

# Biting the Hand

## *New Dilemmas in the History of Predator Control*

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SOMETIME in 1994, mysterious newcomers began to arrive on the Channel Islands off the coast of Southern California. At first, these uninvited guests appeared to have wandered off course, or perhaps they were just vagrants passing through. It would soon become apparent that they meant to stay. Their arrival was a chance event, but their decision to remain was not. They would soon outstay their welcome. Their presence would catalyze a series of interactions that would transform the ecology of the northern Channel Islands, and raise far-reaching questions about the meaning and purpose of wildlife management in the twenty-first century.

Countless naturalists, park rangers, and tour boat operators have dubbed California's Channel Islands the "Galapagos of North America." The chain of eight islands that loom off the coast of Southern California, from the Mexican border to Point Conception, comprise

one of the continent's great centers of biological diversity. Together, they house more than 2,000 species of terrestrial plants and animals, including 145 that exist nowhere else on Earth. The most famous of these endemic species is the diminutive, gregarious, and indisputably adorable island fox.<sup>1</sup>

For millennia, island foxes shared their habitats with other carnivores, including island skunks, marine mammals, dogs brought by the Chumash Indians, and bald eagles. During the eighteenth and nineteenth centuries, visitors stocked the islands with a host of feral ungulates, including deer, elk, pigs, sheep, and goats. These animals proliferated in the absence of predators large enough to capture them. And they grew fat feasting on the islands' indigenous plants, many of which had adapted to the isolated environment by losing the sharp spines and bitter-tasting chemicals that defended their mainland relatives from voracious browsing herbivores.

In 1994, for the first time in recorded history, golden eagles took up residence on the Channel Islands. It is unclear exactly why golden eagles came to the Islands when they did, but circumstantial evidence points to a tantalizing tale. Animals may disperse from their places of residence for myriad reasons that vary from hunger to mating to seasonal migrations to internecine conflicts. When a bird such as a golden eagle decides to move it can cover a lot of ground, fast. Dispersal is a natural part of animal behavior. In this case, though, natural factors were only part of the story.

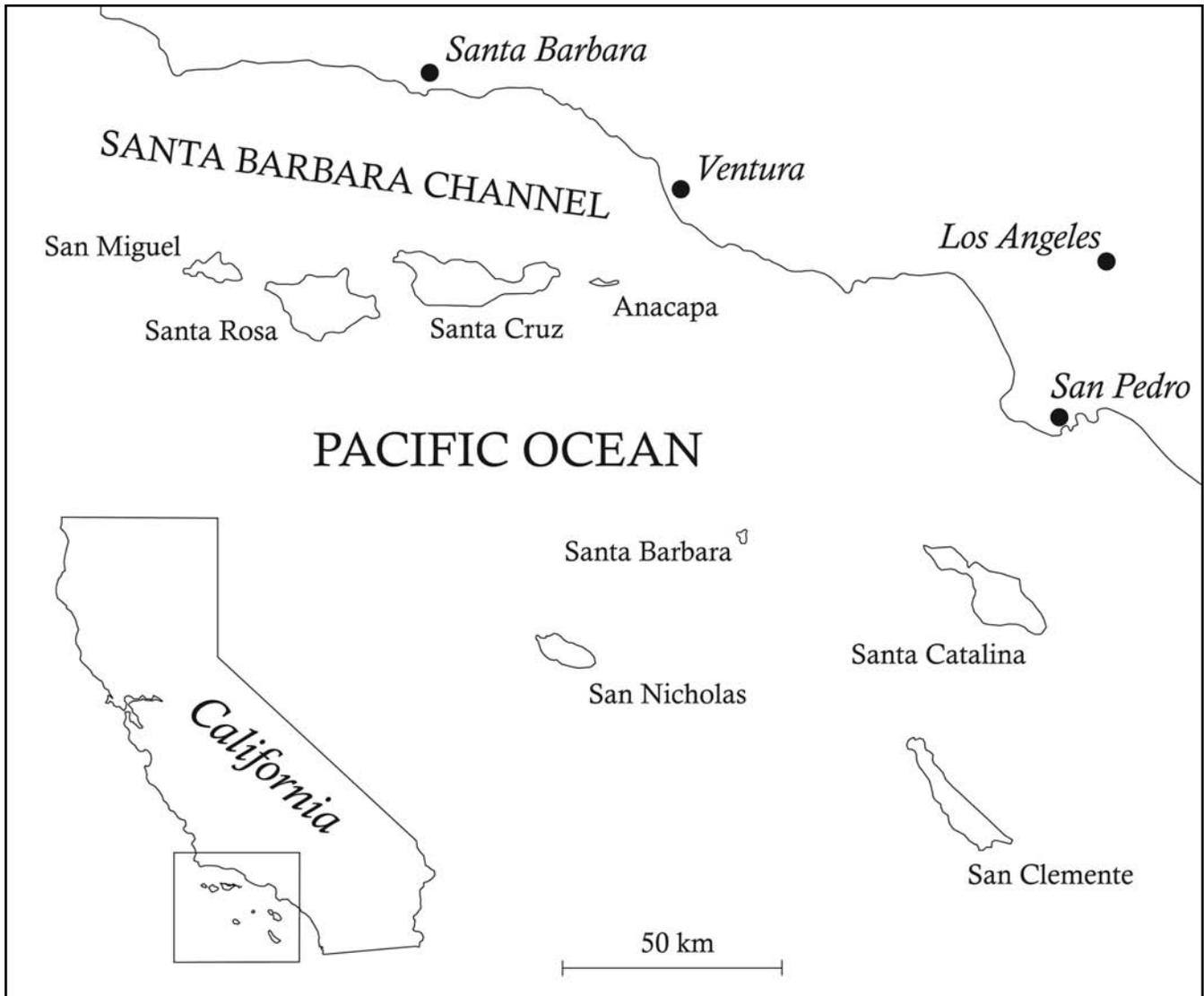
For centuries, eagles were persecuted throughout their ranges in North America. Like other birds of prey — and other predators more generally — they were shot, poisoned, harassed, and driven out of their ancestral habitats. No punishment was too great for these beleaguered varmints.

Unlike golden eagles, bald eagles had long inhabited the Channel Islands. Bald eagles sometimes hunt, but they also scavenge, and on the Channel Islands they feasted on dead livestock and the rotting carcasses of beached fish and marine mammals. Bald eagles are territorial, and many biologists suspect that they defended their island redoubt from colonization by other competitive species. But decades of shooting, poisoning, and egg collecting decimated their population.



Island fox pup.

*Courtesy of the National Park Service.*



Channel Islands area map. Drawn by the author.

Reproductive failure associated with DDT toxicity set in after World War II, and by 1960 bald eagles had disappeared from the islands.<sup>2</sup>

Congress sought to conserve these eagles under the Bald Eagle Protection Act of 1940 — the first national legislation enacted to prevent particular species from extinction. Predator control programs for the two species ended, and additional conservation measures sought to limit the collateral damage being inflicted by control programs aimed at other species. By the 1980s, bald eagles were on their way to recovery in many areas, but they did not return to the Channel Islands.

In 1994, when the first golden eagles arrived on the islands, they found an ecosystem transformed by the presence of non-native ungulates and the absence of native bald eagles. Plump feral pigs offered abundant food, and no aggressive bald eagles were around to drive the golden eagles away. Biologists soon observed

golden eagles hunting, nesting, and generally making themselves at home.

Golden eagles are not discriminating predators. When they found a piglet rooting around, oblivious, in the open country, they took it. When they found a sheep grazing defenselessly in a pasture, they did the same. And when they found an island fox, caught away from its den in open country during the daylight hours, it didn't have a chance. The unwary island foxes had never before shared their habitat with a fierce aerial predator that had a taste for meat on the paw. The feral livestock made matters worse by consuming the vegetative cover, denuding the landscape, and leaving nowhere to hide. Significant portions of the islands were, at that point, bare ground for most of the year.<sup>3</sup>

As late as 1994, surveys conducted on Santa Cruz Island recorded an average of 15.9 foxes per square kilometer. This was one of the greatest population densities ever documented for any wild canid species.<sup>4</sup> In the

late 1990s, officials at the U.S. Naval base on San Clemente Island even launched in an island fox control program to protect an endangered subspecies of loggerhead shrike. By 2003 the number of island foxes in existence had fallen from about 6,000 to fewer than 1,700. On the Northern Channel Islands of Santa Cruz, San Miguel, and Santa Rosa, populations declined by up to 90 percent. The island fox became one of the most critically endangered mammal species in North America.<sup>5</sup>

Biologists have long recognized that a few individual predators, when placed in a new environment with a vulnerable species unaccustomed to being hunted, can decimate or even annihilate the prey population. More recently, they have described a related phenomenon, called *hyperpredation*. In hyperpredation, an introduced or unusually abundant primary prey species supports a large population of predators, which then increases pressure on another prey species. On the Channel Islands, feral pigs attracted and sustained the golden eagles, which then began killing island foxes as incidental prey.

The Channel Islands episode has already become a classic case study in the history of wildlife management. It serves as a cautionary tale about how ecosystems — including those under protection in national parks or nature reserves — can become dysfunctional and even dangerous when they lose their native predators and become overrun with exotic species. The effects cannot be predicted, but they can be devastating and they can even lead to extinctions.

Much remains to be said about the Channel Islands story, but for now it has a happy ending. After years of hard work, officials from the National Park Service, The Nature Conservancy, the California Department of Fish and Game, and other agencies and non-governmental organizations have eradicated the feral ungulates on the northern Channel Islands, removed the golden eagles, reintroduced the bald eagles, and are very close to claiming victory in the island fox recovery program.

As complicated as this story was, it was relatively straightforward compared to many other endangered species recovery efforts. The Channel Islands are geographically isolated and have few meddling neighbors or vested “stakeholders.” The islands have just a handful of major landowners, all of which are federal agencies or non-governmental conservation organizations. No economic conflicts complicated the recovery effort. The only political debate that emerged involved protests by animal welfare advocates against the killing of feral livestock. It is a rare success story in the annals of conservation biology. Yet its relative simplicity may mean that the island fox recovery effort holds few lessons that can be applied to other recovery programs. This is worrisome because similar situations are emerging across California and the American West.



Of all the topics in American environmental history, none has attracted more attention — or generated more controversy — than the issue of predator control. Predator control programs began in the New World almost as soon as the first European settlers arrived on American shores. In 1630, the Massachusetts Bay Colony established the first bounty on wolves in North America, at the rate of one penny per scalp. During the nineteenth century, local, state, and federal governments developed more ambitious programs. Some agencies offered cash rewards while others hired professional hunters. The blacklist of targeted species grew to include a wide range of birds, mammals, and reptiles. Some suffered regional extinctions.

In the early twentieth century, most people still viewed predators as varmints. This included animal welfare activists concerned about the plight of prey species, hunters worried about the loss of game, and ranchers anxious about the safety of their livestock. It also included many scientists and government officials. In 1925 Edward A. Goldman, a prominent naturalist from the Smithsonian Institution and Bureau of Biological Survey, expressed a common sentiment when he wrote that “Large predatory mammals, destructive to livestock and to game, no longer have a place in our advancing civilization.”<sup>6</sup> Other authors, such as Earnest Thomas Seton, regretted that predators were disappearing from the American landscape, but they believed that such extinctions were the inevitable price of progress.

During the 1920s, a few scientists began to speak out against predator control programs. The zoologist Joseph Grinnell and his students, from the University of California, worked to build support in the American Society of Mammalogists and other scientific societies for policy statements that would pressure government agencies to limit their predator control programs. Yet these reformers met with strong resistance in government, industry, and academia. Grinnell convinced superintendents at several National Parks, including Yosemite, to discontinue their predator control programs. But the Bureau of Biological Survey, U.S. Forest Service, and other state and federal agencies only increased their efforts.<sup>7</sup>

In the mid-1920s, the Kaibab Plateau, on the North Rim of the Grand Canyon, became the site of an unintended experiment in the ecological effects of predator control. The Forest Service had engaged in an aggressive, decades long campaign to decimate the Plateau’s populations of wolves, mountain lions, coyotes, and bobcats. The Service’s goal was to increase the populations of popular game species, such as deer and elk, and make the neighboring rangelands range safe for domestic cattle. According to some estimates, by 1924 the population of deer on the plateau had reached 100,000 individuals. In their desperate attempts to survive, the

deer and elk overgrazed the range and devastated the landscape.

This version of the story, as told by Aldo Leopold and others, provided ammunition for opponents of predator eradication programs who argued for the return of large carnivores that could control the deer populations. By the 1970s, however, the Kaibab story had come under criticism. Not enough data existed to support the narrative, and the evidence seemed to point to a more complicated explanation. Today, most ecologists regard the Kaibab incident as a kind of fairytale, a “just so” story in the history of science. Yet the moral behind the story — that native predators are essential components of healthy ecosystems and should be restored in areas where they have disappeared — had already changed the minds not only of conservationists, but also of an increasingly large segment of American society.<sup>8</sup>

Predator control programs continued unabated into the 1970s. Federal agencies, state departments of fish and game, university extension programs, county animal control boards, livestock organizations, and private landowners all pursued their own programs. In 1972 the Nixon Administration took a significant step when it banned the use of compound 1080, a potent poison used for baiting carcasses, on federal lands. The Fish and Wildlife Service shifted its attention away from predator control toward other problems, such as refuge management and endangered species conservation. Most of the state fish and game departments also curtailed their predator control programs. Some of these changes occurred through bureaucratic maneuvers, but others resulted from legislative action or even voter initiatives.

By the late 1980s, it seemed that predator control programs had reached the end of an era. In 1988 Thomas Dunlap began his classic study on American ideas about predators with the question: “How did we go from hating these animals to loving them, and what does this about-face tell us about our society?”<sup>9</sup> In the years since, other authors have told more ambivalent stories. But many still believe that a century of scientific research, political debate, and increasing public awareness has transformed American wildlife management. Some control programs will undoubtedly continue, especially in vast Western states with small human populations such as Wyoming, Montana, Idaho, and Alaska. But haphazard, government sponsored, scientifically endorsed predator control programs — in progressive, urbanized states such as California — are largely a thing of the past.

Or not.

Over the past three decades, the populations of several large carnivore species have increased to levels unseen in the United States for a century or more. This has resulted from several complex and compounding processes. Changes in habitat structure, resource availability, and species interactions have all contributed to

the ability of predators to proliferate and colonize new areas. So has the reduction in predator control programs, particularly for species that are protected by state or federal laws, which almost all large predators are on some level.

Most environmentalists see this resurgence of predators as a victory. Some view it as much more than that. For them, the story of changes in American attitudes toward predators represents an epochal chapter in the struggle for human moral evolution. Aldo Leopold called this process *ethical extensionism*. This idea that, over time, people in various societies have extended their purview of ethical concern to encompass a larger group of human and non-human subjects. The abolition of slavery was one example, the acceptance of predatory wildlife another.

Many scholars today view this version of history as problematic, since it is both Whiggish and teleological. It erases legitimate dissent, and portrays history as an inevitable march toward a more “enlightened” set of ideas and practices. As a cornerstone of contemporary American environmental thought, however, it helps explain why the issue of predator control means so much to so many people. Ethical extensionism provides an optimistic counterpoint to the dominant narrative of ecological destruction so common in American environmentalism today. It also offers a chance at redemption for those who will follow in Aldo Leopold’s steps to work for the preservation of wilderness, the restoration of ecosystems, and the return of native predators.

The problem is that the return of these predators has come with unintended consequences. Most Westerners are familiar with complaints among ranchers in the Northern Rockies that wolves are reducing their ability to raise livestock, and concerns among suburbanites in Southern California that coyotes and mountain lions might harm their children or pets. We are only now beginning to come to terms with another equally worrisome trend: the danger these predators pose to endemic and endangered species, such as the island fox.

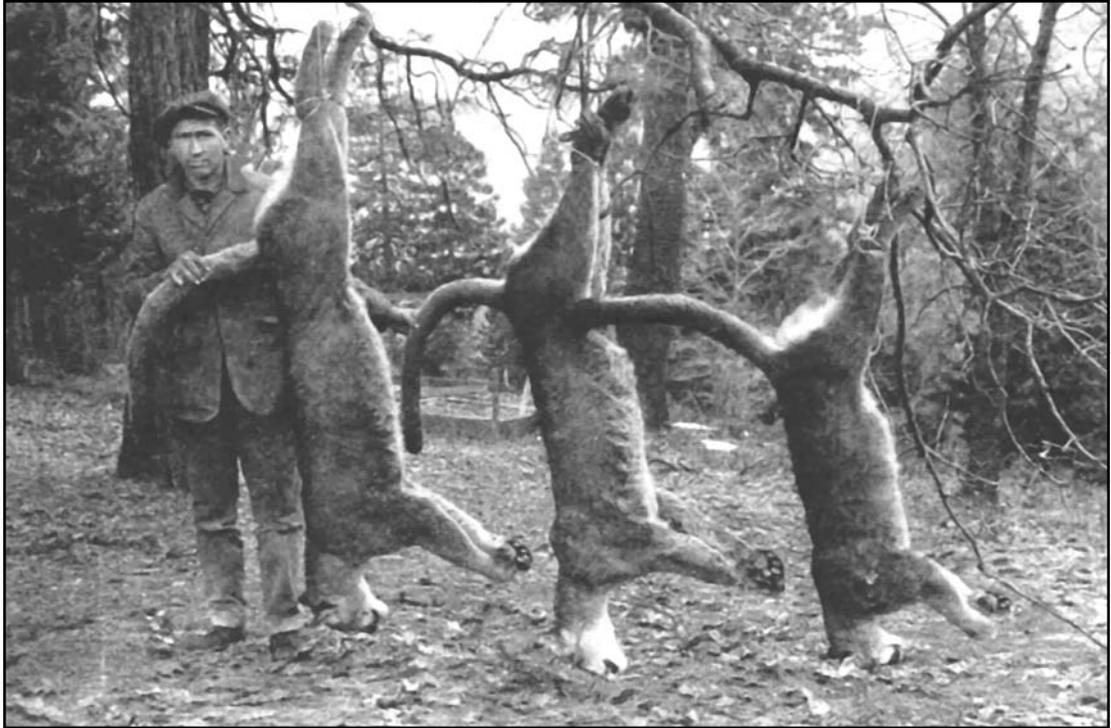


Consider some other examples from in and around California:

Most mountain lions in California prefer to prey on deer, but sometimes they switch and specialize on other species. Sierra Nevada and Peninsular bighorn sheep are both endemic to California, and both are protected under the Endangered Species Act. By 1970 they had declined due to a century of hunting, habitat loss, and disease. Lion predation has also contributed to the bighorn’s problems. Between 1974 and 1988, one biologist working in the High Sierra recorded 49 instances of mountain lions killing bighorn sheep. This accounted for 71 percent of all known deaths in the herd and represented an unsustainable level of predation. To make

Jay Bruce, California State Lion Hunter, January 1924.

*Courtesy of the University of California, Berkeley, Museum of Vertebrate Zoology.*



matters worse, bighorn sheep began remaining at higher elevations in winter to avoid the lions, which increased their risk of exposure, starvation, and even greater mortality.<sup>10</sup>

State and federal agencies waged mountain lion control programs in California for most of the twentieth century. State support ended in 1963, and the federal program concluded eight years later. In 1969 the California Department of Fish and Game reclassified mountain lions as a “big game animal,” but within a year the state legislature placed a moratorium on lion hunting that remained in effect for two decades. In 1990 California voters approved Proposition 117, which made lions as a “specially protected species” and outlawed all lion hunting. Today, the state may only issue a lion hunting permit for cases in which a lion has killed domestic animals, poses a threat to public safety, or is endangering bighorn sheep. Killing mountain lions remains controversial, but many biologists argue that without some vigilant, targeted lion control, California’s bighorn sheep may be doomed.<sup>11</sup>

Nearby, in the Mojave Desert, a different predator, the common raven, is jeopardizing another endangered species. Ravens are native to California, but they were rare in the Mojave before the middle of twentieth century. Since then, residential, commercial, and industrial developments have created novel sources of human food and water, as well as new nesting and roosting sites. Between 1969 and 2004, the population of ravens in the western Mojave increased by about 700 percent.<sup>12</sup>

Desert tortoises are still widespread in the Mojave, but their populations have declined dramatically during the past century. In 1989 biologists discovered an epi-

demic of the pneumonia-like Upper Respiratory Tract Disease, and the U.S. Fish and Wildlife Service used its emergency powers to add the Mojave’s tortoises to the federal endangered species list. Juvenile desert tortoises remain vulnerable until their carapaces harden around the age of five. Researchers have witnessed ravens eating immature tortoises, and surveys have found the ground underneath raven nests littered with tortoise remains. In one study, conducted over a four-year period, a pair of biologists found 250 juvenile desert tortoise carcasses below a single raven nest.<sup>13</sup>

A comparable drama is unfolding in the greater San Joaquin Valley ecosystem of central California. Known to most people as a vast farming and petroleum producing region, the San Joaquin Valley, like the Channel Islands, is also one of the continent’s hot spots of biological diversity. The valley houses at least 25 endemic vertebrate species and subspecies — more than any other area of similar size in the United States. The flagship endangered species for the region is the San Joaquin kit fox, which became famous when former Congressional representative Richard Pombo (R-CA) erroneously testified that regulations protecting the fox had prevented his family from developing its property.

In the 1990s, an effort began to protect the greater San Joaquin Valley ecosystem’s endangered species and biological diversity through habitat conservation. This process has grown far beyond initial expectations, and the region now has a network of nature reserves that encompass much of its remaining upland habitat. These habitats support not only endangered species, but also growing numbers of coyotes and bobcats. In some reserves, coyotes are now responsible for more than 75

percent of kit fox deaths. It is possible that kit fox populations may be able to withstand this pressure, but biologists have little evidence about historical levels of predation upon which to base a judgment.<sup>14</sup>

One intriguing aspect of this story is that the third largest population of San Joaquin kit foxes lives not in nature reserves, but in parks, on golf courses, and under freeway overpasses in the city of Bakersfield. At least one mating pair resides in burrows excavated from a median strip in front of an office park that houses the local headquarters of a petroleum services corporation. This is not the wilderness that many people imagine when they think of endangered species habitat. Yet it seems to work for Bakersfield's urban foxes, which are able to avoid coyote predation and live a diet that includes hotdogs, tamales, popcorn, cheeseburgers, and packets of ranch dressing (just look at the piles of garbage that mark the entrances to their burrows). Bakersfield is not known for its environmental sensibilities, and few environmentalists probably dream of living there. But for a kit fox, it must be some version of heaven — or at least some version of habitat.<sup>15</sup>

A final example comes from the forests of the Pacific Northwest. In 1994, after a fierce battle over the future of old growth timber in the Pacific Northwest, the Clinton Administration established its Northwest Forest Plan. The plan called for the creation of 45 "Late Successional Reserves" covering 2.8 million acres. It also included a variety of other land use designations, restrictions, conservation programs, research initiatives, and monitoring plans. The goal was to strike a balance between timber interests and environmentalists, but the whole process began with the endangered species listing of the northern spotted owl. At the time, this was the largest land use planning effort in American history prompted by the conservation of a single species.<sup>16</sup>

Today, the spotted owl has another problem from which no reserve can protect it. Its larger, more aggressive cousin, the barred owl, is invading its range.<sup>17</sup> During the nineteenth century, barred owls were restricted to eastern North America. Since then, they have expanded their range all the way to the Pacific Ocean. Like the ravens of the Mojave, they were probably aided in their journey by human developments that created new patches of habitat in previously unsuitable areas. The northern spotted owl and barred owl are closely related, and they may even hybridize in the wild. Barred owls may compete with spotted owls, alter their behavior, displace them from their habitats, or even kill and eat them. Despite one of the most ambitious conservation programs in American history, spotted owls continue to decline throughout much of their range.



By the time the movement to protect native predators began in the United States, the populations of many

predators were at all-time lows. Some species had disappeared from entire regions, and a few notable subspecies had vanished forever. The tale of the California grizzly, or "chaparral bear," offers a dramatic example. California was once home to as many as 10,000 grizzly bears — more per unit area than in present-day Alaska. The number seems to have peaked around the time of the Gold Rush in 1849, and then plummeted during the second half of the nineteenth century. The last captive California grizzly died in 1911, and any remaining wild individuals probably perished by 1925. The chaparral bear still appears on the state flag and seal even though it went extinct long ago.

In the 1970s, predators were still among the country's most imperiled species, and some remain on the federal endangered species list today. The grizzly is still listed as threatened in the lower 48 states, and recovery efforts have progressed slowly in the Northern Rockies and Cascades. The Florida panther, a mountain lion subspecies, barely survives on the outskirts of that state's expanding conurbations. The black-footed ferret, in the Great Plains, has been the subject of a contentious recovery effort since its rediscovery after a presumed extinction in 1981. In the future, some of our most endangered predators will probably be denizens of the deep: sharks and other carnivorous fishes of the ocean that strike fear in us all but that few people ever see.

Overall, however, the movement to protect predators has proven immensely successful. In 2007 the Fish and Wildlife Service declared bald eagles recovered, and removed them from the federal endangered species list, except in the Sonoran Desert where restoration efforts continue. Wolves are now well established in the Northern Rockies and appear to be expanding their range south toward Colorado. Mountain lions may be back in New England for the first time since at least the 1940s. In 2008 biologists photographed a wolverine in California's Tahoe National Forest — the first seen in the state since the 1920s. Not many people are fortunate enough to glimpse a wolverine, but suburbanites throughout the American West interact daily with the increasing number of coyotes and bobcats in their midst. Of all these predator recoveries, the most spectacular probably belong to marine mammals, the sea otters and elephant seals that rebounded from near extinction in the early 1900s and are now common in many areas along the Pacific Coast.

These recoveries are the products of a sustained scientific, legal, and political campaign for the support of the American public. Along the way, predator advocates have developed a variety of arguments for why these species should be protected. Healthy ecosystems, they say, require the presence of all native species, each occupying its own customary niche. Predators can regulate prey populations from the top-down, preventing pests from proliferating unchecked, culling the weakest members of the herd, and improving game populations

A wolverine captured by remote camera in the Tahoe National Forest, California.

*Courtesy of the California Department of Fish and Game.*



for recreational hunters. In some cases, predators may serve as “keystone species” that shape the structure, functioning, and composition of entire landscapes. They can also play the role of “flagship species” whose presence can serve as a rallying cry for political action. Finally, predators can act as “umbrella species” because they tend to have such large ranges that the conservation of their habitats will inevitably protect the living spaces of a myriad other plants and animals.

It would be a great understatement to say that environmentalists have taken these lessons to heart. When the first scientists and managers began to advocate for predators, in the 1920s, most conservationists and animal welfare activists viewed carnivorous birds, reptiles, and fur-bearing mammals as ecologically useless, economically detrimental, and morally corrupt. Some people even considered them murders. It took many years and much work to change those minds. Today, although predator recoveries remain controversial in some parts of the country, public opinion outside rural areas of the Western states falls broadly and decisively in favor of protection for remaining and recovering populations.<sup>18</sup>

So conservation biologists now face a dilemma. Efforts by their predecessors to change public attitudes and policies toward predators have succeeded so thoroughly that officials now meet strong opposition whenever they propose new approaches to deal with increasingly abundant predator populations. Wildlife managers first recognized decades ago that conflicts

could emerge between the conservation of species that people value for different reasons. This problem has gained more urgency as predators have begun to jeopardize the continued existence of some endangered species.

Two issues, in particular, have emerged in the debate about what to do next. The first is that almost all native predators are protected under state and federal laws other than the Endangered Species Act. Most of these laws contain stipulations that allow for the capture, removal, and monitoring of predators in cases where they may be threatening other protected species. In theory, such laws could provide a diverse toolkit for adaptive management. In practice, however, this tangled web of codes and statutes often limits the management options of wildlife officials, or at the very least slows their decision-making processes.

The second problem involves public outcry over proposals to reinstate lethal control programs. In each of the cases described above, with the exception of golden eagles on the Channel Islands, scientists and managers have proposed lethal predator control as an endangered species conservation measure. This strategy presents significant ecological and administrative challenges. In instances of hyperpredation, for example, complete local eradication, not just control, of the predator population may be necessary to save the prey. Launching new predator control programs also presents a political challenge. In states such as California, legal challenges by animal welfare organizations have halted several recent

experiments in predator control to protect endangered species.

Mountain lion culling is perhaps the most controversial of all the contemporary predator control programs proposed for endangered species conservation in California. Yet other similar proposals have also met with resistance. In the Mojave Desert, researchers have identified habitat modification as the best strategy for long-term raven control, but short-term management recommendations have included culling. In 1989 a group of state and federal agencies launched the first pilot program to control ravens in the Mojave. It lasted less than one week. A restraining order, issued in response to a lawsuit filed by the Humane Society of the United States, halted the project. Four years later, another lawsuit delayed a second experimental raven control program. The Desert Tortoise Recovery Plan, published by the Fish and Wildlife Service in 1994, again emphasized the need for raven management. Yet by 2008, when the Service issued its updated environmental assessment, no such program had begun.<sup>19</sup>

Conservation efforts for the San Joaquin kit fox and northern spotted owl have also involved predator control experiments. In the early 1990s, wildlife managers at the Elk Hills Naval Petroleum Reserve launched a coyote control program to protect kit foxes. The program began to show success when managers started shooting coyotes from helicopters, but they soon discontinued the effort under public pressure. In the Pacific Northwest, experts have expressed doubt that a control program could reduce the barred owl population enough to help spotted owls over the long term. Yet, in 2007 the first experimental barred owl culling program began on private land in northern California, and the following year, the Fish and Wildlife Service advocated shooting barred owls as a stopgap measure.<sup>20</sup> Significant public opposition has not yet emerged, but it almost certainly will. After all, no one — not even the most dedicated endangered species advocate — likes the idea of killing one owl to protect another.



The epic saga of predator control and conservation in the American West is far from complete. Over just the past few decades, it has entered a new phase in which the conservation of resurgent predator populations has come into conflict with recovery efforts for the federally listed endangered species that now serve as the predators' prey. This unintended consequence has resulted from almost a century of science, law, political activism, and ecological change.

Some observers may view this situation as ironic. Yet behind the facile veil of irony lies a set of real and profound challenges for American environmentalism and natural resource management. The adaptability and resiliency of native predators challenges the adaptability

and resiliency of our environmental laws. Their return to the landscape challenges our ability to understand and adaptively manage complex ecosystems whose dynamics are inextricable from the contingencies of human history. And the debate about lethal control challenges basic narratives and precepts that form a foundation for American environmental ethics.

The history of wildlife management can be understood, in part, as an ongoing attempt to determine and achieve proper levels of abundance and scarcity. Determining the "proper" sizes and distributions of wildlife populations has less to do with ecological science than it does with human values, attitudes, interests, and beliefs. It also has to do with history. Native predators have proven remarkably adaptable and resilient. Will our science, laws, ethics, and politics do the same? The island fox's unique story may not provide an answer to this question or a template for future management programs, but it does provide a reason for hope. Go to the Channel Islands and see for yourself.

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