

Wolves Approach Extinction on Isle Royale: A Biological and Policy Conundrum

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Abstract—The wolf population at Isle Royale National Park, Michigan, is currently declining rapidly and may be close to extinction. Declining wolf numbers since 1983 were attributed to high mortality (greater than 40% per annum) and low reproduction, but studies based on observation alone did not reveal specific causes of mortality. Aside from a documented food shortage, disease and loss of genetic variability might explain the population demise. In a departure from previous study techniques, in 1988 wolves were live-trapped, blood-sampled, and released wearing radiocollars. Technical and philosophical issues associated with this study are reviewed, as well as management options in response to likely extinction of wolves on Isle Royale.



One ecosystem component that is notably lacking in many national parks and reserves throughout the northern hemisphere is predation by large carnivores. Forty years ago, when wolves crossed the ice of Lake Superior and established themselves in Isle Royale National Park, this island became the only national park in the U.S. with a wolf population. It may soon become the first park to lose a wolf population, not at the direct hand of man, but to the insidious biological troubles that face any small, isolated population. In order to appreciate the general significance of what may be happening on Isle Royale, we need to consider the present status of the black-footed ferret, giant panda, Florida panther, Yellowstone grizzly, or any of the growing number of other species that exist in small, isolated populations in fragmented habitats. Some studies have suggested that there is not a single park or reserve in the world large enough to sustain top carnivores in perpetuity.

The predator-prey relationship which developed between the wolves and moose of Isle Royale became the focus of the longest running study of mammalian predators ever conducted, now in its 31st year. The isolation and protection of this simplified animal community has provided an incomparable outdoor laboratory, a real-world microcosm available nowhere else in the world. For the public, the wolves of Isle Royale became symbolic of a natural system at its finest, uninfluenced by human meddling.

In 1988, after a steady 5-year decline, the wolf population inexplicably sank to its lowest level, just 12 animals, and now the possibility of wolf extinction looms large on the horizon. In an attempt to understand the decline, the National Park Service agreed to break the long-standing tradition of observation only. Approval was granted in spring 1988 to examine and blood-sample the animals themselves for the first time, and to radiocollar them in hopes of discovering

causes of mortality. In this article we briefly review the biological issues involved, and then address some of the interesting questions raised for park managers.

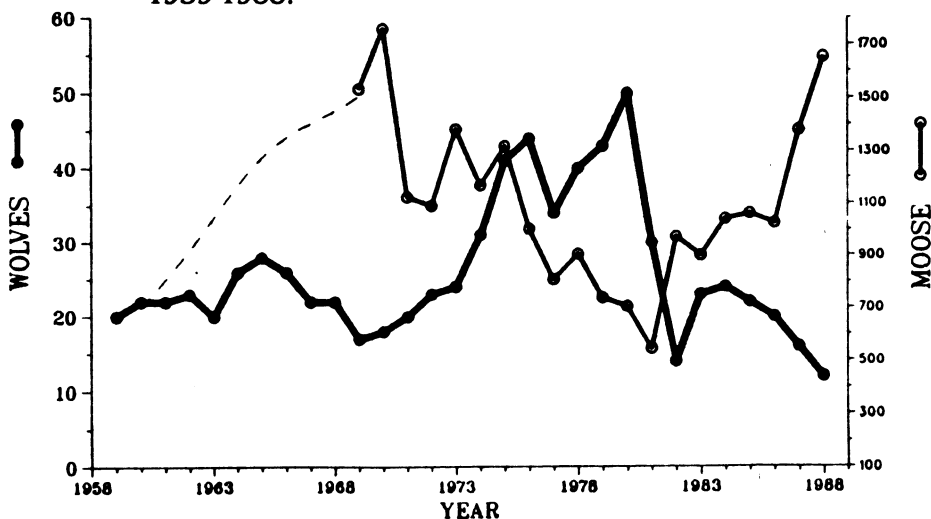
Annual population records for the last 30 years (Figure 1) reveal a very dynamic system, hardly the stable equilibrium suggested by the "balance of nature" notion. Wolf numbers have tended to follow moose numbers after a decade or so, possibly explaining the current trough in wolf population trend. The decline of the last 5 years has arisen from constant high mortality, about 40% per year, coupled with a steady drop in reproduction. In 1982 there were 4 reproducing females, while in 1988 we found none.

Three hypotheses may explain the decline:

- 1) decline in food supply
- 2) mortality from new diseases
- 3) loss of genetic variability

In the strictest sense of scientific inquiry, none of these hypotheses can be proven true, but the disease and genetics hypotheses could potentially be ruled out if animals were examined and sampled.

Figure 1. Wolf and moose fluctuations, Isle Royale National Park, 1959-1988.



In the past, food level alone has explained 85% of the variations in wolf numbers. Most wolf prey are moose older than 10 years of age, which now are rare. The current moose population is dominated by moose 7 years old or younger, born after the wolf crash of the early 1980s. Although food levels in winter are low, there has been no measurable change since 1982.

Disease concerns center on canine parvovirus, a virulent dog disease which appeared initially in 1977 and rapidly spread around the world. A new strain appeared in 1981 and in that year the disease reached the Houghton, Michigan, area, headquarters for Isle Royale

National Park. Its arrival on the island can be attributed to human action, either from domestic dogs or in soil carried on hikers feet. Although dogs are prohibited, they are occasionally brought to Isle Royale by visitors. In 1981 the Isle Royale wolf population was in the middle of a 2-year long crash when over 50 wolves died, but causes of death remained unknown. Canine parvovirus remained an unconfirmed possibility.

Loss of genetic variability is also a possible explanation for the wolf decline, as it has led to reduced reproductive fitness in some captive and wild populations of other species, from reduced survival of young as well as increased susceptibility to disease.

In order to evaluate these possible causes of the wolf decline in 1988 NPS agreed to the immediate handling of up to half the population (6 wolves), and these wolves would be blood-sampled and released wearing radiocollars. The capture effort was terminated after 4 wolves were handled, as few additional animals were located. Studies of disease incidence and genetic variability by collaborators are now underway, using wolf blood samples from both Isle Royale and Voyageurs national parks.

Preliminary results from the disease screening confirm that Isle Royale wolves have been exposed to both canine parvovirus and Lyme disease, although the role of these diseases in the wolf decline is still uncertain. The best news was that the wolves themselves were young to middle-aged adults, and seemed to be in good condition. While the main reproducing pack apparently has disappeared, by year's end the radiocollared wolves were travelling frequently through the pack's former territory. These animals may now initiate breeding and reverse the decline. Simulation modeling based on the history of the population suggests that there may be a 50% chance of extinction just from normal oscillations of wolf numbers. The Isle Royale wolf population, perhaps the most famous and most protected wolf population in existence, is clearly in jeopardy.

What do we do now?

Assuming for the moment that extirpation of the Isle Royale wolf population is imminent, there are several options that management might consider taking immediately. These include (and are listed in order of decreasing conservatism):

- **Attempt Inoculation.** At this point we know the animals have been exposed to canine parvovirus. We don't know how seriously they have been affected, if at all. Hence is this a preventative response to a real threat or a 'shot in the dark?'
- **Supplemental Feeding.** Unfortunately, lack of food may not be the primary problem. The 'artificiality' of this approach gives us some pause as well.
- **Augment Population With Additional Breeding Animals.** Certainly a possibility, although arguably a population under stress would not take kindly to invasion of its territory by newcomers.
- **Capture for Captive Breeding.** This would be more seriously

considered if these were the last animals of the species, which they are clearly not. Besides, the genetic makeup of this population may be the very root of the current problem.

Several options are available to management after extirpation. Again, listed in order of decreasing conservatism:

- **Allow for Natural Recolonization.** Some might argue this is a "do nothing" approach. Its success depends entirely on the status of wolf populations in Ontario, opposite Isle Royale.
- **Introduce New Wolves to Repopulate the Island....** Hopefully.
- **"Control" Moose Population via Artificial Means.** There are precedents in the NPS, but we are never comfortable with this approach.

Whatever decision is taken, it is critical that we consider the policy mandates that are supposed to drive all NPS decision-making. These are statutory (e.g., the Organic Act), regulatory (e.g., Code of Federal Regulations), and administrative (e.g., NPS Management Policies book) mandates. For the first 29 years of the wolf-moose monitoring program at Isle Royale, we had maintained a strict "hands-off" style of wolf management, perhaps the most conservative interpretation of agency policy:

"The primary objective...will be the protection of natural resources and values...with a concern for fundamental ecological processes...Managers...will try to maintain all the components and processes of naturally evolving park ecosystems." (NPS Management Policies 5:1 (3/88 draft))

We had never actually touched a live wolf—no collars, no tags, no blood samples, etc. This "minimal intervention" strategy was entirely consistent with both the recommendations of the 1963 Leopold report as well as the "minimum tool" concept of the 1964 Wilderness Act. At Isle Royale, more than 98% of which was brought into the national wilderness system in 1976, our wolf monitoring/research approach was a matter of symbolism as well as tradition. Our one major concession was the regular use (in winter) of low-flying aircraft for aerial observation and tracking of the wolves. We recognized the compromises inherent in this approach, and our uniqueness, but were willing to forego some types of information in the pursuit of non-interference.

The decision a year ago to change this approach—to actively handle the animals in order to get blood samples—came only after a good deal of soul searching and reflection, much of it (deliberately) exposed in the national media.

Faced with the preliminary results from the four sampled animals and the probability of imminent extirpation, any management actions must be driven by our need to know the "naturalness" of the decline. Unfortunately, however, there may be a built-in conflict at Isle Royale between natural process management and endangered species

protection—both stated NPS management objectives.

The Endangered Species Act never considers 'natural' species decline; legislative history of this law consistently assumes that all species decline is at the hand of man. The Act also assigns the designation of 'endangered' status on a state-by-state basis, using artificial political boundaries rather than ecological ones. The Isle Royale wolf population is much more closely tied to Minnesota and Ontario, where wolves are not legally endangered (they are 'threatened' in Minnesota) than to the mainland of Michigan, fifty or more miles away, but in the same state. The U.S. Fish and Wildlife Service's Eastern Timber Wolf Recovery Plan—a new draft of which was released just last fall (1988)—never addresses even the possibility of a wolf decline on Isle Royale (natural or otherwise), classifying the park as 'critical habitat' and directing the Park Service merely to continue current management direction regarding wolves and moose.

Perhaps natural processes are not sufficient anymore as the principal determinant of NPS wildlife management philosophy. Large carnivores, as previously discussed, appear to be unable to survive on their own in habitat that is being increasingly fragmented. Isle Royale, which is often considered pristine, has been impacted massively by human influences locally and in the region. Moose might not have come to the Island had it not been for large scale logging, settlement, and fires which opened the boreal forest (particularly on the mainland) and created habitat conducive to moose prosperity.

Are moose therefore 'native' to Isle Royale? If we are to abide by agency policy, that could be an important point:

"The NPS will seek to perpetuate the native animal life...as part of the natural ecosystems of parks..." (NPS Management Policies 5:5 (3/88 draft))

"The native animal life is defined as all animal species that as a result of natural processes occur or occurred on lands now designated as a park. Any species that moved onto park lands directly or indirectly as the result of human activities are not considered native." (NPS Management Policies 5:5 (3/88 draft))

Wolves clearly are at Isle Royale due to the presence and high densities of moose. Are wolves native? The first surveys of the park by European man, in 1847, showed caribou, lynx, and coyote—all of which are gone today—and of course no moose or wolves. Hence there is no comparable presettlement fauna and Leopold's concept of a 'vignette of primitive America' may be meaningless.

Perhaps the purists amongst us would recommend the elimination of moose, and an attempt to restore the vegetation and caribou that were here before man 'intervened.' An interesting sidelight on this discussion is a thought out of the Leopold report (1963), one which we question a bit today in its emphasis: *"Maintenance of the moose population is surely one goal of management on Isle Royale."*

Moose numbers will undoubtedly increase regardless of

'naturalness,' presenting management with another imminent dilemma. According to policy,

'Natural processes will be relied on to control populations of native species to the greatest extent possible.' (NPS Management Policies 5:6 (3/88 draft))

Does that mean we should not attempt to control moose numbers? Or is the operative phrase 'to the greatest extent possible?'

What about natural recolonization? The status of wolves on the mainland is the key to informed decision making, but unfortunately not much is known about wolf populations in Ontario, on the north shore of Lake Superior. Wolves are there, but in what numbers? How do they compare to the late 1940s, when the wolves first crossed the ice? Even if the odds are the same—is that probability enough to base a management strategy upon? If we do, there is a real possibility of an Isle Royale with moose but not wolves. Can we, as an agency, accept that? Can we sell it to the public?

It is important here to step back and remember a little island biogeography theory. Islands normally have a limited fauna and flora, due to reduced opportunities for immigration and limited habitat. Irruptive populations are the norm, not the exception. It may not be pretty, and it may not be popular. But it may be natural.

Of course, if our objective is the maintenance and preservation of the distinctive wolf-moose relationship, then waiting for recolonization is arguably in conflict with that goal.

Isle Royale has been considered by many scientists to be the ideal natural system in the National Park System, if not the world. Unfortunately, it just isn't so. The Park is unique, however, in that the lack of human presence makes it hence as close to a 'natural' predator-prey system as exists anywhere in the world. Opportunities to learn from what happens here are unparalleled—even if we have to prop it up occasionally. We may even find that we have to do so repeatedly, perhaps exemplifying the oft-spoken idea of a park as a 'living laboratory.' Certainly this scenario is consistent with the mandates of the park's designation as an International Biosphere Reserve.

What's happening at Isle Royale is going to happen in all other preserves sooner or later. Unfortunately, our policy doesn't tell us what to do; in the absence of precedent and guidance, perhaps we might as well choose which 'natural' policy we like...

The outlook for the Isle Royale wolves is poor. But as long as they have **any** chance to survive on their own, we intend to resist any suggestions to intercede more than we already have. Let the experiment continue!

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