An Unparalleled Opportunity for an Important Ecological Study

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Wolves (*Canis lupus*) and moose (*Alces americanus*) have been studied since 1958 on 540-square-kilometer Isle Royale National Park, in Lake Superior. Wolves arrived there across the ice around 1949, and the population once increased to about 50, averaging about 25 annually (Mech 1966, Jordan et al. 1967, Vucetich and Peterson 2009). However, for various reasons, wolf numbers there have now dwindled to 2 nonbreeders, and the US National Park Service has proposed reintroducing 20–30 wolves over 3 years (National Park Service 2016). This situation offers an unparalleled opportunity to promote science-based management of this unique national park. The park has long been in the public eye for its world-renowned wolf and moose populations. Visitors to this island wilderness are especially interested in the scientific studies it has yielded and in maintaining its ecosystem.

The proposed wolf reintroduction is also an unprecedented chance to conduct an important new chapter in the long-term investigation of wolves, moose, and their interactions. In addition, these studies will allow the continuation of the all-important investigation of the role of wolves as the apex predator in trophic cascades (Ripple et al. 2016), a recent area of considerable ecological interest (but see Peterson et al. 2014, Allen et al. 2017).

Isle Royale features several unique advantages for this new phase of the wolf study: (a) It is a large, isolated, federally protected ecosystem with little human interference. (b) It hosts a single, large prey species with no other large carnivore. (c) Six decades of data on the wolves and moose and five decades of data on the plant community have been published (Mech et al. 1966, Jordan et al. 1967, Vucetich and Peterson 2009). (d) Long-term, *in situ* research biologists intimately familiar with the system are still studying it. In addition, the proposed wolf reintroduction offers an opportunity to select the number, sex, age, main prey, and genetics of the reintroduced wolves, as well as the reintroduction schedule. The weights, ages, measurements, antibodies to various pathogens, possible parasites, and genomes of each wolf to be reintroduced would all be known. All or some of the reintroduced wolves could be radio-collared with standard radio collars or global positioning system (GPS) radio collars. GPS collars offer an increasing array of new research techniques and opportunities that could be employed in the new phase of the study.

Examples of many possible reintroduction scenarios include the following: (a) a single pair of young wolves, closely mimicking the probable original colonization of the island; (b) as many as 30 unrelated wolves in the first year; or (c) enough wolves to establish a functioning population of 10–15 in the first 2 years and then one to several more wolves a year later. Young maturing wolves that would soon disperse would tend to live the longest after reintroduction, but mature, experienced wolves might succeed better in their new environment. Genetic sources could be all from the same well-established population or from extreme ends of a candidate population. For source-animal location, wolves from either Minnesota or Ontario could be used, and those could be from areas where the main prey is moose or where it is white-tailed deer (*Odocoileus virginianus*) or caribou (*Rangifer tarandus*). If the source is from the latter, much could be learned about how quickly wolves with a history of preying on white-tailed deer or caribou learn to hunt moose.

There are any number of variations on these examples, but the best scenario probably would be one that helps shed more light on multiple subjects, such as genetics, wolf–moose relations, and the social organization of recolonizing wolves, while most effectively and efficiently addressing ecosystem concerns such as reducing the unusually high moose population and influencing that species' health status.

Much has been learned from previous and ongoing wolf reintroduction efforts—for example, in Yellowstone and central Idaho (Bangs and Fritts 1996). Because of the many possible research questions and reintroduction scenarios, as well as the uniqueness of this opportunity, considerable informed thought and discussion need to be brought into any final decision about the reintroduction scenario. To support this process, we propose that a panel be appointed of experienced wolf biologists, wolf geneticists, and moose biologists, including the scientists doing the current study, to discuss all of the possible objectives and reintroduction scenarios and to present a prioritized list of reintroduction plans to be considered.

References cited

Allen BL, et al. 2017. Can we save large carnivores without losing large carnivore science? Food Webs. doi:10.1016/j.fooweb.2017.02.008

Bangs EE, Fritts SH. 1996. Reintroducing the gray wolf to central Idaho and Yellowstone National Park. Wildlife Society Bulletin 24: 402–413.

Jordan, PA, Shelton, PC, Allen, DL. 1967. Numbers, turnover, and social structure of the Isle Royale wolf population. American Zoologist 7: 233–252.

Mech LD. 1966. The Wolves of Isle Royale. National Parks Fauna Series, no. 7. US Government Printing Office.

National Park Service. 2016. Draft Environmental Impact Statement to Address the Presence of Wolves. National Park Service. (13 July 2017; https://parkplanning.nps.gov/document.cfm?parkID=140&projectID=59316&documentID=76680)

Peterson RO, Vucetich JA, Bump JM, Smith DW. 2014. Trophic cascades in a multicausal world: Isle Royale and Yellowstone. Annual Review of Ecology, Evolution, and Systematics 45: 325–345.

Ripple WJ, Estes JA, Schmitz OJ, Constant V, Kaylor MJ, Lenz A, Motley JL, Self KE, Taylor DS, Wolf C. 2016. What is a trophic cascade? Trends in Ecology and Evolution 31: 842–849.

Vucetich JA, Peterson RO. 2009. Wolf and moose dynamics on Isle Royale. Pages 35–48 in Wydeven AP, van Deelen TR, Heske E, eds. Recovery of Gray Wolves in the Great Lakes Region of the United States: An Endangered Species Success Story. Springer.

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