

The History of Wildlife Conservation and Research in the United States – and Implications for the Future

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ABSTRACT: Wildlife conservation in the U.S. has been based on the Public Trust Doctrine, wherein wildlife and fishes, water, and scenic places were deemed too valuable for the greater good to be held in private ownership. Native Americans utilized wildfire heavily until Europeans arrived in the 1400's. Disease decimated the Indians, and wildlife rebounded. Settlers in the 1500's – 1700's experienced seemingly unlimited supplies of forests, grasslands and wildlife. Westward expansion in the 1800's brought subjugation of the Native Americans, conversion of wildlife habitat to farms and ranches, and decimation of many wildlife populations by market hunting. Americans finally took notice at the turn of the century, and during the Roosevelt era they set aside millions of acres in public parks, forests and wildlife refuges. Wildlife research for and management of wildlife resources began in earnest in the 1930's with funding mostly provided by levies on hunters. Sportsmen's clubs, conservation organizations and scientific societies lobbied the federal government to pass legislation to establish and fund natural resource agencies, wildlife research, and incentives for landowners to conserve wildlife habitat. Public outrage in the 1960's over widespread use of pesticides and predator poisons led to a series of landmark bills to enhance environmental quality. In recent years, interest in conservation by the public has continued, but funding for research and management has suffered. Debate over state versus federal authority and public good versus private property rights continue, as the nation's wildlife faces new threats of global warming and an increasing human population with consumptive habits. Wildlife scientists are challenged to educate the public and decision makers of the choices facing them and to become part of the democratic process.

Introduction

Thank you for inviting me to Taiwan to make this presentation. Your nation and mine have much in common. We are both political democracies and we are both countries that, although different in size, are similar in abundance of natural resources and in biological diversity. As a result, we have much to learn from one another. America has many lessons to teach the world about the management of its natural resources, especially its wildlife. Some of those lessons are positive, but some are negative – examples of what should not be done. I will discuss both.

Conservation in Context

The history of wildlife conservation and research in the United States must be discussed largely in the context of European migration. Some explorers, such as the Spanish, came to the Americas looking for gold and silver. Others, such as the French and English, came to escape an overcrowded Europe, looking for land and economic opportunity. Many came here looking for escape from religious and political persecution. Although initial settlements had very difficult times (about 90% of the Jamestown settlers perished), once established here, the emigrants saw unlimited land and wildlife, with little or no government or laws to restrict their ambitions. As a result, the attitude of Americans, from the first settlers to now, has been independence of the individual and the right to “life, liberty and the pursuit of happiness.” To this day, Americans bristle at attempts of local or federal government to restrict their personal freedoms and independence. Our attitudes towards wildlife are heavily influenced by this perspective.

Wildlife Abundance

Scientists differ about the abundance of wildlife on our continent prior to arrival of Europeans. Earlier textbooks speak of vast numbers of deer, elk, moose and beavers in eastern forests; polar bears, muskoxen, moose and caribou in the northwest; and millions of buffalo and pronghorn antelope along with thousands of grizzly bears and elk in the West. More recent historians note that English settlers had a difficult time finding game to hunt, and that early Spanish explorers do not even mention seeing the bison. Many Native Americans, including the Sioux, Arapaho, Blackfoot, Cheyenne, Cree, Kiowa, Mandan, Pawnee and Shawnee were hunter-gatherers, living off of meat from some large but mostly small mammals, and the nuts, berries and fruits they gathered. Many, however, planted extensive crops, with vast terraced agricultural plantings. In the forests, they had learned the value of fire as a means of land management. Prior to European exploration, it has been estimated that there were as many as 100 million “Indians” in both North and South America. Archeologists, examining animal and bird bones found in camp fire sites, believe that the Native American may have had a significant impact on North American wildlife. It is thought that they hunted mammals for food, but that they decimated large game around their population centers and crops. Once European explorers arrived, however, their diseases quickly decimated the Native American populations, and the wildlife and forests rebounded. The great numbers of deer, bison and antelope occurred after that period. From the 1500’s to the mid 1600’s there were, it is believed about 3 - 5 million Native Americans in what is now the United States. Isolated droughts in the southwest and severe winters in the north also impacted the survival of both wildlife and Native American populations. It is believed that droughts led to the complete elimination of the Anasazi culture in the southwest. It is also believed that in some areas, including what is now Yellowstone National Park, occasional winter die offs of game animals and localized over harvesting led to near starvation of the Native Americans.

As settlers arrived in the East, they cleared land for farming and cut forests for ship building. Eastern tribes, such as the Sioux, migrated westward. At the same time, the land clearing reduced habitat for wildlife. That habitat loss, combined with hunting for food, market hunting, and trapping for furs had a marked effect on eastern wildlife

populations. In the Southwest, Spaniards introduced literally thousands of domestic cattle, sheep, goats and pigs, which competed with grazing wildlife. Importantly, they introduced the Native Americans to horses, which changed their lifestyle and improved their hunting success, but not to the extent that it had much impact on the wildlife populations.

Wildlife Decimation

The new arrivals from Europe, however, began to have a direct impact almost immediately. As early as 1607, Captain John Smith reported that the French were shipping 25,000 beaver pelts per year to Europe, and by 1650, much of the beaver had been eliminated from the entire east coast. The exploitation of the fur bearers in the northeast and Canada was by the French and by England's Hudson's Bay Company. In the Pacific Northwest, the Russian-American Fur Company took seals and sea otters, and by 1768 had extirpated the Steller's sea cow. Bird populations suffered from being taken both for meat and for the plumage, which was used for ladies hats in Europe. Deer and turkey populations also declined, again, largely due to market hunting. In 1748 alone, South Carolina shipped 160,000 deer pelts to England. As wildlife populations declined, the settlers at first blamed it on predators. In 1630 the Massachusetts Bay Colony offered a bounty of one shilling for each wolf killed. When the deer did not rebound, the city of Portsmouth, Rhode Island enacted the first closed season on deer hunting in 1646. This was only the beginning of American's game management efforts, as well as America's never-ending conflict over our attitude towards predators.

As the nation expanded, the new settlers moved westward, where land and wildlife seemed free and unlimited. It is estimated that there were about 25 million buffalo and 10 million pronghorn in the west at that time. Land purchases, such as the Louisiana Purchase, the War with Mexico, the Oregon Compromise, the Gadsden Purchase and the purchase of Alaska fulfilled the concept of "Manifest Destiny" – or an America that spanned from coast to coast. President Thomas Jefferson sent the famed Lewis and Clark Expedition from St. Louis, Missouri to the Pacific Northwest in 1804. Although they encountered isolated stretches with little game, they found abundant herds of buffalo and deer, as well as grizzly bears and prairie dog towns a mile square. By the early 1800's trading posts had been established across the west, encouraging the Native Americans to harvest game for their hides. In 1830 Congress passed the Indian Removal Act, removing all title to lands from Indian tribes and moving many Native Americans to reservations in Oklahoma. By then, most of the beaver were gone from the country, and silk had replaced beaver for the manufacture of men's hats. The former trappers became buffalo hunters. In 1833 alone the American Fur Company shipped 43,000 buffalo hides, mostly traded for from the Native Americans. Buffalo meat was also used for camp towns and for crews building railroads to the west. There was wanton wastefulness, with many buffalo being killed solely for their tongues, which were considered a delicacy. By the mid 1840's a noticeable decline in buffalo numbers was already evident.

The California Gold Rush of 1848 brought thousands of settlers westward, as did the Mormon migration to Salt Lake City. The population of the U.S. nearly doubled from 17

million to 32 million between 1840 and 1860. The Civil War, from 1861 – 1865 slowed the Western expansion, market hunting, and any thoughts of conservation. It also reduced our population by 600,000, more than all of our other wars combined. But the Homestead Laws of 1862 allowed anyone to mark out 160 acres of land for private ownership at no cost - if they would live on it for 5 years. This of course led to the final Indian Wars, as settler's crowded Native Americans out of their traditional hunting grounds and onto reservations in Oklahoma and the Dakotas.

Market Hunting

The 1870's saw the final decimation of the bison herds. In 1871 Col. R. I. Dodge reported one herd in Colorado being 50 miles wide and 20 miles long, estimated at 4 million head. But the influx of hunters and railroads made shipment of hides, meat and tongues very profitable. The famous "Buffalo Bill" Cody, a hunter for the railroad, once killed 69 in a single day, and 4,240 in an 18-month period. Other hunters were actually more successful than he. The annual kill in 1865 was 1 million; by 1871 was 5 million/year. Most bison were taken just for their hides, with the rest of the carcass being left to rot. In 1864 Idaho imposed the first closed season on bison hunting, and Colorado and Kansas followed in 1875. However, in 1876, the annihilation of Gen. George Armstrong Custer and 276 soldiers of the 7th Cavalry at the infamous Battle of the Little Big Horn outraged the public and sealed the fate of both the Native Americans and the bison. Congress passed a bill that would have stopped the slaughter of the bison, but President Grant vetoed it. The Army knew that extermination of the bison would lead to control of the Native Americans. A complete census in 1886 reported that there were only 540 bison left in the entire United States, mostly in the Yellowstone area of Montana.

The disappearance of the bison became one of the rallying cries for those concerned about the future of wildlife in the United States. Another was the demise of the passenger pigeon. Today it is hard to imagine the abundance of this bird. In 1806, Alexander Wilson, an ornithologist for whom the Wilson Society is named, recorded a flight a mile wide and 40 miles along, estimated to be over two billion birds. In 1813, James Audubon, famous artist and ornithologist, observed in one day a flight 55 miles long which held an estimated 1 billion birds – and the flight continued two more days. Market hunters, using cannon-like "punt guns," nets, and even clubs decimated these flocks, as well as populations of ducks, swans and geese for the meat market in America and Europe. The last passenger pigeon died in the Cincinnati Zoo in 1914.

The Start of Conservation Movement

Early settlers had little time for sport hunting, and wildlife was viewed as a source for sustenance and profit. Naturalist's publications, such as the essay *Nature* by Ralph Waldo Emerson or the book *Walden* by Henry David Thoreau had little impact until generations later. Nonetheless, the concept of wildlife as a "public trust" became codified in law. In 1842 the U.S. Supreme Court, in the case of *Martin v. Waddell*, denied a landowner's claim to exclude others from taking oysters from some mudflats in

New Jersey. The judge quoted the Magna Carta (1215), and codified the concept that in the United States, wildlife and fish belong to all the people, and stewardship of those fauna is entrusted to the individual states. This guaranteed the food supply at the time, although it continued to apply as wildlife became valued for sport, aesthetics, spiritual and cultural reasons. This is the basis for what we now call the North American Model of Wildlife Conservation.

It was not until the nation became more prosperous that sport hunters would become the impetus for early conservation efforts. Landowners and businessmen, who no longer had to hunt for subsistence, formed clubs of like-minded friends to promote comradeship, a kinship with the pioneer spirit, and ethical hunting practices. The first sportsman's club was the Carroll's Island Club, formed in 1832 near Baltimore, Maryland, largely for waterfowl hunting. In 1844 the New York Sportsmen's Club was formed, which drafted model game laws recommending closed hunting seasons on woodcock, quail, and deer as well as on trout fishing. These laws were passed by the Orange and Rockland Counties of New York in 1848. Many of the club members were attorneys, and they personally sued violators to encourage compliance with the law. Eventually, hundreds of local sportsmen's clubs were formed across the country, and similar game laws were passed. In addition to game limits and seasons, some states outlawed use of dogs for hunting and hunting at night with lights, and others banned the use of traps, snares and pitfalls, which were common at the time. Maine was the first state to employ a game warden, in 1852.

Preserving Lands for Public Use

During the 1870's much of North America was still being explored and surveyed. In 1870, a group of explorers pleaded with the governor of Montana that the Yellowstone area was too beautiful to be exploited for profit, and it should be held in trust for the entire public. In 1872, President Ulysses S. Grant established the first national park, Yellowstone, encompassing 3,348 square miles. The law had little effect, however, and the U.S. Army was dispatched to guard the park from "squatters" and poachers for a period of more than 10 years. The Yellowstone Park effort was aided by a young, affluent politician named Theodore Roosevelt. Roosevelt was a 23-year-old Harvard graduate and member of the New York Legislature when he went on his first buffalo hunting trip in North Dakota in 1883. He had been sickly and weak as a child, and he developed his strength through weight lifting and boxing. He became an avid and adventurous outdoorsman and hunter while in North Dakota. The following year he lost his wife and mother a few hours apart, and returned to the North Dakota for three years to reflect on his life and then to purchase and establish the Elkhorn Ranch. Roosevelt was a cowboy and a hunter who loved trophies but who felt a near spiritual kinship with nature. He detested the decline of the buffalo.

Roosevelt the conservationist was born in the Dakota badlands during those years, and he was to become the most active President in the history of American conservation. In 1887 he gathered a group of influential American hunters in New York to form the Boone & Crockett Club with a mission of preserving the big game of North America. One of the members, an outspoken editor named George Bird Grinnel, wrote numerous

articles in his magazine, *Forest and Stream*, about the plight of Yellowstone. In 1894, President Grover Cleveland signed the Yellowstone Protection Act, making the park the first wildlife refuge in the nation and guaranteed funding and administration. Another early conservationist, John Muir pushed for the establishment of Yosemite National Park and other parks in California. Muir was a “preservationist” who believed public lands should not be used for timber harvesting or hunting. Roosevelt, the conservationist, believed lands for public use should also be used for multiple purposes. Muir later formed the Sierra Club in 1890. The philosophical argument over “preservation,” or strictly limiting access of public lands, versus “conservation,” to include recreation, grazing, logging and hunting on public lands continues to this day in the United States.

The Impact of Clubs and the Media on Conservation

One cannot understate the influence of the formation of sportsmen’s clubs, conservation organizations, scientific societies and the print media as part of the American conservation movement. Magazines such as the *American Sportsman* (1871), *Forest and Stream* (1873), *Field and Stream* (1874) and the *American Angler* (1881) informed readers of both the bounty and the plight of western wildlife. Attitudes of the public changed, as they saw some species of wildlife disappear due to market hunting. They came to realize that natural resources in America were not unlimited, and that conservation efforts should be employed. The American Association for the Advancement of Science (AAAS) in 1881 pressured the Secretary of Agriculture to form the Forestry Division, which was later to become the U.S. Forest Service. In 1891 the American Forestry Association and the AAAS convinced Congress to establish national forest reserves. By then the U.S. General Land Office and the U.S. Geological Survey had been formed to survey and keep track of federal lands.

Gilford Pinchot was named Director of the Forestry Division. Pinchot was trained in Europe, as there were no forestry courses in American universities at that time, but he understood that forests could be both utilized for timber, wildlife and watershed, and conserved through “sustained yield” management. In fact, it was he and his staff that developed the word, “conservation,” derived from the British word, “conservator.” He led a survey of American forests with the AAAS, and in 1896 President Grover Cleveland added over 21 million acres to the forest reserves and established Grand Canyon and Mount Ranier as national parks. In 1904 Pinchot became the first Director of the U.S. Forest Service, and became widely known as “the father of American forestry.” About the same time he also formed the Society of American Foresters, an organization comprised of those working in the forestry profession. In 1905 they held the first American Forest Conference to bring together managers, educators and scientists.

During the 1870’s and later, dozens of additional hunting, conservation, and scientific organizations were formed, including the League of American Sportsmen, the American Ornithologist’s Union, the Camp Fire Club, the New York Zoological Society, the Audubon Society, and the American Bison Society. These groups, along with local sportsmen’s clubs, lobbied for stricter laws to stop market hunting for meat and the millinery trade, to ban unethical sport hunting, and to begin game restoration efforts.

They recognized that states had difficulty enforcing their game laws. In 1900 Congress passed the Lacey Game and Wild Birds Preservation and Disposition Act, the first national legislation for wildlife conservation. This law made it a federal offense to transport wild game across state borders if they were taken illegally. It also strictly controlled the importation of exotic species. This strengthened state game laws, and it helped stop the trade in plume and feathers as well as poaching and smuggling of wildlife meat products.

In addition, sportsmen's clubs started wildlife restoration efforts. An interesting result was the importation of 28 ring-neck pheasants, brought to Oregon in 1881 from Shanghai, China. Gamebird farms blossomed, raising birds in captivity and releasing them into the wild. Pheasant hunting is now popular through much of the United States, and few Americans recognize this bird as an exotic species. Destructive logging techniques during that period actually led to better deer habitat as more diverse vegetation replaced the mature forests. In 1878 a sportsmen's club in Vermont was the first to trap and restock deer. Other states followed.

Pressure from these sportsmen's, conservation and scientific organizations also impacted natural resource education. The Land Grant Act, signed by President Lincoln in the middle of the Civil War in 1862, established agricultural and technical colleges in all states, to make college education in agriculture and engineering affordable to "the sons and daughters of farmers and mechanics." Later legislation established the Agricultural Experiment Station System and the Cooperative Extension Service, with joint funding from the state, federal and county governments. In 1898, Cornell University began offering courses in forestry, and in 1900 Yale University established the first School of Forestry. Within three years forestry schools opened at the universities of Maine, Michigan, Minnesota and Michigan State. Wildlife was not yet a scientific or management discipline of its own, as most studies of biota were still of a taxonomic sort, found in botany and zoology programs.

The Theodore Roosevelt Era

When Teddy Roosevelt became President in 1901, a new era of wildlife conservation began. Roosevelt was advised by Gilford Pinchot, George Bird Grinnell, and to some extent, John Muir. Roosevelt formed the Agriculture Department's Division of Economic Ornithology and Mammalogy, which soon became the Bureau of Biological Survey, and tasked it with surveying the nation's biota. It was initially a research organization, but was given policing powers with the passage of the Lacey Act. Maj. John Wesley Powell, the well-known explorer of the Grand Canyon, became Director of the Geological Survey. He supported the Reclamation Act of 1902, which authorized over 30 federally funded reservoir and dam projects. Although this legislation was not directly associated with wildlife, it had a major impact on future wildlife populations. It recognized the authority of the United States Government over the rights of states in national natural resources issues, and, it led to the development of significant irrigated farming in the west.

During this period, the nation's assault on predators continued on both private and public lands, as it was believed they harmed both domestic livestock and wildlife populations. In the Kaibab Plateau of Arizona, a herd of 3,000 deer on about one million acres was thought to be in decline. The government hired hunters and trappers to kill 120 bobcats, 11 wolves, 674 cougars and over 3,000 coyotes. By 1924 the deer herd had grown to 100,000 animals. In a severe winter that year, 60,000 deer died of starvation. This episode was later to become a national example of the perils of predator control as a means of managing wildlife populations.

Teddy Roosevelt believed in protecting as much land as possible for public use. In 1903, Pelican Island, Florida became the first unit of the National Wildlife Refuge System, which now encompasses over 40 million acres. In 1908, he added additional refuges in Alaska, Oregon, Florida and Nebraska. That same year Roosevelt appointed the National Conservation Commission, which was tasked with inventorying the national forests, waters, and minerals and recommending management strategies. In all, Roosevelt set aside 148 million acres during his presidency, over 50,000 acres for each day he was in office, including 16 national monuments, 51 wildlife refuges, and 5 national parks.

Conservation Efforts Continue

It was not until 1913 that Congress addressed the problem of market hunting of waterfowl. The Weeks-McLean Migratory Bird Act of 1913 again asserted the federal government's power over state's rights and let the Secretary of Agriculture set hunting seasons and limits. Three years later the United States signed a Treaty with Great Britain for the Protection of Migratory Birds in the United States and Canada. This landmark legislation was the first between countries to protect wildlife.

By 1910 every state had some sort of commission for the protection of wild game and fisheries. The National Association of Game Wardens and Commissioners became the International Association of Game, Fish and Conservation Commissioners (now known as the Association of Fish and Wildlife Agencies). But funding was still a problem. In 1913 Pennsylvania was the first state to issue a hunting license. When more than \$ 300,000 came into the state's treasury the next year, many other states followed suit. These funds paid for wildlife restoration efforts, enforcement of game laws, and predator control. Predators interfered with livestock operations, but hunters also still believed that predators limited game abundance. Many states paid bounties for wolves, cougars, foxes, coyotes, bobcats, hawks, owls and even eagles.

Debates continued in the state houses and at the national level over the concepts of preservation versus conservation. Dr. William T. Hornaday, superintendent of the National Zoo, published *Our Vanishing Wildlife* in 1913 and led his followers to oppose hunting. He actively opposed the concept of the Migratory Bird Act, as well as federal funding of waterfowl restoration through hunting fees. Other organizations listed above, plus new ones like the Izaak Walton League, Forests and Wild Life, and American Wild Fowlers (later to become Ducks Unlimited) were created by hunters and conservationists. Scientists formed the Ecological Society of America in 1914 and American Society of

Mammalogy in 1919. Both societies were to then publish scientific journals. Wildlife science began to move beyond taxonomy. The scientists had a close relationship with the Biological Survey, and together they developed better methods of censusing wildlife and studying food habits, cover requirements and disease issues on the national parks and refuges. As ecology developed as a discipline, the concepts of plant succession, niche, community scales, trophic levels, and food chains were developed and debated in the U.S. and abroad.

Preservation of public land continued, with the formation of national parks at Glacier (1910), Lassen (1916), Denali (1917) and the Grand Canyon (1919). The National Park Service was formed in 1916 to manage these lands and their wildlife. The NPS was eager to sustain wildlife in their parks for visitors to see. They too hired scientists to study the natural resources they managed. Efforts by the NPS were instrumental in saving the trumpeter swans, grizzly bears, bighorn sheep and wild burrows. Still, however, there was little funding at the national level to support wildlife research.

In 1937, the scientists, with the help of the conservation groups, lobbied Congress to pass the Pittman-Robertson Federal Aid in Wildlife Restoration Act (P-R Act). This act utilized an 11% “excise” tax on all hunting weapons and ammunition. The funds are collected by the federal government and distributed to the states based on the number of hunting licenses they sell, their population and their land area. The Act provides 75% of the funding, which must be matched by 25% from the states. The funds are used for wildlife restoration projects, research, and education, and they cannot be used for any other purpose. This is still one of the major sources of funding for wildlife research in the United States.

Wildlife Management and Research Begin to Merge

The 1930's were the beginning of wildlife management research in the United States. The leader of this effort was Aldo Leopold. Although trained as a forester at Yale, he became “the father of wildlife management” in the United States. Working for the U.S. Forest Service in New Mexico, later for their Forest Products Lab in Wisconsin, and then as a consultant for the Sporting Arms and Ammunition Manufacturer's Institute, he conducted the first intensive analysis of wildlife populations in the mid-west. In 1933 he became the first professor of game management at the University of Wisconsin and published *Game Management*, the first book of its kind in the U.S. In it he said, “We have the scientist, but not his science, employed as an instrument of game conservation.” Leopold was well known for his many essays on “the land ethic,” and he developed a set of wildlife management principles, including the concepts that every species has a defined set of habitat requirements that sets it apart from all other species, that all animal and plant biota are interconnected, and that the habitat has a seasonal “carrying capacity,” which should not be exceeded. He said the tools of wildlife management were “the ax, the plow, the cow, fire and the gun.”

The Stock Market Crash of 1929 and the dust bowl era of the early 1930's were disastrous for American wildlife. Pressure from livestock growers and the public pushed

the Biological Survey towards predator control as its primary mission. They formed the Division of Predator and Rodent Control (PARC) (later to become Animal Damage Control and then Wildlife Services under the Department of Agriculture), and much of the federal funding for other programs was cut at the same time waterfowl and gamebird habitat was disappearing in the Midwest. Wildlife conservation and restoration needed more funding, and in 1934 Congress passed the Migratory Bird Hunting Stamp Act. Since waterfowl are migratory across state boundaries, their seasons and bag limits are set by the federal government, and hunters must purchase a “Duck Stamp” to affix to their state hunting licenses. These funds have now protected over 4.5 million acres of waterfowl habitat.

During the Depression the Civilian Conservation Corps employed thousands of out-of-work factory workers and farmers. They helped to develop thousands of acres of waterfowl breeding grounds. President Franklin Roosevelt hired political opponent Jay “Ding” Darling, a political cartoonist critical of the New Deal wildlife programs, to head the Bureau of Biological Survey. He was an enthusiastic leader, and he enhanced the morale of the Bureau. He saw the need to develop wildlife research programs and to enhance educational programs to produce wildlife managers and biologists. In 1934 he urged Congress and private organizations to establish the Cooperative Wildlife Research Unit Program, the American Wildlife Institute, the North American Wildlife Federation, the North American Wildlife Institute, and the North American Wildlife and Natural Resources Conference.

The Cooperative Wildlife Research Program established research units of 2 to 4 biologists at 10 land grant universities, with funding supplied by the Bureau of Biological Survey, the universities, the American Wildlife Institute (later the Wildlife Management Institute), and the state fish and game agencies. These units provided research on practical wildlife problems, taught university courses, and helped to train thousands of biologists. There are now 40 such units in the country. The Wildlife Management Institute receives its funding from the sporting arms and ammunition industry, and it lobbies for conservation laws and conducts professional reviews of university wildlife programs and state wildlife agencies. It also annually convenes the North American Wildlife and Natural Resources Conservation Conference of scientists, state and federal agency personnel and non-governmental conservation organizations. The first meeting, held in 1935, produced more information in its Proceedings than had ever before been accumulated in one volume on wildlife in North America. The North American Wildlife Federation later became the National Wildlife Federation, a private organization of over 2.5 million members, and the North American Wildlife Institute later became the North American Wildlife Foundation, a private granting agency of the federal government.

Other accomplishments during the New Deal were the construction of dozens of national parks, restoration of streams, and the planting of millions of trees by the Civilian Conservation Corps; the passage of the Fish and Wildlife Coordination Act to force federal agencies to talk to each other; and the establishment of the Soil Conservation Service (now called the Natural Resources Conservation Service). These improvements had a powerful positive effect on wildlife in North America – restoring deer to the

northeast and waterfowl to the mid-west. In 1930 a committee headed by Aldo Leopold developed a Model Game Law, recommending that states set up wildlife commissions of volunteers, appointed by governors, for staggered terms. That eliminated the problem of turnover of state wildlife agency personnel caused by new governors firing supervisors after each election. The P-R Act prohibited the governors from re-directing its funds to other uses.

The Wildlife Society, an organization of professional wildlife biologists, was formed in 1936 and the first issue of *The Journal of Wildlife Management* was published the next year. The American Fisheries Society and the Society for Range Management also represented professionals and published scientific journals. Just before World War II the Bureau of Fisheries in the Department of Commerce and the Biological Survey of the Department of Agriculture were merged into the U.S. Fish and Wildlife Service under the Secretary of the Interior. This was significant, as governmental leaders recognized that fish and wildlife were more than crops to be grown and harvested.

WW II and the 1950's

As with the Civil War and World War I, conservation efforts took a backseat during World War II. After the war, however, returning service men bought hunting licenses by the thousands. Sales went from 7 million per year before the war to 12 million by 1947. States benefited from the influx of hunting license fees and the P-R funds they generated, as did federal agencies from the sale of duck stamps. Unused P-R funds had accumulated during the war, and were now available for larger projects. Large restocking efforts resulted for deer, pronghorn, elk, mountain goats and sheep, bears, beavers and turkeys. By then most land grant universities had wildlife departments, and the G.I. Bill allowed returning service men and women to pursue wildlife biology as a profession. In 1948 Aldo Leopold died, and his final essays were published in a book entitled, "*A Sand County Almanac*." This became a "must read" for Americans interested in conservation for generations to come.

During the 1950's support for conservation took a downturn as the federal government, concerned for military threats in Europe, redirected funds towards increasing the size and power of America's military. Funding for fish, wildlife, park and forest programs diminished, and logging and grazing leases, as well as oil and gas exploration leases were granted on public lands. In 1950, concern over funding for restoration of our fresh-water fisheries led to the Dingell-Johnson Federal Aid in Fisheries Restoration Act (D-J Act) The act was funded by an excise tax on fishing equipment and boats, and it functioned much as the P-R act did for wildlife. The Magnuson Act was passed to separate commercial fisheries from the U.S. Fish and Wildlife Service and pass it to a new U.S. Fisheries Commission. Americans, however, flocked by the millions to our national parks, wildlife refuges, seashores, and forests, thus establishing recreation as an integral component of the natural resource value of our public lands. In response to the decrease in federal land acquisition, The Nature Conservancy was formed in 1951 to preserve lands the government could not afford. It is now the wealthiest conservation organization in the nation, protecting 15 million acres in the U.S. and 102 million acres worldwide.

Bird watching became a popular pastime with the publication of Roger Tory Peterson's *A Field Guide to Birds*. Disney Studios had a huge impact on the public's attitude towards nature, with the feature film *Bambi* and television documentaries, like *The Living Desert*.

This new prosperity and growth brought with it more commercial development of land for housing and agriculture, loss of habitat, and concentrated farming and livestock operations. Farming efficiency was helped not only by mechanization, but by liberal use of pesticides and herbicides. One of the most notorious was DDT. This was an effective pesticide, but it was released before being adequately tested. As early as 1946 it was found to be lethal to crustaceans, like crabs and crayfish. As insects became impervious to DDT, other chemicals, such as chlordane, dieldrin, aldrin, and methoxychlor went on the market. Wildlife biologists first reported songbirds dying, followed by brown pelicans, ospreys and bald eagles. Researchers at the U.S.F.W.S. Patuxent Wildlife Research Center in Laurel Maryland fed these chemicals to wildlife and proved that they were toxic.

Wildlife Become Part of the Environment

In 1962, a former USFWS editor, Rachel Carson, published her book, *Silent Spring*, documenting the impact of these chemicals on the environment, especially on wildlife. She predicted a future of spring seasons when no birds would be heard. This resonated with the public. No book before or after has had as great an effect on arousing the American public's awareness of environmental concerns. It literally set the stage for the future environmental movement for the next three decades. Chemical companies tried to discredit Carson, but President Kennedy defended her and made the environment part of his political platform. He also signed the Land and Water Conservation Fund to acquire land for scenic, recreational and public values. In 1964 President Lyndon B. Johnson passed the Wilderness Act, incorporating areas of 5,000 or more roadless acres into Wilderness Areas to remove them from the National Forest inventory and placing them into national parks and wildfire refuges. Next, Johnson signed the Wild and Scenic Rivers Act, setting aside seven major rivers for recreational and conservation purposes.

Concerns over pesticide toxins led eventually to more concern over predator control techniques. Common methods for killing predators included the use of sodium fluoroacetate (Compound 1080), and "coyote getters," explosive shells filled with cyanide pellets, as well as the use of strychnine and thallium poisons. These devices and poisons killed all manner of small mammals, hawks and even eagles. The Predator and Rodent Control (PARC) division of the USFWS was renamed the Division of Wildlife Services, and was later moved to the Department of Agriculture. Under the Nixon Administration, an Executive Order prohibited the use of chemical poisons on all public lands. In response to public outcry over the potential loss of our national bird, the Bald Eagle and other species, in 1969 Congress passed the Endangered Species Conservation Act, but it had little in the way of enforcement power or funding. Congress followed by a tougher Endangered Species Act (ESA) in 1973. It defined and divided species and subspecies into threatened versus endangered. It eliminated all commercial traffic in live, dead, parts or products from endangered species, and it funded research on why species were

becoming threatened and how to recover them. The act defined “critical habitat,” included harassing wildlife to be a “taking,” set substantial fines, and required teams of scientists and managers to develop recovery plans for each endangered species. Early endangered species included wolves, whooping cranes, Key deer, peregrine falcons, bald eagles, alligators, Kirtland’s warblers, and California condors. Captive breeding programs were often begun as part of the restoration projects. The U.S.F.W.S. and the National Marine Fisheries Service were given authority to enforce the act. The ESA is often touted as the most significant conservation legislation ever enacted in the United States. It continues to be the basis and the source of funding for wildlife research, though the funding is far below what is needed for this enterprise.

Surprisingly to many, the Nixon administration was one of the most environmentally progressive of all American presidencies. In addition to the ESA, Nixon signed the Marine Mammal Protection Act, the National Environmental Policy Act (NEPA), the Clean Air Act, and the Clean Water Act, and he established the Environmental Protection Agency. These acts, taken together, had a monumental impact on guiding what could and could not be done with America’s natural resources, and clearly established the environment as an issue of national importance. The NEPA led to the Council on Environmental Quality, which requires environmental impact statements on all government projects. It also requires open hearings for public input, thus making environmental decision making a democratic process. The EPA is now one of the major funding sources for wildlife research, in addition to being an environmental enforcement and research agency. In 1969, the United States signed the Convention on International Trade in Endangered Flora and Fauna Species Act (CITES) making it illegal to import or export items made from endangered species.

In 1980, the Alaska National Interest Lands Conservation Act expanded the National Wildlife Refuge System by 53 million acres. A Fish and Wildlife Conservation Act was passed to do for non-game species what the P-R and D-J acts had done for game species. Unfortunately, no funding was provided. Funding for federal agencies and university continued to lag for the next two decades. Nonetheless, conservation groups found a new source of revenue for preserving wildlife habitat and for restoration projects. The federal Farm Bill establishes the authority and funding for the Department of Agriculture and its many crop subsidy and price support programs. It is renewed every five years. During the 80’s and 90’s conservation became more prominent each time the bill was renewed. Programs such as the Conservation Reserve Program (CRP), the Wetlands Reserve Program (WRP), the Wildlife Habitat Incentive Program (WHIP), the Grasslands Reserve Program (GRP) and the Environmental Quality Incentive Program (EQIP), all managed by the Natural Resources Conservation Service, provided private land owners with payments to take land out of production or to make conservation improvements. Most states developed similar programs.

During the Clinton Administration, Secretary of the Interior Bruce Babbitt felt that there was too much duplication among the scientific research projects by the many agencies of that Department, so he reassigned all Interior scientists to a new organization called the National Biological Survey and later renamed the Biological Resources Division of the

U.S. Geological Survey. Although that may have improved federal efficiency, the field resource managers of the National Park Service, the Bureau of Land Management, the U.S. Fish and Wildlife Service and others felt they had lost control over the research they needed. Subsequently these agencies formed a coalition with university researchers to conduct the needed research, as well as additional educational and outreach programs. The organization, known as the Cooperative Ecosystem Studies Units, is comprised of 270 universities organized into 17 regions, and allows funding from more than a dozen federal agencies to flow to the academic researchers.

But as we entered the 21st century, funding for non-game species was still inadequate. A concerted effort to correct this was developed and supported by over 3,000 conservation organizations. Termed the Conservation and Reinvestment Act (CARA), it would have used an excise tax on outdoor recreational items, like canoes, binoculars, and birdseed to provide \$ 350 million a year to the states in much the same manner as the P-R and D-J acts. A few equipment manufacturers supported this, but many others strenuously opposed it. A compromise was reached in 2001 with “CARA-lite,” now called the State Wildlife Grants Program, which diverted \$ 50 million a year from the U.S.F.W.S. budget. The funds are awarded competitively and require a match of 25 – 50% from the state. Importantly it required each state to develop a comprehensive wildlife conservation plan, approved by the U.S.F.W.S. Those were completed in 2005. This funding has increased each year, and some of the money is set aside specifically for Native American tribes.

Continuing Problems and New Opportunities

The United States government owns or controls 761 million acres, or about 1/3 of the total land mass of our country. It is clear that the United States now has just about all the public land it will ever have, and that its wildlife resources are limited. Our population continues to grow, utilizing more and more food, goods and services. Forests and farmlands are being converted for commercial uses at alarming rates, removing wildlife habitat and fragmenting what is left. Water quality is a concern, and water quantity is restricting development and wildlife habitat in some areas. The basic infrastructure in our national parks and monuments is poor, and decades of fire suppression have led to devastating fires in our national parks and forests. Overpopulation of some species, game ranching, and international travel have led to outbreaks of wildlife-domestic-animal-human diseases in our wild mammal and bird populations, including West Nile Virus, Chronic Wasting Disease, brucellosis, and tuberculosis.

Our American economy thrives on energy, and there are increased political efforts to expand oil and gas exploration in our national parks and refuges, such in the Alaska National Wildlife Refuge and off of our coasts. Hunting, although still generally supported by the non-hunting public, is declining as a recreational activity. Animal rights and welfare groups, such as the People for the Ethical Treatment of Animals (PETA), have organized public support to ban trapping in some states and hunting of carnivores such as bears and cougars. Human-wildlife conflicts have increased, including millions of deer killed on our highways and multiple cougar and bear attacks on humans each year. There are still political threats to the future of the Endangered Species Act, and

some hunting groups favor the private ownership of wildlife. Polar Bears may soon be listed as endangered, and Alaska Board on Game want to reduce their wolf packs by aerial gunning. Enrollment in natural resources academic programs has been declining for a decade, as state and federal agencies have not had the funds to hire new employees. Climate change threatens our entire society, and yet we are slow to respond to the threat of global warming. Funding for wildlife research in 2007 remains at about the 1980's level, as the war in Iraq absorbs more of the federal budget.

On the other hand, surveys show that the American public feels the environment, natural resources and wildlife are very important. Funding for scientific research, such as through the National Science Foundation, continues to increase. New technologies, such as the use of satellite radio tracking, GIS mapping, and DNA genetic analysis provide new tools for the study of conservation science. The development by the U.S.F.W.S. of the Safe Harbor concept, wherein landowners are not penalized if their managed lands attract endangered species, has provided flexibility to farmers and ranchers. Some species, once at risk of disappearing, such as the bison, timber and gray wolves, bald eagles, peregrine falcons, the American alligator, and grizzly bears have made spectacular comebacks. There are more deer and turkeys in the U.S. now than ever before. Private landowners, looking towards hunting leases and eco-tourism as means of income, see the value of conserving their wildlife and wild lands. The Conservation Directory, published annually by the Wildlife management Institute, lists over 1,600 private conservation organizations. Hundreds of private land trusts and local governments raise money to purchase important habitat land for greenways, or buy permanent conservation easements to restrict commercial development. Slowly, the concept of paying private landowners for "ecosystems services" is developing in the U.S. A carbon trading market has already developed, and some entities are beginning to pay landowners for their watersheds and endangered species habitat.

Lessons Learned

The North American Model of Wildlife Conservation, based on the Public Trust Doctrine of public ownership of wildlife, has had a checkered history, but in general it has served us well in the United States. Unfortunately, few Americans currently know of or understand this history. Wildlife conservation is a political issue, with multiple stakeholders. Conservation issues, such as drilling for oil in the Alaska National Wildlife Refuge, control of urban deer, or shooting wolves become highly emotional in our society. As our population becomes more urbanized and children spend less time outdoors, the public, though supportive of conservation, becomes less knowledgeable and less able to make informed decisions. It is thus critical that we wildlife researchers and managers provide public and private educational programs to inform our citizens about the choices before us. If our research is to be supported and funded by the public, it must first be valued by the public. It is critical that every research project, no matter how basic or esoteric, include justification for its management implications, its social value, and its political implications. Researchers must step out of their labs and field stations and become educators, not only of their students but of the public at large. Furthermore, they must become activists in the sense of educating political decision makers, so that science

becomes the basis of conservation policy. If we do not, then the democracy of conservation will be in peril, as will the very plants, birds and animals that we study.

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