An Answer to "When Are You Going to QUIT?"

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Long-term research—in many cases a practical necessity but invariably a difficult order to fill. Research scientists may be quick to point out that definitive answers to ecological problems often require more than a quick field season or two; this is certainly true for long-lived wildlife species subjected to the vagaries of weather, habitat change, parasites, and predators. As land use intensifies and research funding dries up, we face a regression in ecological inquiry at the very time we need it most.

National Parks in the United States, and equivalent preserves around the world, are rapidly becoming primary sites for ecological research, especially for studies that require natural assemblages of species and habitats. Even among national parks, rarely do we find ecological conditions that we could call "pristine," completely unaffected by man's heavy hand. Wolf predation, for

example, the powerful agent of natural selection for most ungulates in the Northern Hemisphere, has been eliminated in almost all of the coterminous 48 States, and in U. S. national parks outside Alaska wolves hang on only at Isle Royale, Voyageurs, and perhaps a handful in Glacier.

Durward Allen, who has long held the view that a premier value of national parks was their value to science as remnants of the natural order, initiated a "10-year study" of wolves and moose at Isle Royale National Park in 1958, and fortunately didn't quit when the decade was up. The efforts of his students and mine (I succeeded Durward as project director in 1975) have borne much

fruit, but it seems an obvious conclusion that, even after 23 years of work, each additional year produces proportionately more valuable data. The dollars invested in this research by the National Park Service, National Science Foundation, and almost every major conservation organization in the United States have, I believe, been well spent, as Isle Royale stands almost alone in providing major insight into large mammal predator-prey interaction in the Northern Hemisphere. Such an understanding could not have been reached after the usual 3-to-4 year population study. Even after a decade of study, we did not anticipate the general scheme of what would follow.

During the 1960s, the Isle Royale wolf population exhibited remarkable stability, at about two dozen animals (Figure 1). The moose population, after building up within a large burn dating from 1936, was high and probably increased during this period. Wolf predation was highly selective for calf moose and old individuals exhibiting a high incidence of skeletal pathology. Some sort of stable, natural "balance" seemed to have been struck. To many this seemed to indicate that wolves helped maintain stable, productive prey populations. Wolf research helped stir public interest in wolves and contributed to a reduction in wolf control efforts across North America. During the 1960s and early 1970s wolves in North America generally increased, re-colonizing some of their former range, just as humans bent on resource extraction moved into much of the remaining wolf range.

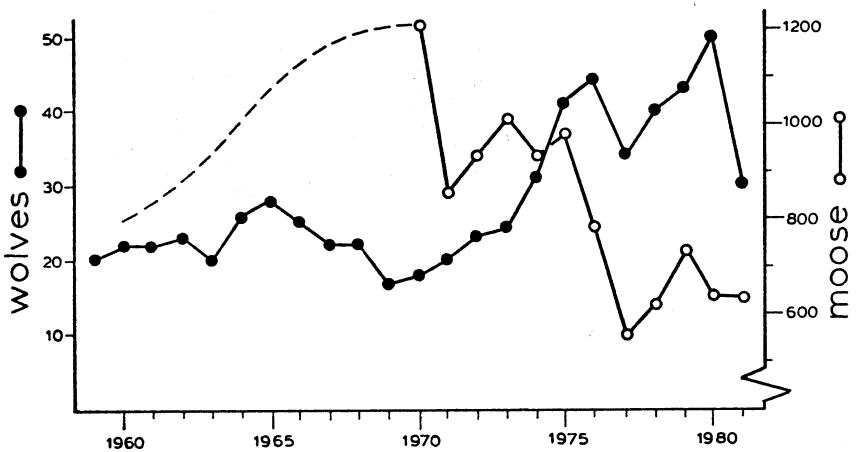
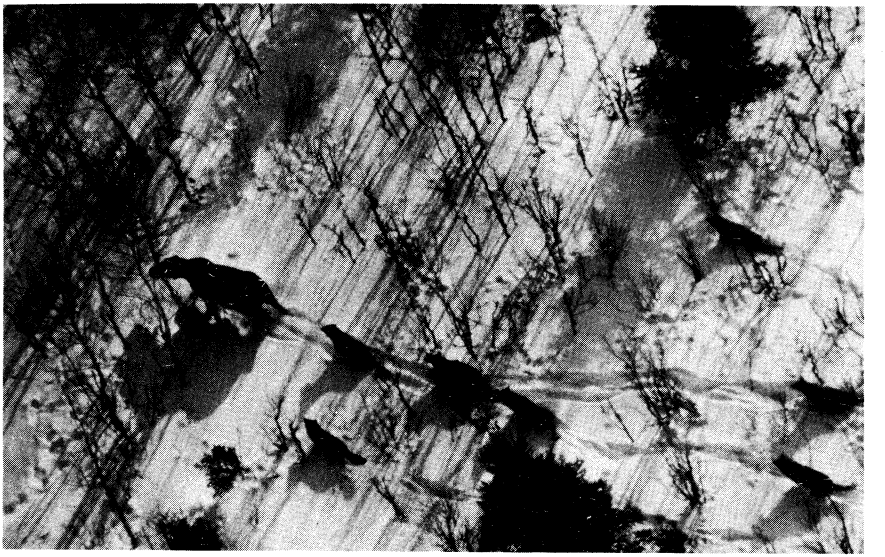


Figure 1. *Population fluctuations of wolves and moose at Isle Royale National Park over the past 23 years.*

The 1970s saw a continuation of Isle Royale wolf research plus several additional studies involving wolves and virtually every principal prey species utilized in North America. A broadened scientific understanding of wolf-prey interaction and population regulation continues to evolve.



The past decade of study at Isle Royale has been a genuine eye-opener, as the apparent stability of wolf and moose populations was replaced by drastic fluctuations. In 1970 the wolf population was relatively low and both moose and beaver (alternate prey for wolves in summer) were at the highest levels observed in two decades. Moose density remained high in spite of a gradual reduction since the 1950s in forage that had been rejuvenated by the 1936 fire. A string of severe winters in the early 1970s emphasized the marginal food base for the moose population, wolf predation increased by an order of magnitude, especially on calves floundering in deep snow, and wolves supplemented their limited diet of moose calves in summer with abundant beaver. For nine of the next ten years, the wolf population increased; both prey species declined, moose by 50% and beaver by about 75%. The wolf population reached a peak level of 50 about 10 years after peak prey populations, indicating an exceptionally long lag period for this predator-prey system. Currently the moose population and probably beaver as well have stabilized, and the wolf population is dropping rapidly as a result of high mortality and low reproduction.

Peak prey populations in the 1960s seem to have been prompted by renewed habitat that followed fire three decades earlier. Forty to 50 years after the fire, are we now heading for a new "stable" equilibrium in moose and wolves? Or will these populations fluc-

tuate in some sort of cyclical fashion, albeit with an exceptionally long period? Current wolf research on Isle Royale and elsewhere suggests that wolf predation may be an important regulatory influence on prey density in some cases. Where human hunting intensity is high, it is at least evident that wolves and human hunters may at times compete for the same prey. It is likewise evident that humans will largely assume the role of "manager" of prey and predator alike, and natural selection will be supplanted by an imperfect knowledge that stands to advance only to the degree that we maintain a few intact pieces of the natural puzzle.