The Value of Scientific Research

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We sometimes hear concern expressed about the value of scientific research. Some research can appear to have little application for solving today's problems. Yet, I am frequently struck by how often wildlife research has unforeseen and far-reaching impacts on contemporary issues. A case in point is research on wolves and the controversy over decisions about management of wolves through regulated harvest.

While the debates swirled over the past two decades about the status of wolves as an endangered species, wildlife biologists were busy studying the wolves. Each year, when budgets were scrutinized, there were questions about the need for such research. Each year, the justification was compelling and research continued. In hindsight, what that research added to our knowledge about wolves and predator-prey systems is stunning. That new knowledge is likely to prove remarkably valuable as we enter deeper into the debates over wolf management.

The restoration of wolves to Yellowstone National Park provided wildlife biologists with the opportunity to test some of the assertions commonly made about wolves. Perhaps no assertion has garnered more attention than the idea that the presence of wolves would restore balance in the ecosystem.

The balance of nature is an age-old notion that has been prominent in ecology. The central idea is that when a predator is restored to the ecosystem, it will cause an initial reduction in the abundance of its prey. When the prey population declines, the predators must eventually decline as well. Through time, predator and prey numbers will fluctuate, but theory predicts that the degree of fluctuation will become less and less. Eventually, predators and prey will achieve constancy in their abundance, a balance, or in the parlance of wildlife biologists, a stable equilibrium.

We can always argue about whether wolves should have been restored, but the policy question we face today is, now that they are here, should we actively manage their populations? Those who oppose active hunting and trapping of wolves often draw on the idea of balance. They argue that restoration of wolves allows natural ecosystems to once again achieve a balance of nature and therefore we should strive to leave them alone. Is that true?

When wolves were restored to Yellowstone, they found a super-abundant food resource in the form of the elk population. Wolves produced large litters and multiple females within a pack were observed reproducing. Wolf abundance climbed rapidly, and elk abundance declined sharply. However, the question was whether this was just the initial adjustment. Would the balance be achieved through time? After nearly two decades of research, the answer is clear: fluctuations in wolf and elk numbers are not going to reach a constant balance. The balance-of-nature theory did not account for additional factors influencing the predator-prey dynamics. In Yellowstone, two additional factors frequently disrupted wolf and elk populations: winter weather and disease. Winter weather, and specifically snow depth, varies from one year to the next. Elk are adapted to migrating to lower elevations when snow is deep, but wolves tend to be fixed geographically to their territory. In those years when snow was deep and elk moved farther, wolves whose territories were devoid of elk faced a dilemma. They could try to survive the winter on other prey, or invade the territories of other wolves where elk were present. Wolves defend their territories to the death and when wolves began invading the territories of adjacent packs, the resulting strife caused extensive mortality in the wolf population.

Disease also upset the predictions about interactions of wolf and elk populations, specifically parvovirus and mange. As wolf populations built to high densities, parvovirus became active in the population and caused heavy mortality. Both diseases are widespread and their impacts wax and wane.

Of course the question is, do we just need to wait a little longer? Will the Yellowstone ecosystem reach stable equilibrium, even in the face of periodic deep-snow winters and disease outbreaks? The wolf-moose interaction on Isle Royale, an island in Lake Superior, gives us some clues. Severe winters occur periodically and when they do, they favor wolves; moose cannot migrate off the island, and deeper snow makes them more vulnerable to predation. Moose and wolf abundances have gone up and down

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over the decades but never achieved a degree of constancy. These findings suggest the answer to our question is, no. We are not likely to see a stable equilibrium in Yellowstone, even if we wait 50 years.

The conclusion that a restoration is not likely to lead to a stable equilibrium or a constant balance is especially important to at least two pending questions. First, are we managing national parks effectively? The idea of balance has been in ecology textbooks for nearly a century. Some have argued that it's a cornerstone to national park policy for managing wildlife in larger parks. We may be about to witness a rewrite of some long-held ideas. Indeed, a recent report commissioned by The Wildlife Society suggests active management of elk on national parks should be considered as a way of stabilizing populations—with hunting as one of the options.

Second, now that the wolf is restored, how should we manage it? Some advocacy groups or policy makers invoke the balance-of-nature argument to justify hands-off management. Other advocates use the booms in wolf increases to justify immediate intervention. Based on what wildlife science has learned about wolves and elk in Yellowstone and wolves and moose on Isle Royale, wildlife managers are well-advised to set policy that is adjustable over time to the inevitable dynamics.

Finally, we should remember Yellowstone and Isle Royale when we reflect on the value of research. Without these long-term commitments to wolf research, we would not have the insight we do today about an old notion–the balance of nature. Of course, drawing on scientific research in shaping wildlife policy is at the core of the Boone and Crockett mission. ■