

In *Encyclopedia of Bioethics*, Revised Edition, Warren T. Reich, ed. (New York: Macmillan Library Reference, Simon and Schuster, 1995), pages 176-80. Also in later editions.

out for themselves. Wildlife that is managed is not wild; it is managed life. So there is logical difficulty in the idea. There is also ethical difficulty. Perhaps humans are not responsible for wildlife; wild lives are on their own. But then again, human activities affect wildlife quite adversely. Have we no duty to care for it, either because of what humans have at stake or because of what wildlife is in itself?

This article outlines some main issues: the contemporary crisis of conserving historically evolved wildlife populations on rapidly developing human landscapes; ownership, control, management, and stewardship responsibilities for wildlife; conservation of endangered wildlife species; fishes and fisheries as managed wildlife populations; wildlife as game for hunting and trapping, including hunting as a conservation strategy; "hands-on" versus "hands-off" management; and feral animals. These are issues of management, but there are ethical questions at every point.

Wildlife and human populations: An emerging crisis

There are more species on Earth today than there have ever been in the 2.5-billion-year history of life. Estimates run from five to thirty million species; ten million is a typical figure. Most of the vertebrate wildlife and birds are known; most unknowns are in the invertebrate animal, insect, and plant species. During evolutionary history, there was no wildlife management; wildlife conservation takes care of itself if no humans intervene. On statistical average, more species have been produced than have become extinct; diversity has gradually increased.

Some five catastrophic extinctions have been followed by rather swift regeneration of the lost species. On landscapes that have grown colder or drier, species may become fewer. Some groups of species were more numerous in the past, such as dinosaurs in the Cretaceous period, or birds in the Pleistocene. Nevertheless, diversity is at an all-time high. In one sense, all biology is conservation biology (biology that conserves life), whether or not humans are involved.

There are many more humans on Earth today than ever, and the expansion of human habitat, coupled with pollution, hunting, and trade in wildlife, threatens populations of wild animals and their habitats. Humans now threaten the biological processes that have been creating and conserving life for billions of years. Hardly an American landscape has not been impoverished of its native fauna. The larger once-dominant animals—such as eagles, wolves, cougars, grizzly bears, wolverines, bison, otters, crocodiles—are especially depleted. The New World depletion in both hemispheres is a result of Europeans entering a relatively empty continent and engaging in explosive development over recent centuries.

III. WILDLIFE CONSERVATION AND MANAGEMENT

Wildlife management may be thought a contradiction in terms. The logic of "wild" precludes "managed." Wildlife lived for millions of years, unmanaged by humans. Part of what humans value in wildlife is animals that can look

The Amerindians had coexisted with wildlife for ten to fifteen thousand years,

Long-settled continents do not escape the problem either. Humans have inhabited Africa since evolving there over a hundred thousand years ago. Only in the twentieth century, as contemporary nations have grown rapidly, has African megafauna or avifauna been seriously threatened. Wildlife in China, India, and Tibet, among the oldest settled areas in the world, has been greatly depleted in this century. The crisis is as serious in the Old World as in the New.

The crisis is now potentially more urgent than at any previous time in the history of the planet. This generates unprecedented responsibilities because humans previously did not have much effect on wildlife, which took care of itself; unprecedented demands for trade-offs between human values and the welfare of wildlife; and unprecedented implications because of its global and irreversible scale.

Wildlife conservation is now challenged to mix human values with wildlife values. Fortunately, wildlife is valuable to humans and, so far, can be included among the human values. Humans wish to hunt and fish; they enjoy watchable wildlife; wildlife art is the most popular American art form. If backyard bird feeding is included, almost one in four Americans spends some time bird-watching. Animals are chosen as state animals; sports teams and automobiles are named for animals. Many animals serve useful roles in ecosystems; hawks catch mice, birds control insect populations. Wildlife can indicate the health of an ecosystem. Unfortunately, many human values conflict with wildlife on landscapes, as shown by the massive depletion of wildlife. Here human interests seem contrary to wildlife's flourishing. And what if wildlife is not valuable to humans? Have we some responsibilities for the values of wild things for what they are in themselves?

The Wildlife Society, the principal professional organization of management and conservation, affirms that "Wildlife, in its myriad forms, is basic to the maintenance of a human culture that provides quality living." The society seeks "to develop and promote sound stewardship of wildlife resources and of the environments upon which wildlife and humans depend; to undertake an active role in preventing human-induced environmental degradation; to increase awareness and appreciation of wildlife values." It also urges "ethical restraints in the use of living natural resources" (Wildlife Society, 1990).

Ownership, control, management, and stewardship responsibilities for wildlife

According to long legal tradition in the United Kingdom, Canada, the United States, and many other nations, individual persons do not own vertebrate wildlife.

Animals and birds do not belong to the landowner on whose property they are found. They move around, with dens and nests in particular places, but the larger animals and the birds can range over hundreds or thousands of square miles. They sometimes live on public land, sometimes on different tracts of private land. Continental European nations, by contrast, sometimes hold that property owners own wildlife resident on their lands.

In the Anglo-American tradition, landowners have the right to control access to their property; they control who, for instance, may hunt there. But the state determines whether and how much game may be taken. Permitted by the state, individuals can "take" wildlife—capture or kill it—at which point the animal enters their possession. State control of wildlife was long understood as state ownership, but wildlife paid no more attention to state lines than to local property boundaries; indeed, migratory birds resided in various nations. The U.S. federal government has often regulated wildlife, since much wildlife crosses state lines and much inhabits federal lands. In recent court decisions, the state ownership doctrine has been rejected as based on a flawed characterization of wildlife, which should be regulated like other natural resources considered commons, not so much owned as held in trust. State ownership of wildlife has been subsumed under the state and federal power to regulate all natural resources, an expanding public trust doctrine. Wildlife is a public good held in trust by the state for the benefit of the people (Bean, 1983).

The general idea is that there is a corporate responsibility for wildlife, a duty to persons concerning wildlife in which they have an interest, and a duty of individual persons to relate to wildlife, caring for it, tolerating it, perhaps hunting it, all within the context of a larger public interest and stewardship. Animal welfare was long subsumed under this rubric, since maintaining this public good required healthy wildlife populations. But animal welfare has increasingly become a concern in its own right, independent of human benefits. This is called the intrinsic value of wildlife, a value also held in trust. This concern becomes evident in concern for endangered species as well as in shifting attitudes toward hunting.

Conservation of endangered wildlife species

The legal tradition arose with regard to individual animals, but protecting endangered species has increasingly figured in regulations covering both game and nongame species. State departments, once of "Game and Fish," have largely been renamed departments of "Wildlife"; though hunting and fishing remain a large part of their assignments, their interest in threatened wildlife has dramatically increased. If the government can regulate individual animals, by the same logic it can regulate species. In the fall of 1981, when black-footed ferrets were

discovered on private ranches near Meeteetse, Wyoming, the ranchers were legally obligated to protect them. Furthermore, the federal government can designate critical habitat on private land.

Landowners ought not to shoot the bald eagles that fly over their property or cut the trees in which they nest. In compliance with the Endangered Species Act, in order to protect eighty bald eagle nesting sites, the Weyerhaeuser Company in the early 1980s set aside more than nine hundred acres in Washington and Oregon, representing over nine million dollars in unharvested timber. Lest it be supposed that the bald eagle, the national symbol, is a unique public good, Weyerhaeuser also, complying with the act, set aside 155 acres in southern states to protect 22 colonies of the endangered red-cockaded woodpecker. These woodpeckers prefer to nest in prime timber, eighty-year-old pine forests; loggers would rather cut these lands more often than that. Though these landowners cannot use the land as they once intended, costing them that opportunity, it does so lest they destroy, at the species level, eagles and woodpeckers that, though on their land, do not belong to them but are a common good.

The Endangered Species Act of 1973 is the most far-reaching wildlife statute adopted by any nation. The U.S. Fish and Wildlife Service is charged by the act to list both domestic and foreign wildlife species threatened with extinction. No government agency may undertake projects likely to jeopardize listed species, at home or abroad, except under authority of a high-level committee that has granted few exemptions. Jeopardizing species includes disrupting their habitat. Neither can persons take listed wildlife species on private lands. In evaluating whether to list a species, economic considerations may not be considered, a point of repeated contention but one that the U.S. Congress has reaffirmed several times. Importing species on the worldwide list into the United States is illegal except under specific conditions.

Generally this concern, enacted into legislation, reveals an increasing sense of human duty toward wildlife that comes to special focus when a species becomes endangered. Game managers who may once have thought of their responsibility as the production of an annual crop of game to shoot now see themselves as wildlife managers whose responsibility is to provide for a diverse native fauna on the landscape, both for the benefits such wildlife brings to humans and out of respect for what all species of wildlife, not just the game species, are in themselves.

Fish and fisheries as managed wildlife populations

Analogous changes have taken place with regard to fishes. Once, what one wanted was fish to catch; and

fishing remains a popular recreation. But there is an increasing concern with native fish populations, now including all species.

The native fish fauna of North America has been tampered with possibly as extensively as, and certainly more rapidly than, the fish on any other continent. Managers have introduced "game" and eliminated "trash" fish; humans have made dams and water developments for domestic, industrial, and agricultural uses; polluted; caused erosional sedimentation; and accidentally introduced parasites and diseases. Of the endangered fishes of the world, about 70 percent are in North America; 56 percent are receiving some degree of protection. The fishes in the United States have been as disturbed as any other wildlife, more so in the West than in the East, most of all in the Southwest. The Endangered Species Committee of the Desert Fishes Council identifies 164 fishes in North American deserts as endangered, vulnerable, rare, or warranting various degrees of concern.

Concern for these fishes has modified or stopped water development projects. On the Virgin River and its tributaries in Utah in 1980, for example, water authorities abandoned the Warner Valley project lest it jeopardize the woundfin, and built the Quail Creek project instead. Water release from dams may be adjusted in time and volume for the benefit of endangered fish and bird species (Minckley and Deacon, 1991).

Coming to focus again in endangered species legislation, what humans think they ought to manage for is shifting from game species to native fishery populations. There is an increasing sense of duty, represented in wildlife managers, to ensure the presence of fishes as an integral part of the wildlife community, not just for the human benefits involved but out of respect for what these fishes are in themselves, as well as for their roles in the riparian ecosystems.

Hunting and trapping: Hunting as a conservation strategy

Wildlife management has traditionally meant game management. Hunting both for meat and for sport is an ancient practice. Humans evolved as omnivores; meat has been important in human nutrition, although it is quite possible for humans to be well nourished as vegetarians. The character of hunting has accentuated sport hunting in modern times; few hunters today are primarily meat hunters, although in most cases the carcass will be eaten. Most hunters have a code of ethics. They think it unethical to waste the meat. Hunters also seek a fair chase, a clean kill, minimal suffering, and respect for the animal; and hunters have long been among the most effective conservationists. Predators, especially wolves, were often eliminated as competitive hunters.

Since the mid-1960s, a strong antihunting movement has emerged, on the ground that shooting animals

for sport is unethical, even if the hunter's ethic is observed. Such persons regard wildlife management for the purposes of maintaining hunting as morally wrong. A further problem is that much funding for wildlife conservation comes from hunting and fishing licenses, and if these activities are curtailed, alternative funding sources will have to be found. Hunters also argue that properly managed hunting can ensure conservation, since this activity makes wildlife valuable both to the hunter and to others who profit from the hunter's presence.

Such an argument is especially used for African wildlife. In Africa, although much hunting is legal, poaching has also been rampant, resulting in an international ban on skins, hides, horns, tusks, and other parts of various species. Wildlife managers may argue that whereas such bans may discourage poachers, they also prevent legal hunting, which can be quite profitable; this makes wildlife worthless to native peoples, who can neither hunt for food nor sell wildlife products. Even the products from culled animals (shot to reduce excess populations) cannot be sold. Ivory has been a case in point. Most world ivory trade is now illegal, but some authorities argue that the sale of legal ivory could greatly benefit elephant conservation.

Trapping has been a traditional use of wildlife, largely for the pelts and hides made into mink coats, beaver hats, alligator-skin purses and shoes, and so on. Given available substitutes, many people object to such use of animals, on grounds that this trapping involves needless cruelty. Furs on fashion models simply flatter female vanities, somewhat as trophy animals mounted in sportmen's dens flatter male vanities. The leghold trap is especially objectionable to opponents of trapping. A counterargument is that a high value on animal skins, with effective management, can ensure conservation. Most of the world's crocodile species are endangered; crocodiles are dangerous and often frequent rivers where humans are present. Only if the crocodiles are of considerable value to local peoples are they likely to be tolerated and saved.

"Handgun versus "hands-off" management**

Although there is a growing consensus that humans have an urgent responsibility actively to conserve wildlife, many argue that the less wildlife is managed, the better. So far as wild animals are managed, their wildness is compromised—the paradox of wildlife management. The animals become artifacts, more like pets. This leads to a debate between "hands-on management," which favors active intervention, habitat enhancement, supplemental feeding, breeding, radio-collared monitoring, and so on, versus "hands-off management," which favors as little management as possible consistent with animal welfare.

From a medical point of view, there is contention whether veterinarians ought to treat wildlife diseases. Like all physicians, veterinarians seek good health. Colorado veterinarians treated a lungworm disease in bighorn sheep successfully. By contrast, when an epidemic of pinkeye ravaged the bighorn sheep of Yellowstone Park, authorities refused to let Wyoming veterinarians treat the disease. The welfare of the sheep, they said, required letting the disease take its course; disease-resistant sheep would survive and the genetic fitness of the herd would improve. Whether the disease is introduced by humans is a factor. The *Chlamydia* parasite producing pinkeye was not thought to be introduced; some said that the lungworm was introduced from domestic sheep, or at least that the sheep were weakened due to human disruptions, especially of their winter range. Although over half the Yellowstone herd perished by starvation and injury following partial blindness, the herd has recovered, although not yet to its former numbers.

Many argue that although hands-off management is an ideal for animals that inhabit extensive ranges, owing to development and human needs there remains insufficient habitat for hands-off management. With elephants in Africa, they say, only hands-on management is possible. Given the elephant's destructiveness and its tendencies to migrate, herds must be fenced, water holes provided, herds culled, and so on. This strikes a balance between responsibilities for elephants and for humans. A controversial case in the United States involved supplemental feeding for grizzly bears in Yellowstone Park, where, after such feeding went on for decades, park officials, preferring a wild bear over a managed bear, elected to risk letting the endangered species survive on its own.

Feral animals

Feral animals are those introduced by humans, not native to landscapes, that have managed to survive on their own. Management of such animals is disputed, especially of mustangs and burros in the western United States. Although not now living in their native ecosystems, such animals may have been living wild for centuries. Management policy is typically to eliminate them, on grounds that they are not authentic wildlife, although the U.S. Congress has mandated preserving mustangs in some localities. Animal-welfare advocates have protested eliminating the mustangs and burros. Other cases involve feral hogs and goats. On San Clemente Island, off the coast of California, nearly thirty thousand goats were eliminated, about half of them shot, the other half captured and relocated with poor survival rates, in order to protect endangered species of plants, as well as to prevent further degradation of the island ecosystem. The goats had been left there by the Spanish in earlier centuries. The argument here is that

we have a greater responsibility to native wildlife and plants than to feral species,

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Directly related to this article are the other articles in this entry, especially the articles on ETHICAL PERSPECTIVES ON THE TREATMENT AND STATUS OF ANIMALS, HUNTING, and ZOOS AND ZOOLOGICAL PARKS. For a further discussion of topics mentioned in this article, see the entry ENDANGERED SPECIES AND BIODIVERSITY. Other relevant material may be found under the entry ENVIRONMENTAL ETHICS. See also the APPENDIX (CODES, OATHS, AND DIRECTIVES RELATED TO BIOETHICS), SECTION VI: ETHICS PERTAINING TO THE ENVIRONMENT.

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