sense of Wonder* as my guide, I simply allowed our sons to play—once they had done their morning chores: violin practice and “schoolwork.” Free to explore, enjoy the water and wildlife, build contraptions out of junk from

the Park Service scrap heap and make up games, the boys thrived. They always realized that we were on an island because it was Daddy's workplace, not our vacation home, and our common experience and outlook knit us together. Also, the summer assistants Rolf hired were wonderful big brothers and sisters to our boys, enlarging our family circle, encouraging trust.

The Bangsund family had covered the log walls of the cabin with tar paper to keep out the wind, providing marvelous housing for those bats, mice, garter snakes and spiders. One day in 1971, as I walked out the front door, a snake that had been sunning itself on the doorjamb fell on my head and encircled my neck. Terrified, I grabbed the thing and flung it into Lake Superior, 15 feet from the door. It was then I learned that garter snakes are terrific swimmers. Of course, my fear was irrational, and when I became

a mother, I determined not to pass this handicap to our children. When snakes appeared, as they often did, traveling along the top log of the cabin wall or curling up next to the pilot light behind the propane refrigerator or under the baby's crib, I was able to pick them up and gently take them outside. I have overcome my fear, but I am still working on fondness.

There were times I would gladly have offered my ringside seat at Bangsund cabin to any taker. One stormy night in August 1985, when Rolf was conferring with colleagues in Canada and when Lake Superior was so high that the northwest wind blew the wave splashing against our front window, I did my best to hold our estate together through a rip-snorting thunderstorm. Fortunately, the boys were sound sleepers. The dock, somewhat anchored to the gravel shore with two three-foot sections of pipe, was bucking and



Rolf and Candy Peterson

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Candy Peterson assisted her husband, Rolf, with summer fieldwork, hiking off-trail, looking for moose bones and wolf dens, like the one shown here.

coming loose, so I moved the skiff, which was tied to a cleat on the dock, to the shore. I pulled it out of the water as best I could, but even with the bow nosed up to the cabin window, the surging waves pounded and rocked the boat until I piled rocks and logs in the bow, raising the stern above all but the highest thudding

coffee cans and dishpans that were set out to catch drips, making what Pete Edisen called “Chinese music.” That night I wrote in my diary, “There are times I hate this place—always when I am afraid.”

Of course, storms always end. That, in a nutshell, is what Isle Royale has taught me. The long-term char-

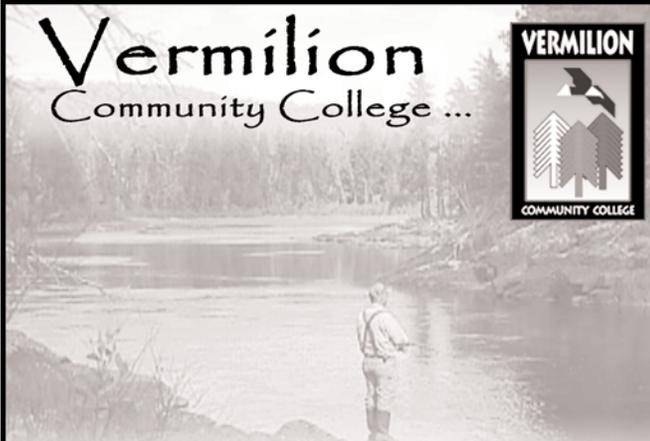
acter of the wolf-moose research project has shown me that nature is always moving, that death makes way for new life. From the perspective of Isle Royale, where I have felt my highest highs and lowest lows, it is easier to accept my own term limits. Vulnerable, yes, but the process of change, of which we are all a part, is always moving toward healing. And, to use the circus image again, when we are afraid, it's nice to have someone sitting in the next seat. ■

Carolyn (Candy) Clarke Peterson was born in Duluth, Minnesota, and canoe-camped in the Boundary Waters Canoe Area Wilderness (BWCAW) from the age of four. After marrying Rolf Peterson, she supported him in his work on Isle Royale. She has done fieldwork, raised two sons, assisted Earthwatch volunteers and welcomed thousands of visitors to the summer research site, Bangsund Cabin. Her memoir, A View from the Wolf's Eye, will be published in 2008 by the Isle Royale Natural History Association.



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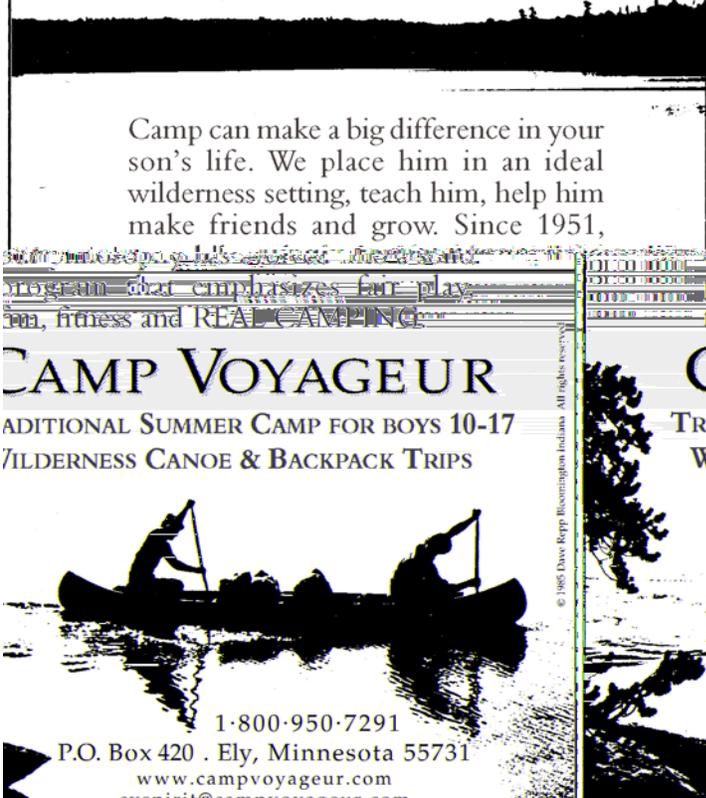
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Wolves Finally Taste the “Tree of Knowledge”: Changing the Rules of Wolf-Human Interaction on Isle Royale

by Rolf Peterson

For over 50 years the wolves on Isle Royale exhibited a remarkable fear of people, even though there is not a safer place on the planet for a wolf. I've thought this attitude could be attributed to intergenerational learning; young wolves were taught by their elders to avoid people, and thereafter they are not inclined to test the limits of right and wrong.

All this changed about four years ago when, for unknown reasons, wolves suddenly began to confront visitors and would stand and watch instead of fleeing in terror. This did not seem to be preceded by wolves acquiring food from people. And it quickly became clear that more than one or two wolves were involved; suddenly most of the wolves seemed

to have changed their attitude about us. Wolves are expert observational learners, and they were applying themselves to the task of learning about two-legged life.

In September 2007, wolves began to find fallen apples beneath an old tree in Daisy Farm Campground, the largest backcountry camp on the island and a hub for hikers and boaters alike. At least one starving wolf was involved, but most of them seemed to be in pretty good condition. And they were completely unafraid of people.

This was an unprecedented and potentially very dangerous situation. Photographs taken by excited visitors might show a wolf completely surrounded by people. I attended a couple of hastily called meetings with the park staff, and I learned that the apple trees (dating from 19th-century miners or 20th-century camps of the Civilian Conservation Corps) were themselves historic objects, so removing the attraction would not work.

Moving quickly, the Park Service decided to just give the campground to the wolves by closing down human access to the site for the rest of the year. Rangers diligently patrolled the periphery, and I set up an automatic video camera to monitor wolf use of the best apple tree. Over a six-week period, wolves visited this tree

almost daily, and by the time the last apples fell in autumn, I estimated that wolves had eaten about 120 pounds of green apples. Their scats looked like bear droppings.

We do not understand exactly what wolves are learning, in addition to the obvious fact that people aren't dangerous. The only behavior that park staff can really manage is human behavior, and only time will tell if our own knowledge and good intentions are enough to allow coexistence with a capable carnivore that has now gained valuable insight about us. ■

Rolf Peterson is a research professor at Michigan Technological University in Houghton. He has been involved in the study of wolves and moose in Isle Royale National Park for the past 38 years and currently serves as secretary of the board of directors of the International Wolf Center.



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Isle Royale: A Living Classroom

by Jenn Carlson

One of my favorite places to be is the shore of Lake Superior. From watching the cold waves, to agate hunting, to naming the trees, I can spend countless happy hours wandering the beach, contemplating the wonders of nature. This curiosity to learn about the natural world was awakened at a young age by my family's camping trips, and my thirst for knowledge has continued to this day. I have also found a way to share my enthusiasm. As a science teacher, I have the opportunity every day to empower my students to understand the world around them.

Unfortunately, not all young people have been introduced to nature in as positive and consistent a manner as I was. Every time I take my classes on a hike through the state park near our high school, I am astounded at the number of students who are not familiar with the ecosystem that surrounds them. The curiosity to observe the common plants and animals and to examine how they interact with each other and the physical environment does not come naturally to most of my students. I have found, however, that once the students are introduced to nature (in much the same way I was as a small child), the curiosity appears and, with gentle guidance, flourishes.

As a teacher, I am continually seeking opportunities that will allow me to encourage that curiosity about the natural world so I can bring the outdoors, nature and science to life in my classroom.

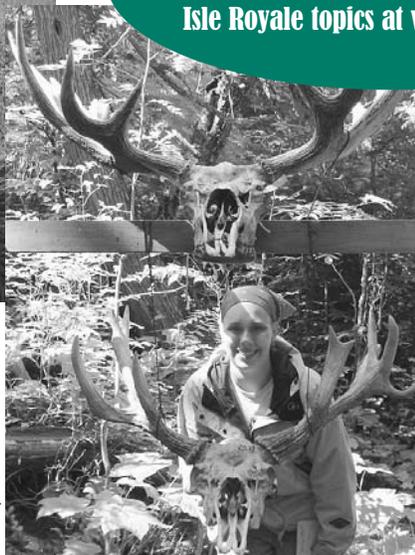
During each of the past two summers, I have had the good fortune to spend two weeks in the backcountry of Isle Royale National Park as a graduate student through the Isle Royale Institute and Michigan Technological University's graduate courses for teachers. As Isle Royale is a true wilderness situated a long distance from land in Lake Superior, I was thrilled to visit the island. Under the guidance of an experienced naturalist, I explored the island's rich ecology while backpacking and canoeing. I also had the opportunity to interact with a number of the scientists who are involved in ecological research on the island. My time on Isle Royale inspired me personally and, even more importantly, as a teacher. To me, Isle Royale's allure lies in its unique combination of wilderness and science. And as a teacher, I left the island with the hunch that my students might be just as intrigued by the ecology and research of Isle Royale as I am. And for the most part, my hunch has been correct.

In my biology class, I use Isle Royale as the springboard to spark my students' curiosity about their local ecosystems. My ecology unit now introduces concepts through Isle Royale (what freshman can resist the drama of wolves and moose?) and leads the students through inquiry activities where they discover how the biotic and abiotic factors around them interact. The unit challenges my students to engage in a number of high-level learning activities. The students *examine* a climate diagram and my photos of the flora and fauna of Isle Royale (they really like the one of me holding a moose leg bone!). They *observe* succession on the island after the 1936 fire, *study* parasitic relationships such as the winter tick and moose, and *investigate* predator-prey cycles by constructing and inter-

Find out more about courses for teachers at Isle Royale and lesson plans incorporating Isle Royale topics at www.iri.mtu.edu.



Teacher Jenn Carlson uses her knowledge of Isle Royale to introduce biological concepts to her students.



Jenn Carlson spent two weeks during each of the past two summers exploring Isle Royale National Park under the guidance of an experienced naturalist through the Isle Royale Institute and Michigan Technological University's graduate courses for teachers.

preparing their own graphs of the wolf and moose populations.

And my springboard seems to be successful! After introducing ecological concepts in the context of Isle Royale, my students often ask on their own, "But what would happen here?" Local follow-up activities include graphing the climate for our city, identifying flora and fauna on a hike, creating food webs on the Michigan DNR's ecosystems posters, and drawing storyboards of succession in southeast Michigan.

In my environmental science class, my first unit has wolves as its theme and integrates ecology, zoology, conservation, genetics and evolution. Highlights of this unit include an introduction to wolves using the online Web-based inquiry science environment (WISE) called *Wolves in My Backyard*, authored by the International Wolf Center. Also included is an investigation of genetic diversity and population numbers of wolves on Isle Royale from fecal DNA (thanks to Leah and John Vucetich, researchers on Isle Royale for providing data and ideas). Each student is required to write an argumentative essay for or against further protection of wolves under the Endangered Species Act.

Isle Royale is the perfect case study to teach students both ecology concepts and the nature of science in a real-world context. The rich traditions of scientists, National Park rangers and volunteers, and visitors of Isle Royale continue to contribute to the preservation and further study of its natural ecosystems and inspire all who visit the island. I may not be able to bring my students to Isle Royale, but I can bring Isle Royale to them and hopefully keep their curiosity about the natural world sparked! ■

Jenn Carlson is a biology and environmental science teacher in Michigan at Lake Orion High School. She earned her B.S. from the University of Michigan's School of Natural Resources and is currently enrolled in the Masters of Science in Applied Science Education Program at Michigan Technological University.

Learning More About Isle Royale: How to Get Involved

by Ann Mayo-Kiely

Visit Isle Royale

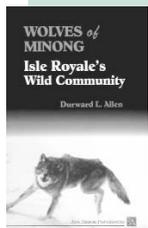
Visit Isle Royale as part of an educational course through the Isle Royale Institute and its partners, or on your own. The institute partners with the wolf-moose researchers and the National Park Service to provide educational programs tied to this and other research at Isle Royale. For more information on courses, contact the institute at www.iri.mtu.edu.

Visiting Isle Royale on your own requires advanced planning given the very limited resources available once you reach the park and the reservations or permits required for ferries, the lodge, camping and boating. For more information about planning a trip, contact the National Park Service at www.nps.gov/isro or 906-485-0984.

Recommended Readings

The Wolves of Isle Royale: A Broken Balance, by Rolf O. Peterson. Revised edition, 2007.

The Wolves of Isle Royale, by L. David Mech, 1966; reprinted 2002.



Wolves of Minong: Isle Royale's Wild Community, by Durward L. Allen, 1979.

Island Life: An Isle Royale Nature Guide, by Ted Gostomski and Janet Marr, 2007.

A View from the Wolf's Eye, by Carolyn C. Peterson, 2008.

"Wolf-Prey Relations," by L. David Mech and Rolf O. Peterson in *Wolves: Behavior, Ecology, and Conservation*, edited by L. David Mech and Luigi Boitani, 2003.

"Wolves Versus Moose on Isle Royale," by Durward L. Allen and L. David Mech, *National Geographic*, February 1963.

Special Isle Royale issue of the Michigan Science Teachers Association Journal with articles and lesson plans, Fall 2007 (vol. 52, no. 3).

Volunteer for Wolf Conservation

Several regional and national organizations have made significant contributions to wolf recovery and conservation in the United States. Most of these organizations offer volunteer opportunities and accept charitable contributions. These organizations include, but are not limited to, the following:

The International Wolf Center: www.wolf.org

Earthwatch: www.earthwatch.org

National Park Service: www.nps.gov/isro

Ann Mayo-Kiely is the director of the Isle Royale Institute, based at Michigan Technological University in Houghton, Michigan (www.iri.mtu.edu). She has been involved with Isle Royale since 1994.

Follow the Wolf-Moose Research

Scientists conducting Isle Royale's winter study post field notes and updates on pack activities from the island on their Web site: www.isleroyalewolf.org. Here you will also find resources for teachers and students and past and current annual reports with population updates, personal encounters, phenomenal photos and video clips, and new insights from the study. Throughout 2008 and 2009 scientists involved in the Isle Royale study will be speaking in public venues around the country. Speaking schedules will be updated frequently at the 50th anniversary Web site: www.wolfmoose.org.

"A North Woods Park Primeval: Isle Royale," by John L. Eliot, *National Geographic*, April 1985.

"Wolves and Moose of Isle Royale," DVD video lecture by John Vucetich. Go to www.isleroyale-wolf.org for order information.



Additional Isle Royale books as well as maps, posters, and other media are available for purchase through the Isle Royale Natural History Association (www.irnha.org, or 800-678-6925).

The Isle Royale Natural History Association: www.irnha.org

The Timber Wolf Alliance: www.northland.edu/soei/timber_wolf.asp ■

A Look Beyond

Maybe We Don't Know Enough Yet

by Rolf Peterson

We should take hope from the fact that the wolf, thoroughly reviled even as recently as a generation back, has not only hung on across the planet but even prospered. Science had a role, to be sure, in focusing our attention and providing vital information. But what really mattered was that human values and attitudes changed, and entire societies decided that our archenemy was, after all, worthy of respect and honor. Probably we could apply this lesson more broadly, and the entire planet would flourish.

—Rolf O. Peterson, *The Wolves of Isle Royale: A Broken Balance*

“**M**aybe we don't know enough yet . . .”

These words, by an Anishinaabe elder, are a fine plain-language statement about the nature of science as a critical human activity that has no end. Scientific conclusions are temporary, often fleeting moments on a progressive timeline that lead us closer and closer to the truth about nature, in our broadest understanding of the word. Science, then, is a journey with no final destination, no definitive endpoint that can be anticipated. There are, of course, many dead ends, where course correction is necessary.

One of the times of year that I savor, rather oddly, is the anticipation of the annual trek to Isle Royale, when I am forced to consider all that has happened in the past in an effort to predict what we will find. As everyone knows, the future is inherently unpredictable. An important reason for this is that nature is complicated, even in a “simple” system like Isle Royale. According to

one sage, nature is not only more complicated than we know, it is more complicated than we can ever know. After 50 years of learning about wolves and moose, we no longer take our predictions very seriously, except to understand that we are likely to be completely surprised by future events. That is a very important take-home message today, amid the media frenzy about the implications of climate change.

We now understand why moose are so vulnerable to a climate with warmer summers (they feed less and cannot put on enough fat to survive the lean times of winter, and a major parasite, the winter tick, thrives in warmer environments). Yet it is the dependent wolves on Isle Royale that are vulnerable because they are relatively scarce. A sustained decline in moose will be followed in about a

decade by a wolf decline, and the wolves are always much closer to zero. But it is our own security and well-being that are at risk in an uncertain world of changing climate.

The national park environment of Isle Royale is largely off-limits to human meddling, even if well-intentioned. What we can do, and indeed what the National Park Service has a legal obligation to do, is provide an adequate science-based foundation for improved park management and greater human understanding in the future. The day has already arrived when we have to scale up our information and actions to the level of the entire planet Earth. ■

Rolf Peterson is a research professor at Michigan Technological University in Houghton. He has been involved in the study of wolves and moose in Isle Royale National Park for the past 38 years and currently serves as secretary of the board of directors of the International Wolf Center.



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