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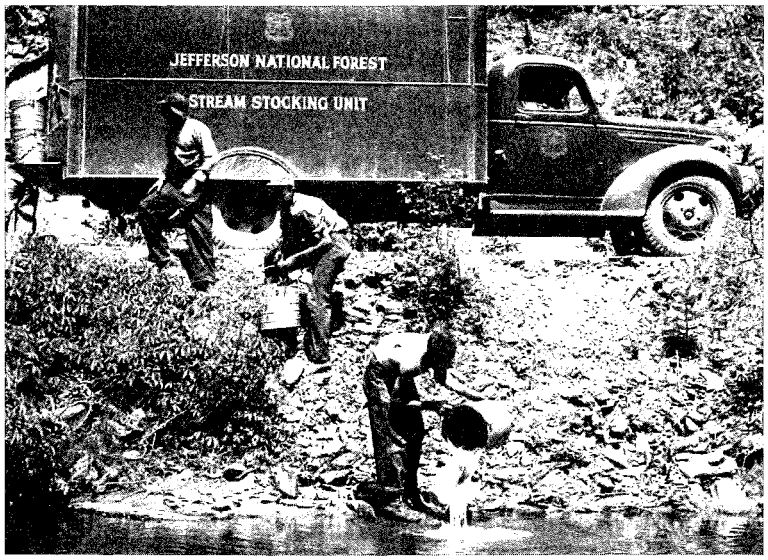
Forest Service

October 1998

The Fish and Wildlife Job on the National Forests

A Century of Game and Fish Conservation, Habitat Protection, and Ecosystem Management



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Dear Reader:

"The Fish and Wildlife Job on the National Forests" - you are holding in your hands a history which is well worth your time to read. It was prepared by Historical Research Associates from agency files and with the assistance of many current and retired employees, and others familiar with the agency. As you will see, we have come a long way in the management of fish and wildlife resources since the end of the last century. It has been an interesting evolution, with many players, significant achievements, and, yes, some costly mistakes. Parts of the book are painful to read. But the true importance of this book is not in laying bare all of our past sins or in placing blame, but in considering the journey, and the progress we've made in moving fish and wildlife management into mainstream national forest management. By considering the lessons learned from the past, we can be better conservation leaders today and in the future.

With over 191 million acres of public multiple-use lands administered by the Forest Service, the "Fish and Wildlife Job" has been daunting at times. As biologists, we have had to become specialists in areas we never anticipated - economics, marketing, sociology, and conflict resolution, to name a few, all while staying on the cutting edge of our areas of biological expertise. As society's values have changed, and as public opinions on how these lands should be managed have become increasingly diverse and polarized, our management of National Forest System resources has also changed and become even more complicated.

While this book is in large part written from the perspective of fish and wildlife biologists, it is important to remember that little, if any, of the progress that has been made in integrating sound management of fish, wildlife and rare plant resources into the way we do business would have been possible without the support, dedication, and efforts of countless other Forest Service employees and our tremendous partners.

Enjoy this fascinating historical journey, consider it's lessons, and think about what the 2099 edition of this book might contain.

Harv Forsgren

HARV FORSGREN
Director
Wildlife, Fish and Rare Plants

Enclosure

THE FISH AND WILDLIFE JOB ON THE NATIONAL FORESTS:

A Century of Game and Fish Conservation, Habitat Protection, and Ecosystem Management

Prepared for

Theodore Catton
Lisa Mighetto

Historical Research Associates, Inc.

PREFACE

The "fish and wildlife job" in the USDA Forest Service has never been easy. Although early conservationists intended that the first national forests would protect game and fish as well as other resources, the agency devoted much of its attention to rangelands and watershed restoration in the early 20th century, and to timber harvesting and reforestation after World War II. From the outset, wildlife and fisheries biologists in the Forest Service had to compete with livestock and lumber interests.[1] In recent years, public criticism of forestry, grazing, fire management, and mineral extraction practices and their effects on wildlife and fisheries have further complicated relations within the agency as well as with local communities. Even so, the Forest Service's interest in protecting wildlife, fish, and rare plants has increased throughout the 20th century, gaining considerable momentum since the 1970's. This is the story of that development, from the work of the first forest rangers during the late 19th century to the current efforts of wildlife and fisheries biologists and other professionals to protect sensitive species and preserve biodiversity a century later.

This book is organized into three sections. The first of these explains wildlife and fisheries work in the early years, from the turn of the century to the 1930's. Reflecting conservation thought at the time, the Forest Service initially focused on saving game populations through enforcing hunting restrictions, establishing refuges, and eliminating predators. By the 1930's, the science of game management had encouraged an emphasis on habitat management and research. At that time, agency personnel also expanded protection efforts to include nongame animals. The second section outlines how the Forest Service cooperated with other agencies to develop habitat management programs for wildlife and fisheries, from the 1930's to the 1970's. The final section examines protection of threatened and endangered species, and the introduction of ecosystem management during the late 20th century.

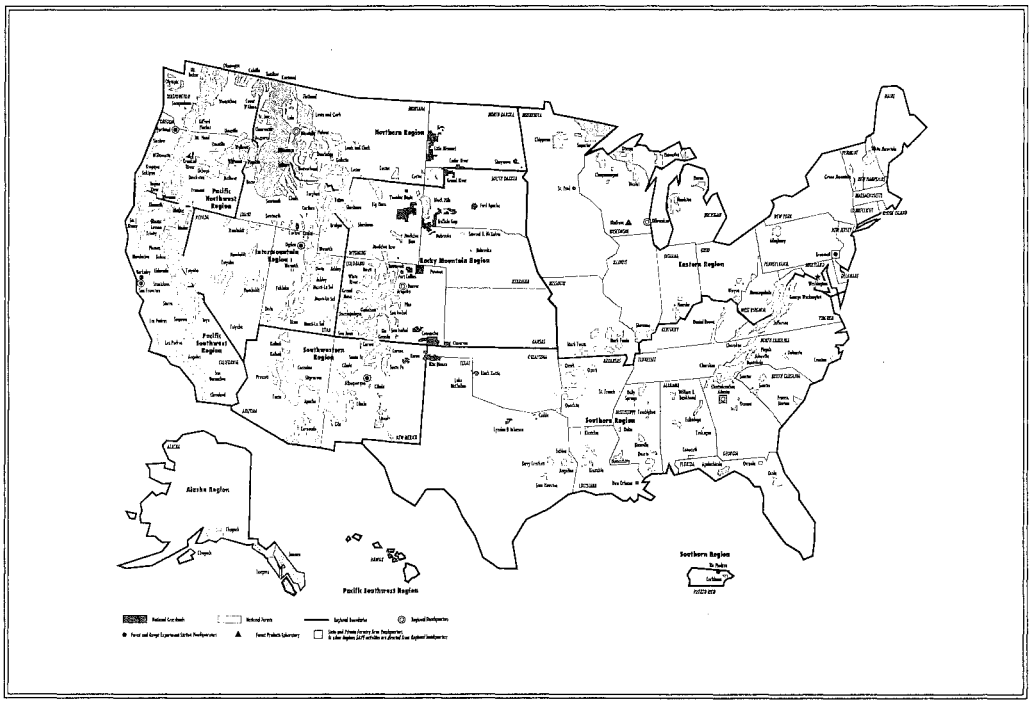
A major theme of this book is how changing values have affected the culture of the Forest Service during the last 100 years. At the outset, the agency's view of the natural world was commodity-driven—and the progression of the agency's wildlife and fisheries work throughout the 20th century reveals the extent to which this perception has changed. The agency's wildlife and fisheries work has reflected larger developments in American society, including the evolution of conservation and scientific thought.

A related theme is how the Forest Service built constituencies for its programs and policies. Early personnel, including Chief Forester Gifford Pinchot, recognized the need for public relations during the agency's founding years. As he explained, "public support of acts affecting public rights is absolutely required." Pinchot also advised foresters against making enemies for trivial reasons. "If you are any good," he pointed out, "you will make plenty of them on matters of straight honesty and public policy and will need all the support you can get."[2] Others similarly recognized the importance of public support. "It is not the Forest Service that finally determines the forest policy of this country," noted one observer in 1925. "It is not even Congress. It is intelligent public opinion."[3]

This point complicated the agency's wildlife and fisheries work, as public opinion became increasingly diverse throughout the 20th century. Joe Harn, who began his career with the Forest Service as a wildlife biologist in the late 1950's, recalled that during his early years most of the interest in these resources stemmed from hunters and anglers. Within ten years, an array of environmentalists and loggers also had become actively concerned about management of wildlife and fish. "You had to be a salesman" and a "diplomat," he explained.[4] By the late 1980's, Chief F. Dale Robertson had observed a variety of interests affecting agency policies. "There is a lot of pulling and tugging on the Forest Service," he suggested in 1988. "The arguments and debates are an overall indicator of the underlying conflicts and disagreements among the American people over how these precious national forests ought to be managed."[5] In the 1990's, the Forest Service faced a continuing responsibility "to meet the needs of so many publics."[6]

To date, few histories have focused on wildlife and fisheries management on the national forests. Yet much of the country's wildlife habitat is located on the national forests. By the late 20th century, the agency had acquired responsibility for wildlife and fisheries habitat on 155 national forests and 19 national grasslands, totaling more than 191 million acres.[7] The fate of numerous species on these lands could be determined by policies and legislation implemented during the late 20th century.

The Forest Service contracted this study to provide a record of its activities for the benefit of interested parties both inside and outside the agency. To that end, the Forest Service was enormously supportive in making records and personnel available for research and interviews. In the course of this study the authors visited all 9 regions of the agency, and interviewed more than 40 individuals who have been engaged in some capacity in the fish and wildlife job on the national forests. Numerous current and retired employees of the Forest Service reviewed all or portions of the manuscript, and supplied the authors with printed materials and photographs. The authors, who bear ultimate responsibility for this work, join the principal Forest Service officials who oversaw this project in expressing their hope that the collaboration has resulted in a study that places the agency's activities in historical context in preparation for the challenges that lie ahead.



COURTESY USDA FOREST SERVICE

National Forest Lands.

ACKNOWLEDGMENTS

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We are also grateful to individuals such as Jack Ward Thomas who granted interviews that provided a valuable personal perspective to the story of wildlife and fisheries management on the national forests. Their names are listed in the bibliography. We especially wish to thank Glen P. Contreras, Laurie Fenwood, Carolyn Jo Lippire, Robert D. Nelson, and Shelly Witt for their support and advice throughout this project.

We are further indebted to wildlife historian Thomas R. Dunlap of Texas A&M, who reviewed the first draft and offered valuable suggestions from a perspective outside the agency. Additional individuals outside the Forest Service who shared their viewpoints include Tom Franklin of The Wildlife Society; Paul Brouha of the American Fisheries Society; Alan Christensen of the Rocky Mountain Elk Foundation; Lonnie Williamson and Lawrence R. Jahn of the Wildlife Management Institute; and Jim D. Yoakum and Donald A. Klebenow, wildlife consultants.

The staffs of a variety of libraries and repositories provided assistance. These include the Special Collections Divisions and Forestry Libraries at the Universities of Washington, Oregon, and Wisconsin; the Bancroft Library at the University of California, Berkeley; the Conservation Division at the Denver Public Library; the Minnesota History Center in St. Paul; and the National Agricultural Library in Maryland.

Materials from various Forest Service regions were obtained at the National Archives and Federal Records Centers in Atlanta, Georgia; College Park, Maryland; Denver, Colorado; San Bruno, California; Seattle, Washington; and Anchorage, Alaska. The following agency repositories also provided research materials: Eastern Regional Office, Milwaukee, Wisconsin; Intermountain Regional Office, Ogden, Utah; Northern Regional Office, Missoula, Montana; Pacific Northwest Regional Office, Portland, Oregon; Pacific Southwest Regional Office, San Francisco, California; Rocky Mountain Regional Office, Denver, Colorado; Southern Regional Office, Atlanta, Georgia; Southwestern Regional Office, Albuquerque, New Mexico; and Washington Office, Washington, D.C.

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Theodore Catton
Lisa Mighetto
Missoula and Seattle, 1998

The Fish and Wildlife Job on the National Forests: A Century of Game and Fish Conservation, Habitat Protection, and Ecosystem Management

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SECTION ONE
EARLY YEARS: 1890'S TO 1930'S

COURTESY USDA FOREST SERVICE

Blue Mountains Ecosystems Mountain Meadows and Riparian Habitats

These photographs were shot from the same vantage point in Rock Creek Meadows, Baker County, Oregon, 91 years apart.

In an attempt to understand the changes to forest ecosystems of the Blue Mountains in Oregon and Washington, Jon M. Skovlin and Jack Ward Thomas of the Forest Service compared photographs from the early 1900's with shots taken from the same vantage point in the late 20th century. Skovlin and Thomas thus analyzed the long-term trends affecting the forest, including fires, insect, and disease depredation.

1901
Gifford Pinchot took this photograph of a sheep-bedding ground, to show that the animals had eaten the bark and tree needles. The waist-high browse line is clearly visible. W.O. Dayton, Chief Forest Service botanist from the Washington Office, leans against a tree in the foreground.

COURTESY USDA FOREST SERVICE

1992
Little remains of the clump of trees, and the site has been reoccupied by herbaceous species.

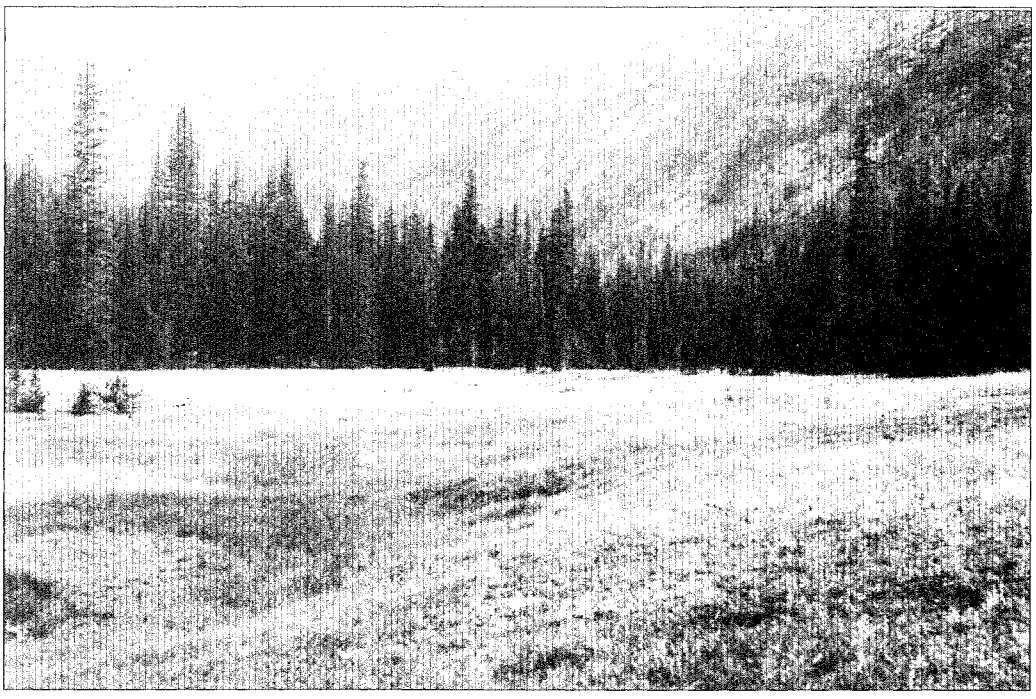
COURTESY USDA FOREST SERVICE

Blue Mountains Ecosystems Mountain Meadows and Riparian Habitats

These photographs were shot from the same vantage point in Baker County, Oregon, 91 years apart.

1901

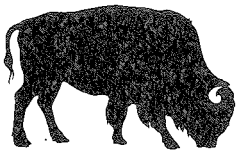
Gifford Pinchot took this photograph, which shows close cropping of vegetative cover. There were many dead subalpine fir trees scattered throughout the stand as well as fallen snags of fir and spruce along the meadow edge.



COURTESY USDA FOREST SERVICE

1992

The spruce-fir stand of trees appears young and healthy, and is perhaps encroaching on the meadow. Saplings appear at the far left, where only large boulders were evident in 1901.



CHAPTER ONE

CHAPTER ONE
"SAFE HAVENS OF REFUGE": THE ROLE OF THE FIRST NATIONAL FORESTS IN WILDLIFE AND FISH PROTECTION

"Some at least of the forest reserves should afford perpetual protection to the native fauna and flora, safe havens of refuge to our rapidly diminishing wild animals of the larger kinds."

"The preservation of forests and game go hand in hand."

. . . *President Theodore Roosevelt.*

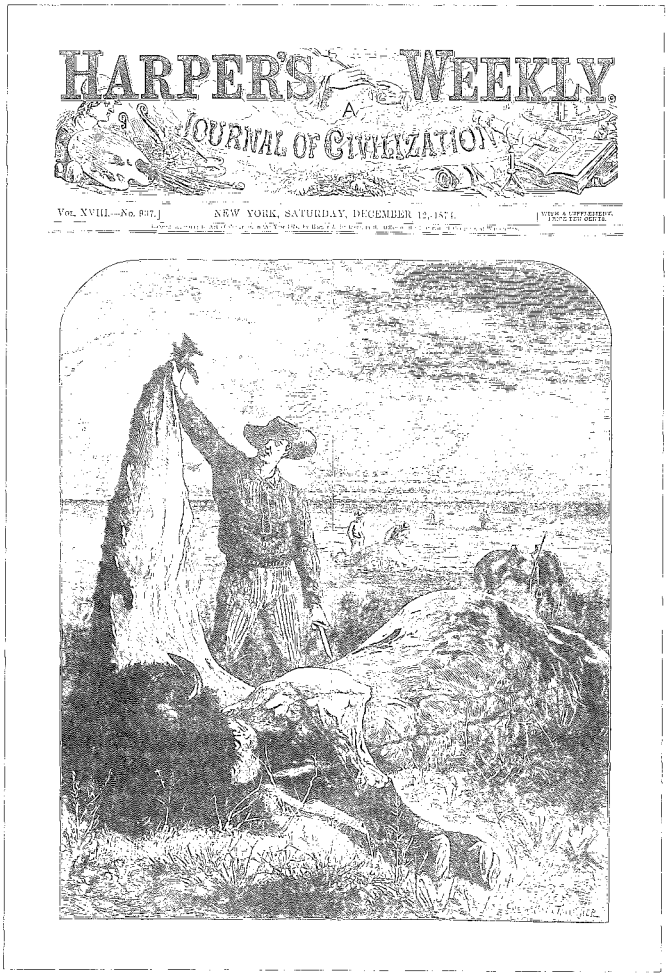
During the early 20th century, the Forest Service assumed responsibility for millions of acres of wildlife habitat that had been altered by activities such as logging, livestock grazing, and irrigation. The story of how these activities forever altered the American landscape and how they affected habitat for wildlife and fisheries populations provides essential background for understanding the influence of the conservation movement and the emergence of the Forest Service. It also provides context for understanding how the agency developed policies for managing game and fish during its early years.

The first national forests were created in a climate of alarm. Harvesting of natural resources had reached such staggering proportions by the late 19th century that historians characterized the era as the "Great Barbecue."[1] This unregulated use, which devastated wildlife populations as well as timber and rangeland, prompted the rise of the conservation movement. Its proponents, including early Forest Service employees, focused on curtailing the harvest and extraction of these resources. Market hunting—harvesting wildlife and fish for profit—provided an especially visible target in the fight for wildlife and fisheries protection. Even so, early conservationists such as Theodore Roosevelt also called for saving the land and water areas on which these animals depended. It was in this context that the forest reserves and the Forest Service emerged. From the outset, agency officials confronted the problem of restoring wildlife populations depleted by overhunting and degraded habitat.

Market Hunting

Until the late 19th century, many Americans believed the Nation's natural resources to be inexhaustible. "The whole continent was once a vast park filled with wild life in forest, mountain and plain," John Lacey, an Iowa congressman, explained in 1906. "The preservation of these creatures was long neglected, because their innumerable multitude seemed to make it impossible that they should ever be exterminated."[2] One of the country's most striking features was the abundance and diversity of its wild creatures—and the perception of cornucopia proved to be remarkably resilient.[3]

By the late 19th century, however, an astonishing number of species had approached extinction. The American bison, or buffalo, an important symbol of the West, exemplified the extent as well as the rapidity of wildlife destruction. Vast herds totaling as many as 60 million animals once roamed the grasslands of the continent, from the Mississippi Valley to the Rocky Mountains. During the 19th century, however, their meat and hides became valuable commodities in eastern markets—and some military leaders saw destruction of buffalo herds as a means to control Native Americans dependent upon them. In 1869, the transcontinental railroad provided access to the buffalo, and within 20 years these animals were nearly wiped out.[4]

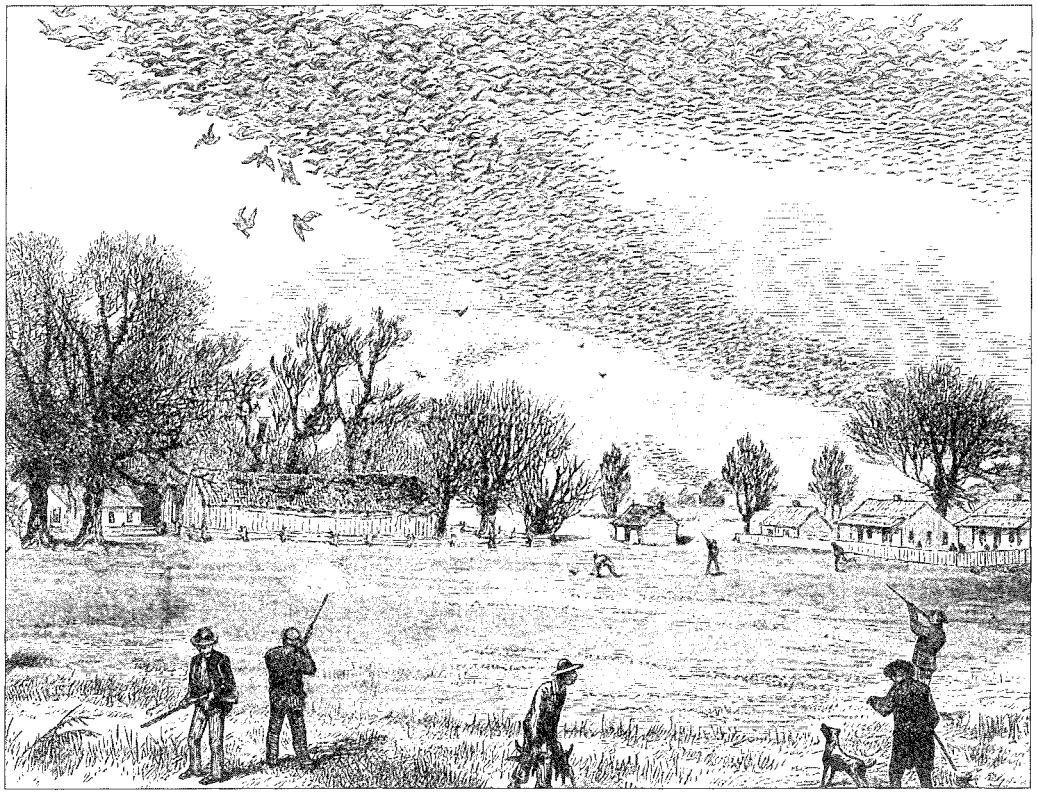


This illustration, called "Slaughtered for the Hide," depicted market hunters skinning buffalo.

The passenger pigeon suffered a similar fate. Resembling mourning doves, these birds were once more numerous than all other species of the Nation's birds combined. The naturalist John James Audubon described their numbers as "immense beyond conception."[5] In 1813, he reported a flock that spanned more than 50 miles and contained more than a billion birds. By 1914, however, this prolific species had become extinct, due to market hunting and habitat loss.[6]

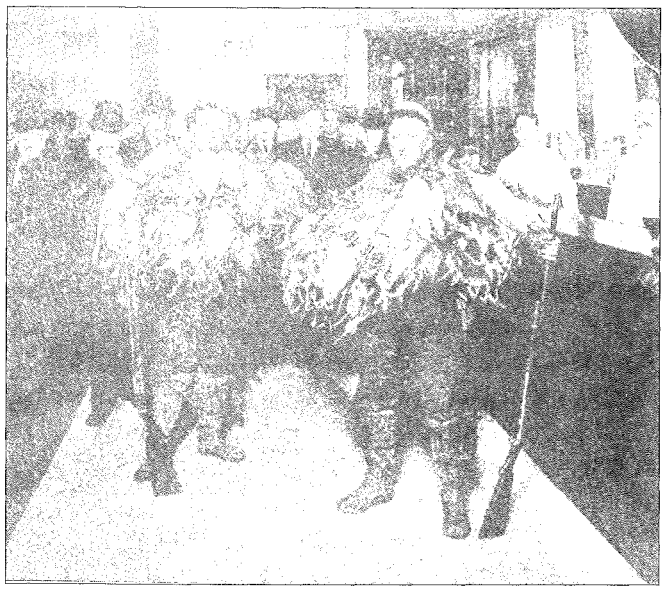
Numerous causes contributed to the destruction of wildlife populations. None was more visible or more dramatic, however, than market hunting. This occupation flourished during the late 19th century, when advances in rail transportation provided access to game populations as well as a means to supply cities with meat and hides. Unlike pot hunters, who killed animals for subsistence, market hunters sought profit—and they harvested large numbers of animals to meet market demands.[7]

During the 19th century, market hunters provided a wide array of wild animals for purchase in the Nation's butcher shops, inns, and restaurants. These included bison, elk, deer, caribou, pronghorn, bighorn sheep, mountain goat, and black bear.[8] Americans also could buy a variety of birds for their tables. Loons, swans, geese, and more than two dozen



COURTESY ALFRED RUNTE

Passenger pigeons were once more numerous than all the Nation's species of birds combined.



FROM *WESTERN WILD LIFE CALL*, February 7, 1913

Market hunters provided a wide array of wild animals for purchase in the Nation's butcher shops, inns, and restaurants.

COURTESY WILLIAM T. HORNADAY COLLECTION, LIBRARY OF CONGRESS

species of ducks were offered for sale in eastern markets. Professional hunters also killed songbirds, which were used in soups and pies. The millinery trade, too, created a demand for attractive waterfowl, whose decorative plumes—particularly those of egrets and herons—adorned women's hats.[9]

Although the buffalo and the passenger pigeon came to represent the decimation of American wildlife in the late 19th and early 20th centuries, a number of once-prominent species suffered declining populations, including the Rocky Mountain elk, white-tailed deer, black bear, woodcock, heath-hen, wild turkey, sharp-tailed grouse, and beaver.[10] Concerned that the problem could worsen, the New York Zoological Society in 1898 investigated "the shocking decrease in our native wild life" in most of the Nation's States and territories. The Society's study revealed an average decrease of 46 percent in the bird populations of 30 States, noting that "in many places species of large mammals and even of the larger birds are reported as having become extinct."[11]

By 1910, *Forest and Stream*, one of the Nation's leading outdoor journals, had painted a bleak picture: "the bison, save in captivity, is only a memory. The immense flocks of passenger pigeons, which once darkened the air, have vanished forever. The wild turkey, once plentiful, can now be found only in a few favored locations in the East. Rivers and creeks, which not so long ago teemed with fish for food and sport, are now barren."[12] No less worrisome than the depleted numbers of wildlife was the rapid pace with which the former abundance was harvested.

Critics held the market hunters responsible. Condemning the "reckless destruction" and "butchery" of animals that profit inspired, they lobbied for prohibiting the sale of wild meat.[13] William T. Hornaday, Director of the New York Zoological Society, became one of the Nation's most outspoken opponents of market hunting. Professional gunners "never give up," he warned. "They work at slaughter when other men are enjoying life, or are asleep."[14]

Hunting restrictions dated back to the colonial era. Even so, early statutes to protect wildlife remained timid, sporadic, and difficult to enforce. State game laws—many of which imposed hunting seasons and bag limits—had proven to be ineffective against large-scale harvesting of wildlife.[15] Historians would later disagree about the precise effect of market hunting on wildlife populations.[16] Still, during the late 19th century this activity provided a ready, tangible cause around which the burgeoning conservation movement could rally.

Loss of Habitat

Less obvious and more difficult to understand was how loss of habitat affected American wildlife. After the Civil War, the growth of industry and settlement accelerated the degradation of land and water areas that wildlife needed. Development restricted some animal populations to the higher elevations, disrupting those with established migration patterns. Winter rangeland, located in lower elevations, remained "vital" to these animals—yet they became increasingly scarce.[17] During the 1860's and 1870's, Federal land legislation— including the Oregon Donation Land Claim Act (1850), Homestead Act (1862), and Desert Land Act (1877)—opened millions of acres of the public domain to Americans in the East, encouraging them to head westward. These laws intended to dispose of the vast Federal landholdings in the West. Land laws such as the Timber Culture Act (1873) and Timber and Stone Act (1878) proved useful to timber speculators, who subverted their intent to acquire by fraudulent means approximately one half of the Nation's forests.[18]

This legislation helped timber and livestock operators acquire choice lands for such activities as logging, grazing, and farming—all of which took their toll on the Nation's wildlife. As historian William G. Robbins summarized:

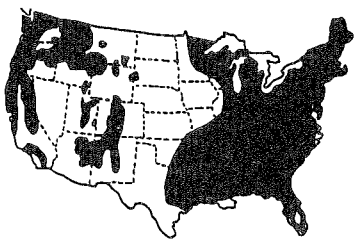
> In the last decades of the 19th century resource entrepreneurs, railroad promoters, lumbermen, mine owners, land speculators, cattlemen, and farmers indulged in the uninhibited and feverish exploitation of America's natural resources. Urged on by a ruthless and excessively competitive economic environment, these groups despoiled rivers and streams, devastated timberlands, wasted mineral resources, and overgrazed the western range.[19]

Unregulated logging proved especially destructive to some wildlife species. Before the 19th century, the Nation's timber stands, like the wildlife that they supported, were lavish and abundant, "perhaps beyond imagination."[20] So vast were America's virgin forests that they spanned nearly half the country's surface. Eastern forests included a mixture of deciduous and coniferous stands that extended from the coast to the prairies. Western forests were comprised predominantly of conifers: Douglas-fir, Sitka spruce, ponderosa pine, lodgepole pine, and enormous sequoias and redwoods.[21] Forests, according to Robbins, "were the predominant feature of colonial America."[22] The Nation's economy quickly became dependent on the abundance of wood. Major industries—ranging from shipbuilding in New England to ironworking in Pennsylvania and furniture manufacturing

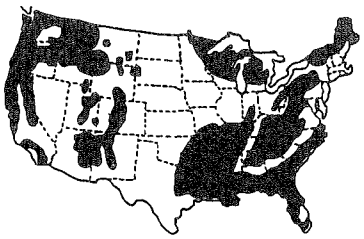
in the Midwest--required forest products, and wood was widely used for fuel. Rail lines spanning the continent also depended on wood for railroad ties.[23]

By the mid-19th century, however, the pine and broadleaf forests of Maine, New York, and Pennsylvania had been heavily logged. The lumber industry then moved to the extensive pine forests of the Great Lakes, to support development spreading westward to Chicago. Once these stands were exhausted, logging interests turned to the pine forests of the South and the rich stands of Douglas-fir in the Pacific Northwest.[24]

"In conquering this continent the American people had practically treated the forest as a thing to be subdued, an enemy," wrote one early 20th-century observer. "The wealth of this country in its woodlands was in danger of being dissipated altogether."[25]



Virgin Forests 1620



Virgin Forests 1850

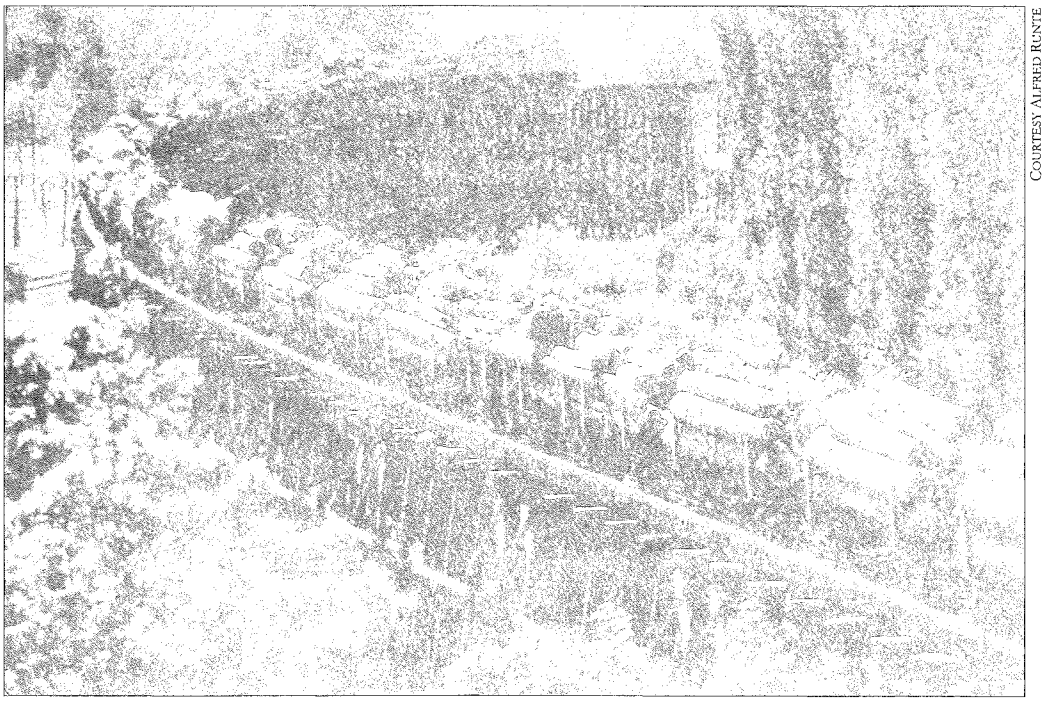
Virgin Forests 1989

COURTESY GERALD W. WILLIAMS, USDA FOREST SERVICE

So vast were America's forests before the 19th century that they spanned nearly half the country's surface. The darkened areas of these maps reveal the extent of these early forests, which have receded throughout the last 150 years.

COURTESY ANDY DOLLOFF, USDA FOREST SERVICE

Hardwood logging in Alabama, early 20th century.



COURTESY ALFRED RUNTE

A logging train in the Pacific Northwest.

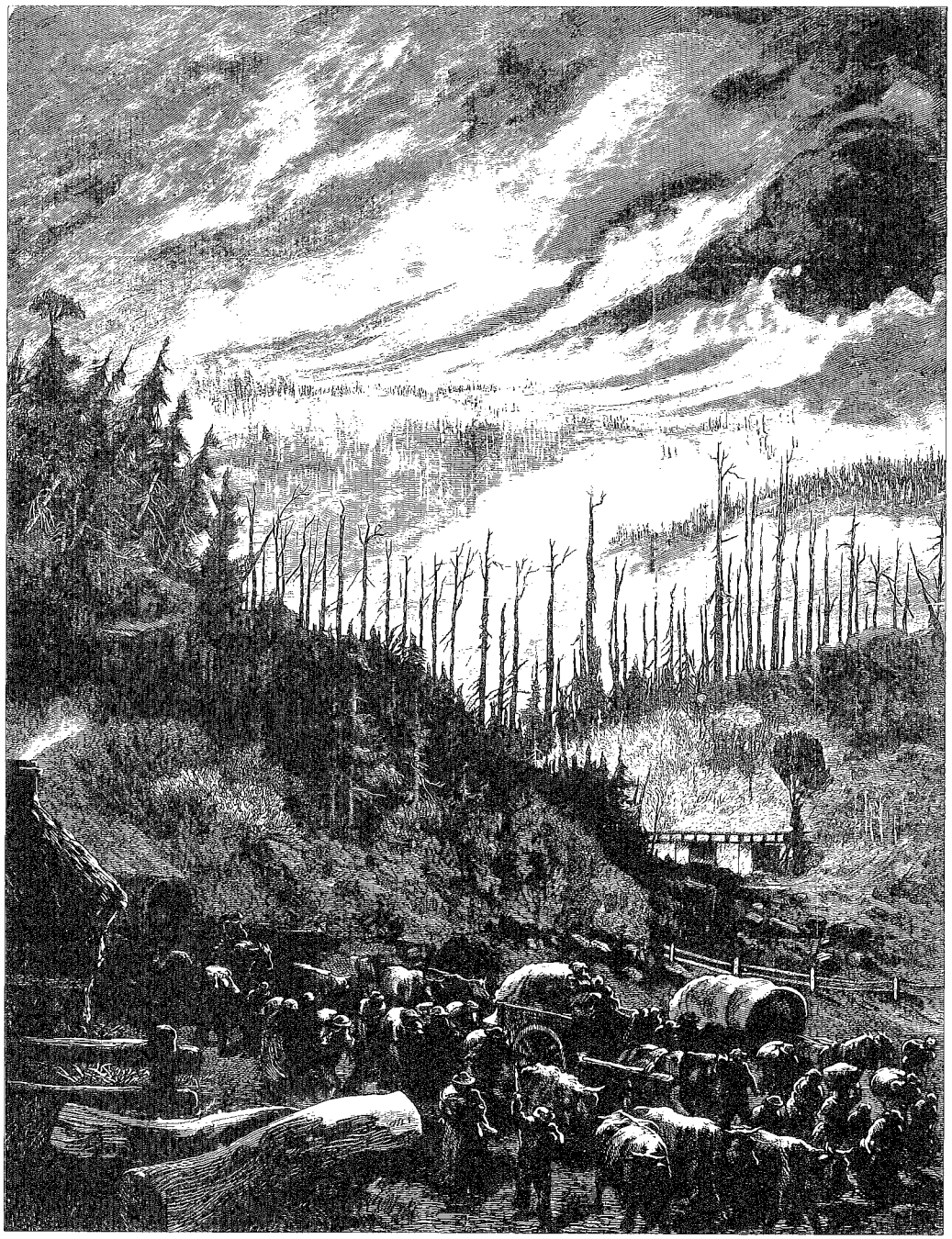
This progression of logging affected wildlife and fisheries habitat in a number of ways. First, removal of forest cover could severely alter streamflow. George Perkins Marsh, a distinguished diplomat and scientist, published his observations on this point in 1864 in his influential book, *Man and Nature*. He noted that the river running through his hometown of Woodstock, Vermont, flooded during the spring, yet often dried up completely during the summer. Marsh attributed this problem to logging in the mountains behind the town. Carl Schurz, Secretary of the Interior, offered similar ideas. Like Marsh, he was a prescient observer of environmental problems during the 19th century. He warned in 1877 that "timber grows mostly on the mountain sides, and when these mountain sides are once stripped bare, the rain will soon wash all the earth necessary for the growth of trees from the slopes down into the valleys. . . ."[26]

Second, throughout the 19th century, logging along waterways also led to siltation of streams and rivers, which degraded spawning beds and killed fish. Log drives in the eastern forests scoured river channels, denuding them of the woody debris that supported insect larvae, and thus depleting the supply of fish food.[27]

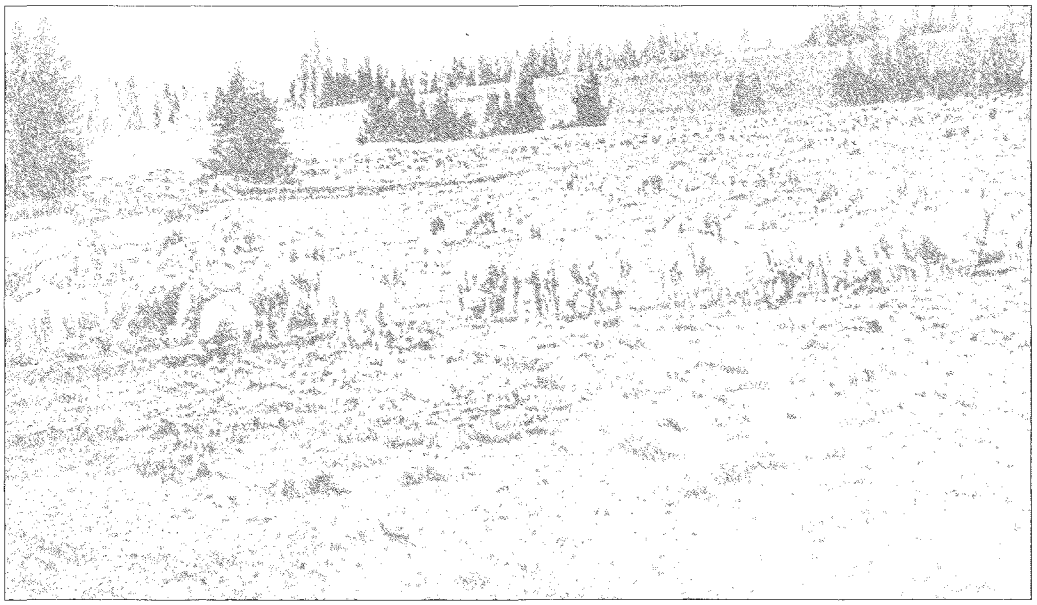
Fires stemming from logging presented another hazard to wildlife. Called "The Curse of the Woodlands," fire was responsible for "appalling" losses of timber and game.[28] Richard Lilliard, author of *The Great Forest*, described the blazes that erupted in lumbering areas as "vastly more dramatic than malaria, and more immediately destructive."[29] Devastating fires sometimes started in logging camps and sawmills, sweeping through an area and altering its vegetation.

In 1871, for example, flames engulfed the lumber town of Peshtigo, Wisconsin. So intense was the heat from the ensuing firestorm that fish died in nearby streams and rivers, and the surface of Green Bay became covered with birds that burned in flight.[30] More than 1 million acres of land burned in this infamous fire, and approximately 1,500 people lost their lives. "By morning," Lilliard wrote, "Peshtigo becomes a desert dotted with smoking ruins, tangles of warped iron, and sprawling black corpses. Its soil is a layer of hot ashes half a foot deep."[31] Occurring just 7 years after publication of *Man and Nature*, the Peshtigo disaster offered "somber and convincing proof" of Marsh's warnings about the dangers of indiscriminate logging.[32]

Fires also swept through the slash left by loggers—a problem that was exacerbated by attempts to clear land for agriculture.[33] Residents of the Puget Sound region deliberately set fires to burn slash on cutover forests. During the early 20th century, this practice of burning logging debris consumed much of the forest duff layer, degrading soil texture and preventing water retention. Prospective farmers in the region, moreover, resorted to the slash-and-burn method of land clearing now typically associated with the tropics. Settlers permanently altered the vegetative succession of their lands, replacing forests and grasslands with houses, pastures, and farm crops. Patches of bracken fern—a hardy and persistent plant—gained a foothold, surviving the fires and spreading as other vegetation receded.[34] In California, too, fires associated with logging permanently reshaped the vegetation, opening brushfields and pushing back forests.[35]



This illustration appeared in *Harper's Weekly* in 1871, alerting readers to the devastation of the Peshtigo fire.



COURTESY USDA FOREST SERVICE

Overgrazing by sheep and cattle eroded topsoil, degrading habitat important for fish and wildlife populations.

Overgrazing by livestock caused further damage, particularly in the West. In some areas, this activity eroded the topsoil, allowing rains to wash it into waterways. The cattle boom reached its apex during the 1880's, when herds of livestock spread westward from the Great Plains into the Great Basin and Montana. Expecting "limitless grass" and an expanding market, cattle raisers, most of whom sold by the head and not by the pound, overstocked western rangeland.[36]

The cattle industry thus "raced toward economic and ecological disaster"—and the southern plains were first to experience both. In that region, according to some sources, each head of cattle had required only 5 acres in 1870. Just 10 years later, however, each animal needed 50 acres, due to the scarcity of forage. Disaster struck the cattle industry during the winter of 1885. That year, 85 percent of the cattle reportedly were lost in one of the most severe winters on record. Weakened by lack of forage, many froze to death, presenting a grim spectacle during the spring thaw. The following winter bitter cold hit the northern plains, leaving the rangeland once again littered with the frozen carcasses of cattle that had been weakened by a depleted rangeland.[37]

As the cattle industry declined, the numbers of sheep grazing on rangeland increased, posing new threats to wildlife habitat. Sheep thrived on the forbs and weeds that invaded areas stripped of grasses.[38] The naturalist John Muir denounced these animals as "hoofed locusts," owing to their destruction of ground cover. As these animals advance, he explained, "flowers, vegetation, grass, soil, plenty, and poetry vanish."[39] Decreasing forage forced cattle and sheep into competition with wild ungulates for "palatable browse,"

resulting in reductions of deer, elk, and bighorn sheep populations.[40] So severe was the deterioration of the rangeland during the late 19th and early 20th centuries that some historians employ the imagery of battle to describe it. Donald Worster, for example, concluded that the "invasion" of the West by cattle and sheep "must have come with the explosive, shattering effect of all-out war," and the "wildlife reeled and died before the onslaught."[41]

Farming could be especially damaging to wildlife habitat. Although not widely recognized at the time, the decline of the buffalo and the passenger pigeon during the 19th century resulted in part from "the spread of agriculture."[42] Similarly, during the early 20th century, migratory waterfowl populations plummeted as a result of widespread drainage of wetlands to create farmland. These birds require a variety of wetland habitats— including marshes, swamps, lakes, ponds, rivers and streams, and estuaries—which provide crucial resting and feeding stops and breeding places along flyways.[43] By the 1920's, however, nearly 100 million acres had been drained in the United States and Canada, and the depletion of waterfowl had reached "crisis" proportions.[44] "The birds are not disappearing altogether from too much shooting," Senator Peter Norbeck of South Dakota explained in 1926. "They are disappearing because their nesting grounds, their feeding grounds, their resting grounds have been turned to other uses. The marshes have been drained, and they

COURTESY USDA FOREST SERVICE

Meadow surface, destroyed by overgrazing.

Courtesy USDA Forest Service

This depiction of an ungulate trapped in barbed-wire fencing reveals the hazards that grazing presented to wildlife.

have to get out, and they congregate in a few smaller places where there is an insufficient quantity of food."[45]

Fish also remained vulnerable to the changes in habitat that agricultural growth encouraged. In the Pacific Northwest, the diversion of rivers to irrigate fields caused many tributary streams to dry up during low water periods. This pattern proved harmful to anadromous stocks— fish that hatch in fresh water, migrate to the ocean, and return to the stream of their birth to spawn. Construction of unscreened diversion canals further hindered their migration. These structures sometimes drew fish into irrigated fields, where they lay stranded. Migrating fish also had difficulty negotiating the small dams that proliferated throughout the Columbia River basin. By the early 20th century, some salmon runs had become seriously depleted.[46] In the Rocky Mountain region, diversion of streams similarly affected trout populations.[47]

Not all wildlife species were harmed by these activities and the advance of settlement. Even so, Raymond Dasmann, a renowned wildlife biologist at Humboldt State University, indicated that by the early 20th century "much of the wildlife" had vanished. "The remnants," he noted, "had to adapt to a different kind of world." According to him, "only the inconspicuous, the wily, the elusive animals survived, and with them the pests of range and farmland, rodents and rabbits that found an ideal home on overgrazed or disturbed lands." The introduction of exotic plants and animals further crowded native species.[48]

Permanent conversion of lands to farms and cities, as well as the misuse of forests, grasslands, and waterways remained the key agents of habitat destruction. As early as 1864, Marsh had perceived the interconnections among land, the biota, and human welfare, striking a note that would later sound in the conservation movement and again during the era of environmentalism. He concluded in *Man and Nature* that deforestation and overgrazing had destroyed the resource base of ancient civilizations, prompting their declines. He detected the same pattern in the American approach to the natural world. "Man is everywhere a disturbing agent," he lamented. "Wherever he plants his foot, the harmonies of nature are turned to discords." Marsh worried that "We have now felled forest enough everywhere, in many districts far too much."[49] By the late 19th and early 20th centuries, the degradation and loss of wildlife habitat had become a nationwide problem, extending from the eastern seaboard to the West Coast, and from the Midwest to the South.

COURTESY USDA FOREST SERVICE

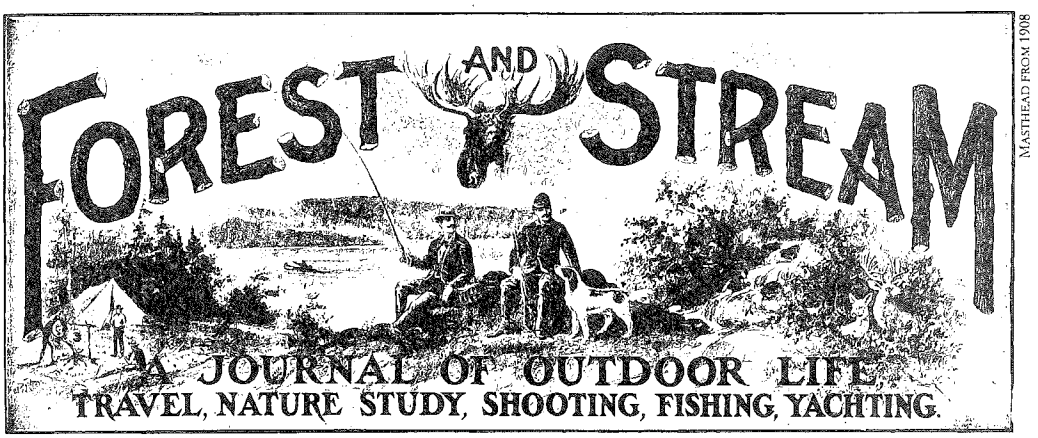
Fences posed a threat to wildlife.

COURTESY ANDY DOLLOFF, USDA FOREST SERVICE

Flood damage in Virginia, early 20th century.

The Emergence of the Conservation Movement

It was in this context that the conservation movement was born. During the late 19th and early 20th centuries, proponents questioned "whether the country's natural resources should be used lavishly for merely present needs or should be conserved for future use as well."[50] Conservationists advocated the wise use of natural resources—and their motivations were diverse. Some were primarily concerned with ensuring economic



Forest and Stream, one of the Nation's leading outdoor journals, expressed concern about declining wildlife and fish populations. Articles educated readers on the principles of sportmanship.

prosperity for present and future generations, while others focused on preserving opportunities for recreation and aesthetic appreciation of nature.

Sport hunters were among the first groups to take action. So prominent was their role that some historians credit them with establishing the conservation movement.[51] Quick to dissociate themselves from market hunters, sportsmen organized to educate the public and to promote game protection. More than 300 sporting clubs emerged in the United States during the 1870's and 1880's, in part due to increasing affluence and leisure time. Advances in high-speed printing enabled these organizations to distribute their message through a variety of journals. These included *The American Sportsman* and *Forest and Stream*, both of which began publishing in the early 1870's. Initially, these journals discouraged Americans from pot and market hunting, attempting to instill a spirit of sportsmanship.[52]

Proper field etiquette had been a subject of consideration among American sport hunters since the 1840's. Henry William Herbert—also known by his pen name, "Frank Forester"—served as its primary spokesman. An Englishman who emigrated to the United States, Herbert outlined the correct methods of gunning and angling in his two-volume *Field Sports*, first published in 1848. To ensure a sense of fair chase, he discouraged such activities as shooting geese in the water and grouse on the ground, as well as the use of artificial lights to lure prey and the practice of driving deer into water, where they became easy targets. Good hunters, moreover, remained attentive to their horses and dogs. To Herbert, hunting was an activity that strengthened moral fiber.[53]

In general, Herbert distinguished the "genuine sportsman" from the destructive hunter who killed animals for food or profit. By the 1870's and 1880's, his "code of the sportsman" held increasing appeal for gentlemen hunters worried about depleting game populations. One article on field sports, for example, informed readers in 1877 that indiscriminate shooting

into flocks of ducks "may be excusable" in a pot-hunter, "but in a true sportsman—never."[54] A number of guide books offering advice to sportsmen emerged during this period. *The American Sportsman*, printed in 1871, distinguished the "well-bred" hunter from the common pot-hunter, characterizing the latter as "disgusting," "selfish," and "unmanly."[55]

Theodore Roosevelt provides a striking example of the link between sport hunting and conservation. As a youth, he had developed a keen interest in wild creatures, establishing the "Roosevelt Museum of Natural History" in his home. While attending Harvard, he joined the Nutall Ornithological Club of Cambridge.[56] In 1883, Roosevelt's interest in wildlife led him to undertake an expedition to the Badlands in the Dakota Territory, where he hunted buffalo and pronghorn. Only 25 years old, he had already served in the New York State legislature. Reeling from the deaths of both his wife and his mother in 1884, he returned to the Badlands for 2 years, seeking solace.

During this period, Roosevelt developed his famous persona of the "wilderness hunter." Shooting game, in his estimation, was part of the "strenuous life" that an increasingly urbanized and industrialized Nation needed. During the late 19th century, he urged Americans to "cultivate that vigorous manliness," along with the "hardihood" and "self-reliance" that close contact with the natural world had provided to previous generations. Sport hunting became a rejuvenating activity for Roosevelt, strengthening his spiritual and physical health.[57] His prey included big game and a variety of predators, including grizzly bears and wolves. "Nothing more exciting than this sport can possibly be imagined," he suggested.[58] To complete the image of the wilderness hunter, Roosevelt wore a buckskin suit reminiscent of the garb of Daniel Boone and Davy Crockett.[59]

During his 2 years ranching in the Dakota Territory, Roosevelt witnessed firsthand the consequences of "excessive logging," overgrazing by livestock, and mining. These activities in the Black Hills had stripped the soil cover, resulting in flooding and erosion. Roosevelt's experience in the Dakota Territory resulted in a lifelong concern for forestry, rangeland, and wildlife conservation, and his observations of environmental problems shaped the ideas that he would later implement as president. "In the young man who went west to hunt buffalo," historian James B. Trefethen explained, "conservation was to find its most vocal, most colorful, and most influential leader, at a time when it needed leadership the most."[60] Roosevelt's contemporaries also noted that he held a prominent position among conservationists. As one observer recalled in 1925, it was his leadership "that stirred the people" on forestry and conservation issues.[61]

In 1888, Roosevelt and George Bird Grinnell, the editor and publisher of *Forest and Stream*, founded the Boone and Crockett Club. One objective of this organization was to encourage big-game hunting, and members were required to have collected three trophy heads.[62] Wildlife conservation, however, became a more pressing concern. The Boone and Crockett Club, which included Senator Henry Cabot Lodge and Carl Schurz, former Secretary of the Interior, wielded considerable financial clout as well as political power. Members lobbied Congress to pass the Forest Reserve Act in 1891, which allowed the president to set aside sections of the public domain.

FROM THEODORE ROOSEVELT'S *HUNTING THE GRIZZLY*, PUBLISHED IN 1903

Theodore Roosevelt, Wilderness Hunter, 1893.

Within weeks, President Benjamin Harrison used this statute to create the Yellowstone Park Timber Land Reserve, located southeast of Yellowstone National Park. During his administration, Harrison established 14 additional forest reserves in the West. Embracing more than 16 million acres, they were intended to offer watershed and timber protection.[63]

Due to the efforts of the Boone and Crockett Club, the forest reserves were also to serve as "refuges where the timber and its wild denizens should be safe from destruction."[64] According to historian John F. Reiger, Roosevelt recognized "that while millions of acres of timberland were being preserved, the big game he cherished so much would also find sanctuary."[65] As Roosevelt explained, "the preservation of forests and game go hand in hand. He who works for one works for the other."[66] Timber operators and market hunters continued to operate in the reserves, however, prompting Roosevelt and Grinnell to promote additional laws to guard the resources of the reserves. "The timber and game ought to be the absolute property of the government," they wrote in 1893, "and it should constitute a punishable offense to appropriate such property within the limits of the reservations."[67]

During the 1890's, the distinction between the forest reserves and national parks was not clear. Yellowstone National Park, established in 1872, had similarly attracted market hunters, because it harbored the largest elk and buffalo herds in the Rocky Mountains. Although the U.S. Army patrolled the park, poachers suffered only confiscation of their equipment and expulsion from the area. In 1894, Congressman John Lacey, a member of the Boone and Crockett Club, drafted legislation to impose jail sentences and fines for wanton destruction of animals in the park. This legislation made Yellowstone the Nation's first inviolate wildlife refuge.[68] In 1900, Lacey again sponsored legislation to protect wildlife from market hunting. The Lacey Act forbade interstate shipment of wildlife products taken in violation of State game laws. The Forest Service and other Federal agencies would use this legislation to prosecute poachers late into the 20th century.[69]

Much of the legislation passed in the late 19th century focused on enforcing hunting restrictions. By the early 20th century, sport hunters had increasingly sought to protect habitat as well. President Roosevelt viewed the forest reserves in 1901 as "safe havens of refuge" for wild plants and animals.[70] Similarly, Lacey argued in 1906 that "not the least of the important uses" of the forest reserves "should be to give shelter to a remnant of that wonderful wild life that once filled this continent." He regarded the forests as "propagating grounds" that would produce an "overflow" of game "to the benefit of the general public."[71]

Formed in 1911, the American Game Protective Association also promoted "the growing of the forests" for game populations. "Wild life conservation begins with the conservation of wild life habitat," this organization noted. "All that the government and the States can do in this particular will not be too much."[72] The American Game Protective Association further warned that if destruction of land and water areas continued, "all restrictive laws, such as daily bag limits, shooting seasons and other regulations, will not be worth a fig."[73]

Sport hunting was not the only interest concerned with wildlife conservation. Birds also became a focus of concern during the late 19th and early 20th centuries, and in the course of time, bird conservationists would take a keen interest in the management of bird habitat on

the national forests. As early as 1886, the American Ornithological Union proposed a "model State law" for the protection of nongame birds throughout the Nation. Comprised mostly of scientists, this group protested the killing of birds with decorative plumage for fashion.[74]

Bird lovers often joined sport hunters in calls for protection of various species, and these interests sometimes overlapped. One of the most prominent organizations to take up the cause was the Audubon Society. George Bird Grinnell established this group in 1886, partly owing to his "interest in natural history."[75] The National Association of Audubon Societies, formed in 1902 and incorporated in 1905, encouraged State legislatures to protect a variety of bird species. Audubon Society members also pushed for Federal legislation to protect migratory birds.[76] For the most part, Audubon Society members valued birds for their aesthetic appeal. As Grinnell explained, they "were interested in wildlife protection because these objects are beautiful to look at and ought to be preserved so that we and our successors may have the pleasure of seeing them."[77]

The Audubon Society also publicized the usefulness of birds that consumed destructive insects and rodents. "Some birds will eat their own weight of insects each day," noted one activist in *Forest and Stream*. "Pests such as insects, field mice, and weeds increase wherever birds are depleted; the cost of raising grains, other food stuffs, and domestic animals increases in consequence and this causes an advance in the prices of the necessities of life." According to this writer, the Bureau of Biological Survey—a predecessor of the U.S. Fish and Wildlife Service that operated under the Department of Agriculture—had conducted "a careful, systematic, minute examination of the surface of small areas of woodland and meadow soil" that revealed the "ever-present danger of the increase of insects."[78] The Biological Survey concluded that "certain birds prey on the boll-weevil, that the woodpeckers are among the best friends of the forester and wood lot owner, that orioles, mockingbirds, cardinals, robins, many of our native sparrows, and the quail are of extraordinary value to the agriculturalist as insect destroyers and seed eaters, and so ought to be protected."[79]

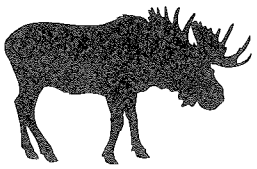
Although it focused on birds, the Audubon Society advocated conservation of a variety of animals. In 1908, one member explained the progression of wildlife destruction as follows:

> A species is first extirpated from the East and then from the West. With very few exceptions the exterminated species are those that injured man's property or those that he killed for food or profit. Hence we find most rapidly disappearing the eagle, the wolf, the bear and the game birds and mammals or those having the most valuable fur or feathers. The larger mammals and game birds go first because of their greater size and value. Therefore the wild turkey and wild swan are extirpated, while the grouse and the smaller wildfowl remain; but eventually the increase of population, the breaking up of the breeding grounds, and the added demands of the markets insure the destruction of most of the valuable food ducks, the grouse and the larger shore birds, as well as the larger edible and fur-bearing mammals, except in regions where hunting is severely restricted.[80]

Like the Boone and Crockett Club, the Audubon Society feared that the Nation's wildlife was in serious peril. This passage indicated a concern that depletion could lead to extinction of animal species.

In addition to advocating hunting restrictions, the Audubon Society encouraged protection of land and water areas to support wildlife populations. Establishment of migratory bird refuges became a prominent cause for this organization. In 1903, members encouraged President Theodore Roosevelt to set aside Pelican Island as the Nation's first bird refuge. Located in a Florida lagoon, Pelican Island provided feeding grounds and roosting places for a variety of shorebirds.[81] During the early 20th century, the Izaak Walton League, founded in 1922, also served as a "defender" of soil, vegetation, and water for wildlife and fish populations.[82]

Wildlife and fish protection remained a component of the larger conservation movement that became concerned with a variety of natural resources, including forests, minerals, and water. As the need for habitat became increasingly prominent, wildlife conservationists looked to the forest reserves as the key to saving what remained of the Nation's wildlife. From this early start, they encouraged the Federal Government to establish a system of national forests that included game refuges and wildlife preserves. President Theodore Roosevelt established 51 game refuges before leaving office. By the 1990's, the game refuges and wildlife preserves within the National Forest System totalled 1,218,953 acres.[83]



CHAPTER TWO

CHAPTER TWO
"AN ANCIENT AND HONORABLE ASSOCIATION": EARLY GAME AND FISH PROTECTION

"Forestry and game are linked together by an ancient and honorable association."
. . . *W.B. Greeley, 1924.*

"The idea of protecting animals, particularly big game, was oversold. It just got out of hand."
. . . *Lloyd Swift, 1968.*

Although the Forest Service remained primarily concerned with timber, watershed, and rangeland protection during the early decades of the 20th century, the agency also viewed wildlife and fish as a renewable resource. For the most part, its early wildlife and fish management efforts focused on two related objectives: propagating game and controlling predators. To that end, the agency promoted hunting restrictions and establishment of refuges. During the early 20th century, it also conducted some of the earliest surveys of big game ranges and populations. Controversy over irruptions in deer populations on national forests, along with developments in the science of game management, prompted the agency to revise its wildlife and fisheries policies during the 1930's.

National Forests as "Wildlife Reservoirs"

Forest Service officials recognized that the reserves provided a "home for wild life."[1] As an extensive system of public lands, national forests became "vast wildlife reservoirs," particularly for game animals.[2] Lloyd Swift, a long-time director of the Forest Service's wildlife program, recalled that "right from the beginning ... the Forest Service policy was one of being interested in game as a resource of the national forest areas."[3]

The agency in fact viewed its responsibilities regarding wildlife and fisheries as part of a long tradition. W.B. Greeley, who served as chief during the 1920's, observed that "forestry and game are linked together by an ancient and honorable association." The first public foresters, he noted, also functioned as game keepers.[4] Early Forest Service officials were well aware of this connection. "Since the mythical days of Robin Hood," Chief F.A. Silcox wrote in 1935, "wild life has inseparably been associated with the forests."[5] Many Forest Service officials viewed their role as caretakers of much of the Nation's game with enthusiasm. In Greeley's estimation, nothing equaled the "delightful experience" of a "fall tramp or canoe trip" through the Superior National Forest. Here the "lover of wild things" could encounter partridges, deer, and possibly "a huge moose, belly-deep in the water and scouring the bottom with his huge overhanging lip for succulent water plants."[6] Although the National Forest System was created for a variety of purposes, some agency officials considered protection of game to be a significant concern from the outset. Throughout the first three decades of the 20th century, the Forest Service's interest in wildlife

COURTESY USDA FOREST SERVICE

According to Chief W.B. Greeley, one of the advantages of a trip through the Superior National Forest was the possibility of seeing "a huge moose, belly-deep in the water." He observed that "forestry and game are linked together by an ancient and honorable association."

conservation increased, and the agency developed and refined its management policies accordingly.

Early Legislation

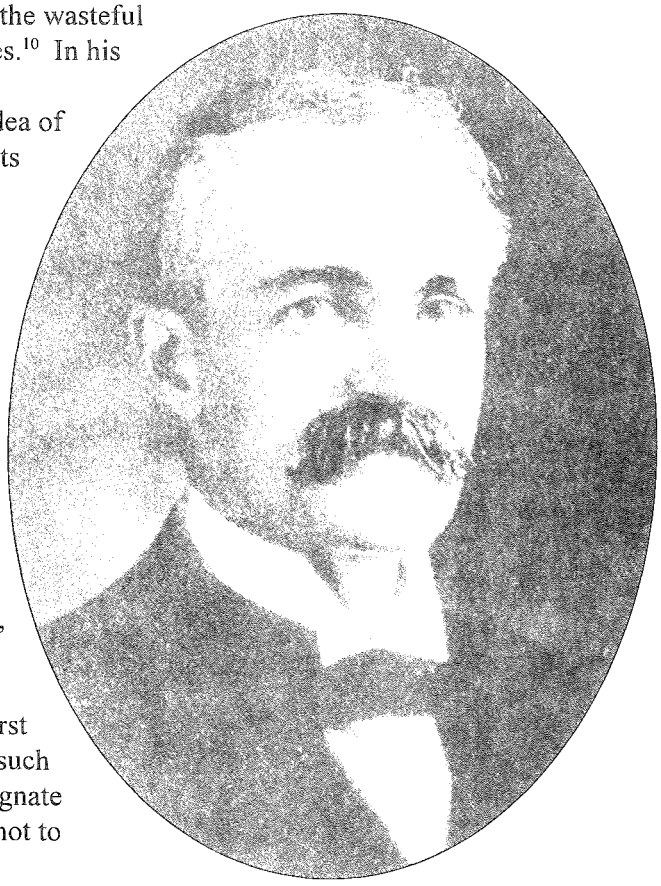
Historians have characterized the late 19th and early 20th centuries as the "Golden Age" of conservation. During this era, the number of forest reserves grew quickly, prompting questions about how they would be administered. During his administration in the early 1890's, President Benjamin Harrison set aside 17,564,800 acres of forests in the West, where most of the Nation's remaining timber was located. His successor, Grover Cleveland, withdrew an additional 22,420,860 acres.[7]

This action sparked considerable opposition among westerners. Although the Forest Reserve Act of 1891 had authorized the president to set aside lands, there were no provisions for their management and use. Many westerners protested vociferously, demanding that the forests be restored to the public domain, where they would remain available for timber harvest, mining, livestock grazing, and other uses. They viewed the reserves not as protection but as a means of preventing further use of timber and other

resources. Meanwhile, uncontrolled fires continued to destroy forest lands. "The timber," one observer explained, "was simply locked up and left to burn."[8]

As a solution to this problem, Congress passed the Forest Management Act (sometimes called the Organic Administration Act) in 1897, which established a system of administration under the Secretary of the Interior. This legislation clarified the objectives of the reserves, noting that they were "for the purpose of securing favorable conditions of waterflows and to furnish a continuous supply of timber for the use and necessity of citizens of the United States." Representing a compromise between conservationists and western interests, the Forest Management Act provided protection of natural resources while allowing for their use.[9]

The system of forest reserves continued to grow under Theodore Roosevelt's administration. This dynamic leader brought conservation into national prominence, presenting it as essential to the Nation's stability and prosperity. Assuming office in 1901, President Roosevelt began the new century by focusing public attention on the need to protect natural resources—and many of his efforts were devoted to forests and wildlife. As a leading "Progressive" reformer, Roosevelt opposed land monopoly, and sought to stop the wasteful destruction of the Nation's resources.[10] In his first annual message, the president announced that the "fundamental idea of forestry is the perpetuation of forests by use." He also suggested that portions of the forest reserves "should afford perpetual protection to the native fauna and flora, safe havens of refuge to our rapidly diminishing wild animals of the larger kinds."[11]



Gifford Pinchot. COURTESY ALFRED RUNTE

Assisting Roosevelt in ushering in this new era was Gifford Pinchot, one of the Nation's first foresters. Pinchot shared the president's background of wealth, social status, and commitment to public service. A graduate of Yale, he had studied forestry in Europe, becoming the first native-born American to complete such training.[12] In 1892, the railroad magnate Cornelius Vanderbilt retained Pinchot to

manage his Biltmore estate in North Carolina. Here Pinchot encountered a virgin forest of yellow poplar, hemlock, hickory, black walnut, and beech trees. Sections of these stands later were incorporated into the Pisgah National Forest. Pinchot's study of this old-growth timber convinced him that harvesting could foster natural reproduction of trees, by taking the mature stands and providing light for seedlings. Pinchot's logging operations in North Carolina resulted in a "remarkable density" that remained "unequaled" in the Southern Appalachians during the early 20th century.[13] Encouraged by his success, Pinchot opened a private consulting practice in New York City in 1893. Five years later, he became Chief of the Division of Forestry, which had provided the Federal Government with advice on forestry problems since 1881. Pinchot preferred the title "Chief Forester," indicating that Washington had many "chiefs," but just one "forester." In 1935, the term "Chief" was readopted.[14]

During the late 1890's, the Department of the Interior retained control of the forest reserves, while the professional foresters—all two of them, as Pinchot quipped—remained in the Division of Forestry under the Department of Agriculture.[15] Pinchot in fact described himself as a "forester without forests," and his objective was "to get forestry out of the dark and into the woods."[16] To that end, he wished to remove the reserves from the Department of the Interior's General Land Office, which had become tainted with corruption and associated with land laws that were given to fraud. This idea was implemented in 1905 in legislation transferring the forest reserves into the Department of Agriculture, creating the Forest Service.[17]

THE PUBLIC LANDS COMMISSION

The administration of the public-land laws by the General Land Office of the Interior Department is one of the great scandals of American history. At a time when, in the West, the penalty of stealing a horse was death—death without the benefit of law—stealing the public land in open defiance of law was generally regarded with tolerance or even approval. It cast no shadow on the reputation of the thief.

When I was appointed to the Division of Forestry in 1898, the Forest Reserves were, as you know, still in the Department of the Interior. To get charge of them having become my chief objective in life, some acquaintance with the land laws, how they were administered, and how they worked, was hardly less necessary than a knowledge of Forestry itself. Part of the knowledge I personally had already collected. The rest the Division proceeded to acquire.

Source: Gifford Pinchot, *Breaking New Ground*, 1947

COURTESY FOREST HISTORY SOCIETY

Gifford Pinchot, pictured right, became President Theodore Roosevelt's closest advisor on conservation issues.

The Factions of the Conservation Movement

As the Nation's Chief Forester, Pinchot viewed the reserves as a storehouse of natural resources, which, properly managed, would yield an endless supply of timber, minerals, and water. In his estimation, these resources were not only to be protected, they were to be used. "The first duty of the human race," he explained, "is to control the earth it lives upon."[18]

Pinchot embodied the utilitarian faction of the conservation movement, which promoted efficient use of resources through scientific management. An array of experts, including foresters, hydrologists, and geologists, would determine levels of resource consumption on a sustained-yield basis.[19] As one historian has suggested, Pinchot "was singularly unromantic about conservation and forest management." To his mind, forestry involved "tree farming." He believed that while the farmer harvests "crop after crop of corn, oats, wheat, cotton, tobacco, and hay," the "forester gets crop after crop of logs, cordwood, shingles, poles, or railroad ties from his forest."[20]

WHAT MADE THE FOREST SERVICE CLICK

The Forest Service was generally recognized as the best government organization of its day. It set a new standard of efficiency in Washington. That was because it had a great purpose, and knew that it had, and because it was organized on the principle of individual recognition and responsibility.

Source: Gifford Pinchot, *Breaking New Ground*, 1947.

In contrast, the well-known naturalist and writer John Muir preferred to save the forests in their natural state. Muir represented the preservationist faction of the conservation movement, which emphasized aesthetic use rather than harvesting of natural resources.

Inevitably, Muir's view clashed with the chief forester's utilitarian vision for the public forests. While Muir sought to exclude sheep—or "hoofed locusts," Pinchot encouraged the Secretary of the Interior to allow regulated grazing privileges in the forests. During the early 20th century, the differences between the utilitarian and preservationist perspectives culminated in the battle over placing a dam at Hetch Hetchy in Yosemite National Park—a project that Pinchot supported and Muir bitterly protested. The differing positions of these two men came to symbolize the growing divergence in the conservation movement.[21]

Pinchot adopted his utilitarian approach in part to foster support for the reserves. He promoted regulated grazing, for instance, to counter protests against public forests from western livestock operators. To appease ranchers, he also opposed the Boone and Crockett Club's plan to set aside game preserves within the forests.[22] Realizing the need for public support, Pinchot became one of the first government officials to develop a program of public relations for his agency. He developed guidelines for foresters in public service, advising them that "public support of acts affecting public rights is absolutely required."[23] To cultivate approval for his ideas, Pinchot routinely furnished technical information to prominent individuals, and he distributed forestry literature and illustrations to schools, public exhibits, and the press.[24]

Pinchot became Roosevelt's closest advisor on conservation issues, often steering the president in a utilitarian direction. The chief forester promoted the "multiple-use" concept in the administration of the reserves, integrating watershed protection and grazing rights with timber sales management.[25] In 1905, Pinchot became the head of the new Forest Service, which oversaw 65 million acres of forest reserves. He penned a letter signed by James Wilson, Secretary of Agriculture, instructing that these lands would be managed for their "most productive use for the permanent good of the whole people." As the widely circulated letter indicated, "all the resources of forest reserves are for USE, and this use must be brought about in a thoroughly prompt and businesslike manner, under such restrictions only as will insure the permanence of these resources." The reserves would be managed for a variety of interests, including lumber, mining, and ranching—and when these conflicted "the question will always be decided from the standpoint of the greatest good of the greatest number in the long run."[26] This principle of the "highest use" implied that a variety of activities should be maintained, not necessarily on the same lands but on the most suitable areas, determined by the best advantage to the public and the relative number of users.[27]

COURTESY USDA FOREST SERVICE

Gifford Pinchot.

COURTESY GERALD W. WILLIAMS, USDA FOREST SERVICE

This political cartoon advocated protecting the country's timber supply in national forests.

Pinchot's Administration

Pinchot's statement of the objectives of the Forest Service became the "fount of administrative doctrine" in the agency, providing guidance for nearly 100 years.[28] His commodity-driven view of natural resources, moreover, was to shape the culture and direction of the Forest Service into the late 20th century. Under his leadership and as his legacy, the agency would reflect the utilitarian side of the conservation movement.

Together, Roosevelt and Pinchot added approximately 100 million acres of forest reserves, more than tripling the size of the system. They believed that western timberlands could be protected only by continued withdrawals from the public domain—and their administration "marked the high point in the growth of the reserves."[29] As a result of their zeal, 38 percent of Idaho, and 20 percent of California and Washington came to be comprised of public forests.[30]

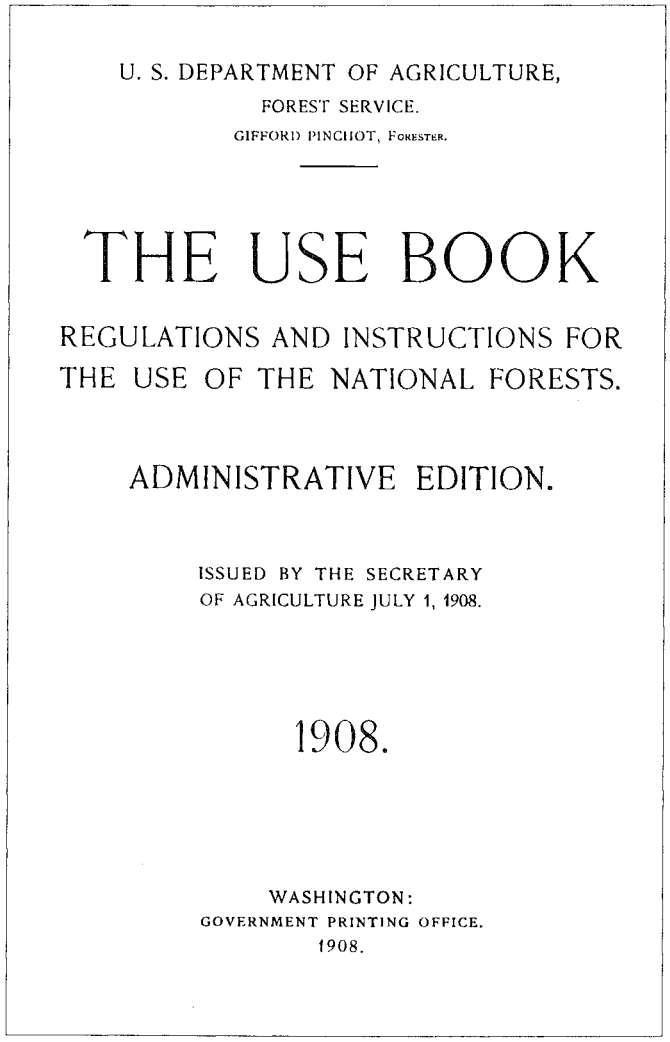
Not all Americans, however, welcomed the creation of the agency and the additional reserves. The West remained particularly resentful of the Federal Government's withdrawal of forests from the public domain—lands previously set aside for disposal. One problem was that Pinchot imposed a system of grazing fees, drawing protests from ranchers who had become accustomed to free use of rangelands. Congress thus passed legislation in 1907 to prevent the president from designating new reserves in six heavily timbered western States.[31]

NO RED TAPE

The Forest Service was alive. Its members were young, on their toes, proud to be engaged in so great an enterprise, ready to meet the future with much the same eagerness for battle that was evident in T.R. The Service was bound to win, and well our people knew it.

Source: Gifford Pinchot, *Breaking New Ground*, 1947.

What happened next has become a legend in conservation history, exemplifying the commitment and boldness of the two principal architects of early 20th-century forest policy. Before signing this bill, President Roosevelt and Pinchot studied maps of the six States long into several evenings, determining which forests required protection. Roosevelt then withdrew 16 million acres of these lands—dubbed the "midnight forests"—before signing the bill that would remove his power to take such action. It would be difficult to name two conservationists who were more influential in the early 20th century, especially given the speed at which their ideas were translated into policy.[32] During the early 20th century, Pinchot's "personality and thought" continued to dominate the development of the reserves, called "national forests" after 1907.[33] To increase efficiency in administration, the national forests were divided into districts (now called regions), overseen by district foresters, in 1908.[34]



U. S. DEPARTMENT OF AGRICULTURE,
FOREST SERVICE.
GIFFORD PINCHOT, Forester.

THE USE BOOK

REGULATIONS AND INSTRUCTIONS FOR THE USE OF THE NATIONAL FORESTS.

ADMINISTRATIVE EDITION.

ISSUED BY THE SECRETARY OF AGRICULTURE JULY 1, 1908.

1908.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1908.

Pinchot's utilitarian philosophy was reflected further in the new agency's wildlife policy. Unlike the national parks, which prohibited hunting for the most part, national forests fell within the jurisdiction of State game laws, and hunting was allowed. The agency's wildlife protection efforts, moreover, would focus on game animals. In 1905, the Forest Service's first *Use Book*—a manual of regulations and directives—included wildlife conservation in its outline of the agency's responsibilities. It directed Forest Service personnel to cooperate with State agencies in enforcing local game laws. Field personnel, or rangers, were to "inform all hunters and travelers" of these regulations—a sometimes dangerous task best accomplished "with courtesy and tact."[35]

In 1896, the Supreme Court had ruled in *Geer v. Connecticut* that resident wildlife is the property of the State.[36] Accordingly, the Forest Service was required to consider States' rights in managing this resource.[37]

By 1907, the agency had declared its arrangement with the States in wildlife conservation a success. One Forest Service publication noted that as a result of the agency's protection of game under State and territorial law, wildlife "is usually more abundant and better looked after within the national forests than outside of them."[38] Observers outside the agency agreed. As the *Oakland Tribune* reported, the national forests provided "one of the best means for the protection of wild game," including quail, grouse, and deer. In California, these animals had become "plentiful" since the "forest reserve has allowed no fires, thus causing the underbrush to grow densely, making a shelter and hiding place for the timid game."[39] In 1908, Federal legislation mandated that the Forest Service assist State authorities in the protection of game.[40]

Subsequent *Use Books* continued to build on these principles. The manual of 1914, for example, pointed out that "game is a product of the forests." Protection of game animals, birds, and fish was listed here as "an important duty of forest officers." Regulation G-30 required that Forest Service personnel cooperate with State and territorial officials in enforcing local laws. It also authorized rangers to act as deputy game wardens, which included collecting hunting and fishing license fees. This regulation benefitted many State fish and game departments, which often lacked the finances and the staff to enforce local laws.[41]

The First Rangers

The role of the ranger as game warden dated back to medieval England, where this colorful figure served as a protector of the royal forests. By 1909, rangers had become the "backbone" of the Forest Service. "Were it not for them," one observer claimed, "the national forests would soon be forests no longer."[42] During the early days of the forest reserves, however, their duties were not clear. Edward Tyson Allen exemplified the vague nature of the ranger's job responsibilities. Hired by the General Land Office in 1898 at a salary of $50 per month, he assumed a position as a ranger on the Washington Reserve, which later became part of the Gifford Pinchot National Forest. Initially, Allen received very little guidance. "Well, you are now a forest ranger," his new supervisor informed him, "so go out and range!"[43]

At first, the agency looked for rangers who were "self-taught, 'rugged outdoorsmen'" familiar with local customs as well as the area's flora and fauna.[44] Frank Hammit, one of the first rangers on the Yellowstone Park Timber Land Reserve, formerly had served as chief of cowboys in Buffalo Bill's Wild West Show for several years. Hammit had studied for the priesthood and reportedly could speak eight languages. Observers described him as a "practical man of the mountains" and a "rough and ready individual, typical of the majority of the Forest Rangers."[45]

Frank Liebig, assigned to the Flathead Forest Reserve Station at Lake McDonald in Montana, further illustrated the skills essential to rangers in the early 20th century. His reputation as an "expert tracker and a crack shot with a rifle" assisted him in enforcing game regulations. "I sure had my hands full, and then some," he recalled. "A ranger and a mounted police were on the same footing. People always liked us a long ways off."[46] Everett R. Doman, who later served as director of Wildlife and Fish Management, began his career with the Forest Service as a ranger in the early 20th century. He remembered that the qualifications for this position included the ability to "cook meals and shoe horses."[47] By the 1930's, the agency had required that rangers receive training in forestry or a related field.[48] As Doman recalled, however, "biologists were a rarity" in the agency in the early years.[49]

THE WORK OF A FOREST RANGER

In the spring of 1902...a man was waiting for me who said his name was F.N. Haines and that he was "looking for a good man that would like to work as a Forest ranger for Uncle Sam." He said that he had heard much of me, that I didn't drink or get on a spree, and the main thing was that I knew the country and was not afraid of anything. He then asked me if I would like to tackle the job. He said the pay was $60 a month, board myself, and furnish a horse or two...

The Supervisor gave me a notebook or two and a nice shiny silver badge. It said on it, "Department of the Interior, Ranger." The Supervisor also gave me a couple of big sheets or forms, on which I had to state what I did every day, and send the sheet in at the end of the month to Kalispell. This report was sometimes half a month late, and the officials in Washington could not understand why I wasn't on time. I guess they didn't know that I had a half a million acres to patrol, with very few trails in the area.

Then the Supervisor gave me a double-bitted axe and a one-man crosscut saw and a box of ammunition for my 45-70 [Winchester] rifle, and told me to "go to it, and good luck." He said "the whole country is yours, from Belton to Canada and across the Rockies to the prairie or Waterton Lake and the foot of St. Mary's Lake." It comprised nearly [all] the present Glacier National Park.

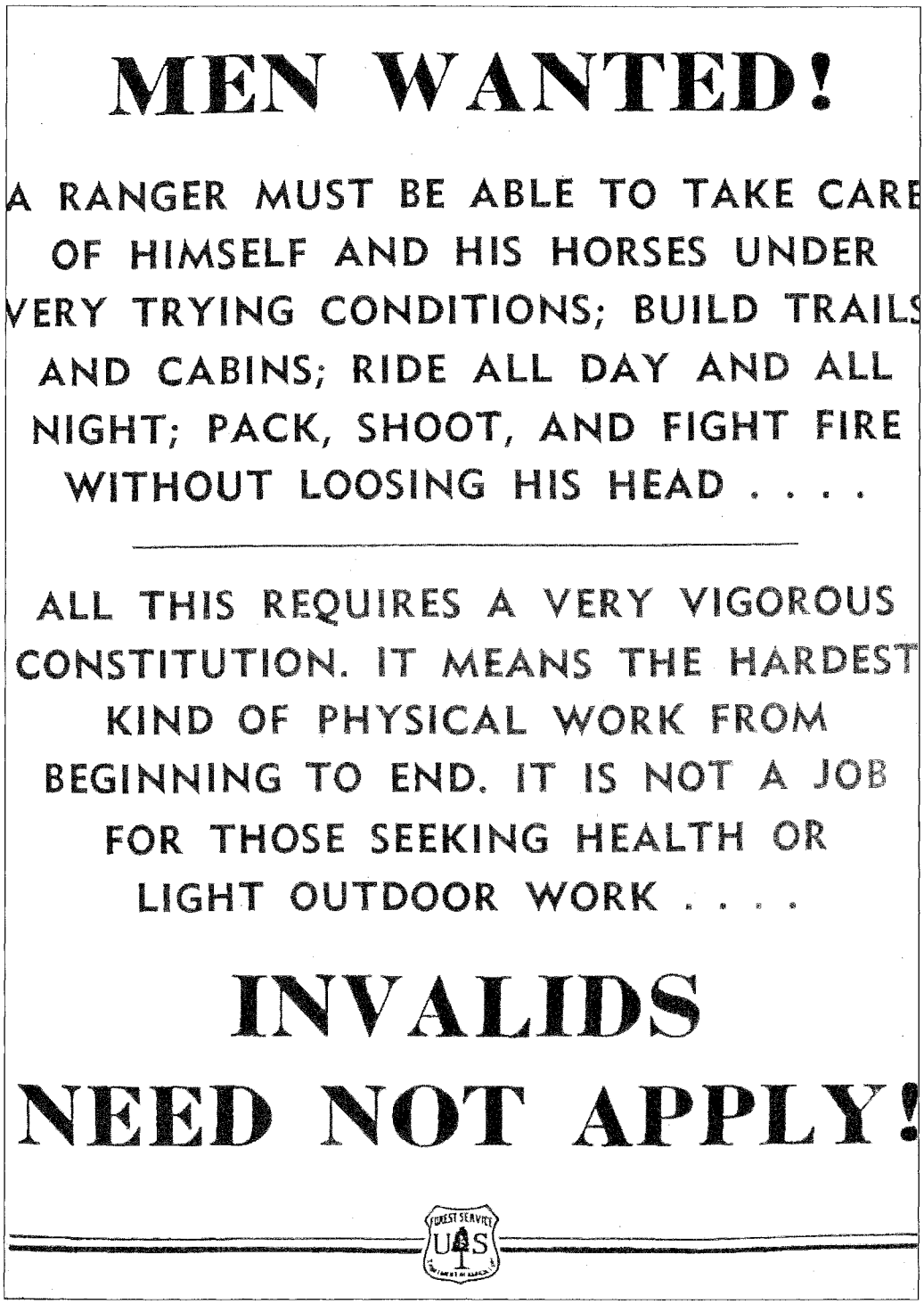
The instructions were to look for fires, timber thieves, which were plentiful all along the Great Northern Railway, and to look for squatters and game violators. I sure had my hands full, and then some.

A ranger and a mounted police were on the same footing. People always liked us a long ways off. More than once I have been waylaid, but, like the preacher and the bear, the Lord was on my side. My reputation as a good shot or Uncle's badge buffaloed the trespasser, and I always came out on top.

- Frank F. Liebig, quoted in *"I'll Never Fight Fire with My Bare Hands Again": Recollections of the First Forest Rangers of the Inland Northwest.*

During the early 20th century, the Forest Service raised the salaries for rangers, some of whom received $1,500 per year. Rangers used their own incomes to buy the horse, firearms, and clothing that were required for patrolling several hundred thousand acres.[50] William D. Hurst, who served as Assistant Ranger and District Ranger on the Wasatch and Ashley National Forests between 1937 and 1943, was responsible for multiple tasks, including game utilization studies. "I was the only Game Warden around on a vast acreage of land," he recalled. "And my situation wasn't unique."[51]

In addition to serving as game wardens, rangers conducted surveys of big game populations, recording their numbers by forests. They also settled disputes between cattle and sheep raisers, organized and led firefighting crews, built roads and trails, negotiated grazing and timber sales contracts, and completed reforestation and disease control projects.[52] Additional activities included stocking fish, which they transported to isolated lakes and streams by pack mule.[53]



COURTESY GERALD W. WILLIAMS, USDA FOREST SERVICE

Forest ranger recruitment poster.

During winter months, some rangers assisted the Department of Agriculture's Bureau of Biological Survey with its predator control work. Livestock interests encouraged elimination of carnivorous animals such as mountain lions, bears, wolves, and coyotes, that could prey on cattle and sheep. In 1906, for example, the *Report of the Forester* pointed out that "the loss of cattle in Wyoming and southern New Mexico during recent years from wolves has caused much alarm." The agency joined the Biological Survey in studying wolves and coyotes "and the most practical method for their extermination" for the benefit of livestock interests.[54]

Sport hunters, too, worried that predators would decrease the numbers of game animals. "Some species of wild life are more beneficial to mankind than others," explained one forester. "To the extent that the less beneficial are interfering with the successful propagation of the more beneficial the former must be controlled."[55] Forest Service employees supplemented their incomes by hunting wolves, coyotes, and mountain lions, which yielded bounties ranging from $1.50 to $50 per animal.[56]

During the early 20th century, newspaper headlines revealed the perception that rangers were engaged in warfare against predators. "Forest Rangers Battle with Beasts," announced one article, while another reported that "Forest Rangers Annihilate Wolves." Poisoned bait became the preferred method of destroying "these destructive beasts which have become such a menace to the stock industry."[57]

While coyote populations continued to thrive throughout the West, by the 1920's some Forest Service officials had suggested that wolves could be exterminated. "It seems possible to clean them up to the last animal," noted one assistant forester. This bold rhetoric reflected an animosity against wolves that was widespread in the late 19th and early 20th centuries, and the Forest Service's predator control efforts helped improve the agency's public relations with ranchers and hunters throughout the West.[58]

FOREST RANGERS BATTLE WITH BEASTS

IT IS A WAR OF WITS BETWEEN UNCLE SAM'S MEN AND WILD ROVERS OF WOODS.

Washington, Oct. 19.—One of the duties of Uncle Sam's is to kill "varmints" cattle, sheep and oth animals, in the wester bears, mountain lion otes, wildcats and lyn ful, and annual dam beasts runs into milli forest rangers killed ive animals. The show that 213 bear lions, 172 wolves, 69 coyotes, 870 wildcats fell before the range

In addition to th animals that are t stock and to game a forest officers have against the prairie one thirty-second as The biological surve one grown wolf wi $1,000 worth of stock the average family get at least $3,000 v killed by wolves is Calves and yearlin selected by them f if these cannot be and even full grown An old cattleman is experience to so old

FOREST RANGERS ANIHILATE WOLVES

Make Inroads in Cattle Killing Beasts

Track Them on Snowshoes and Kill Eight Varmints

A HEAVY BOUNTY FOR THEM

PROVIDENCE (R. I.) JOURNAL OCT. 19, 1911

WILD BEASTS TAKE TOLL OF MILLIONS

Forest Rangers Gaining in War Upon Predatory Animals.

POISON A VALUABLE ALLY

orest Rangers Gaining in War Upon Predatory Animals.

OAKLAND (Cal.) TRIBUNE NOV. 19, 1911

FOREST RANGERS GET RARE SPORT

Wage Warfare Lions, Wolves Wildcats.

Nov. 18.—In the here bears, moun coyotes, lynxes and ful, the annual runs into millions, t rangers killed 213 n lions, 173 wolves, coyotes, 870 wild

forest officers have inst prairie dogs, 32 as much in a year estimated that the wolves will eat stock in a year, gs for most part, en hunger presses, r steer.

t successful weap sts, but it has to ports and watched t will not destroy and game birds. commonly used. nment employes in war is much more e old bounty sys hunters would not s they feared to at lays the golden bstituted scalps of the wolf bounties

FOREST SERVICE PROTECTS GAME

Supervisors Criticise the State Laws as Source of Much Confusion.

Topics of rare interest and vital con cern in connection with the develop ment of the national forests and their relation to the growth of the adjacent communities were discussed at yes terdays session of the conference of forest supervisors. The program was devoted to "public service."

C. J. Hald, assistant district forester at Denver, read a paper on service to forest users. He pointed out the

DENVER (Colo.) NEWS FEB. 3,

Smith Riley, district forest yer, reviewed the opportu public service on the part o officials, which he declared numerous and calculated to be o benefit.

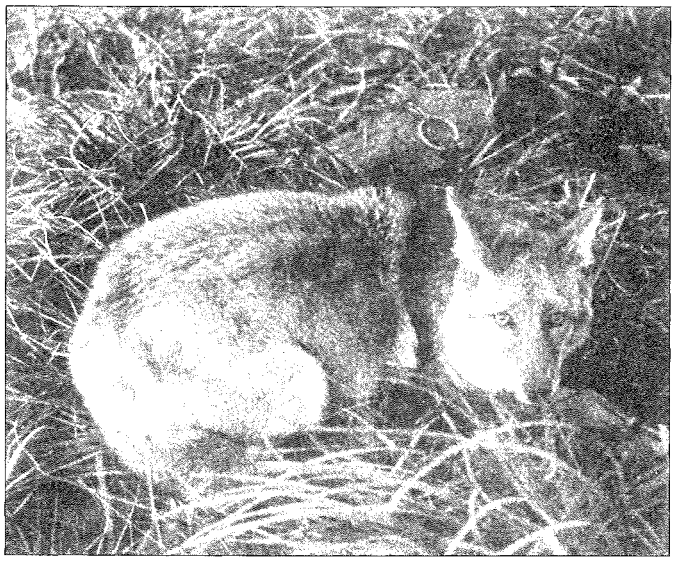
Supervisor A. G. Hamet o Ysabel forest, in the course on community organization, a area in the San Ysabel for Beulah, which has been set developed as a community are used by residents of Pueblo that community organization effective in getting good r proved schools and the develo playgrounds.

L. S. Dale, national field ager for the Rocky Mounta of the Boy Scout organizatio work accomplished by the Bo in hosting fire boss in p forest fire area in summer, and the saving one of cabin site Some Scout section.

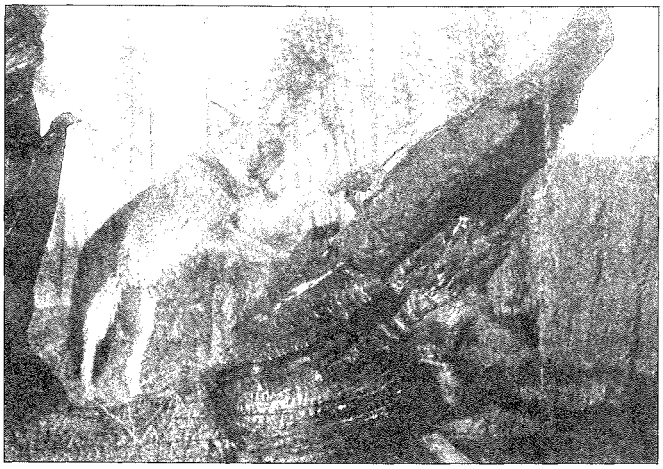
Wireless Phone Used in Fo

COURTESY USDA FOREST SERVICE

These newspaper headlines suggested that rangers were engaged in a war against predators.



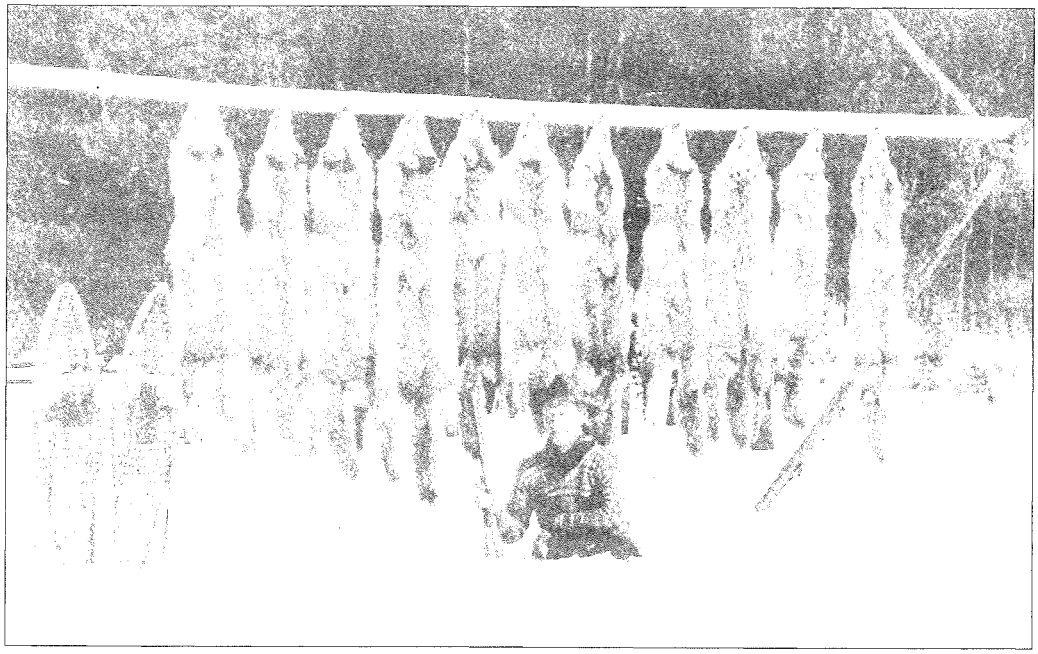
COURTESY NATIONAL ARCHIVES



COURTESY NATIONAL ARCHIVES

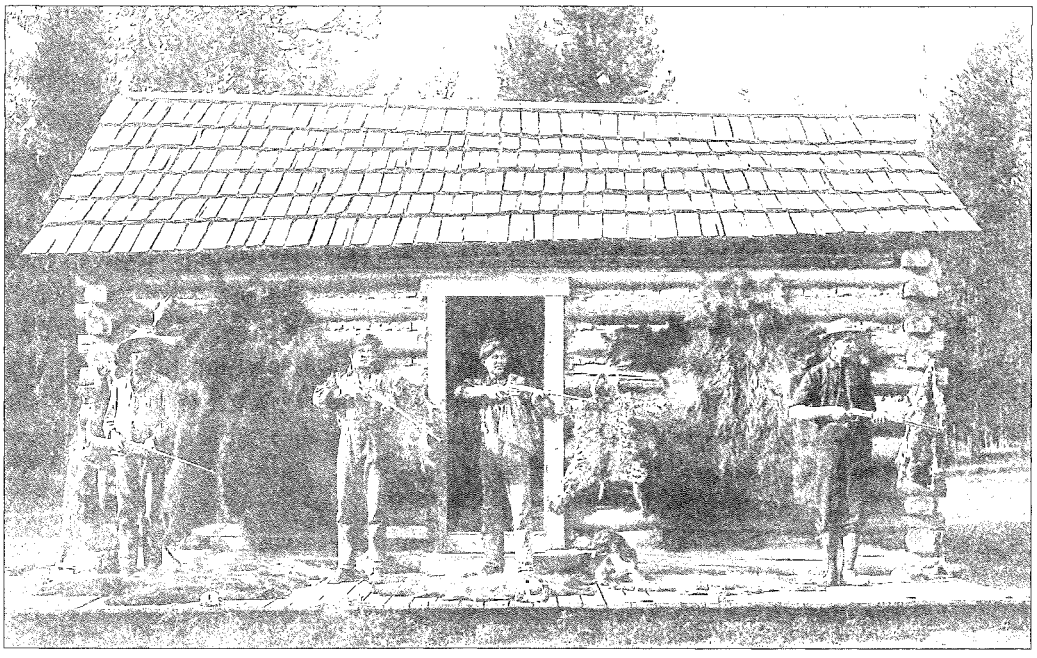
During the early 20th century, the Biological Survey, Forest Service, and State fish and wildlife agencies targeted wolves, coyotes, mountain lions, and bears in their efforts to control predators. Although poisoned bait became the favored method, these animals were also shot and trapped.

COURTESY UNIVERSITY OF WISCONSIN - MADISON ARCHIVES



COURTESY GLACIER NATURAL HISTORY ASSOCIATION

Hunters and trappers in Montana (top) and on Wallowa National Forest (bottom).



COURTESY USDA FOREST SERVICE

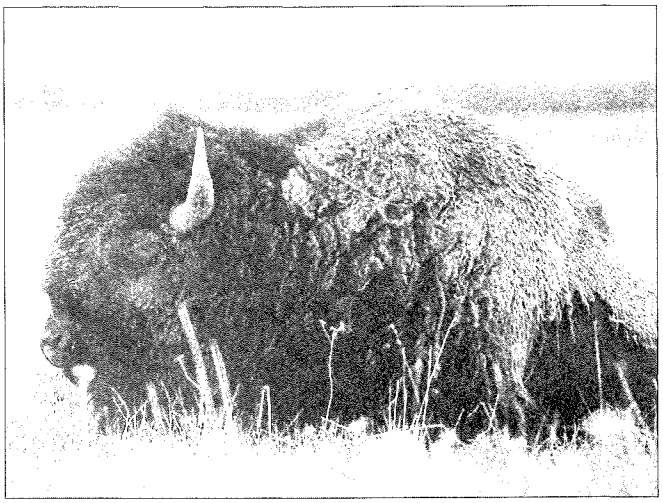
Early Efforts to Increase Game Populations

In addition to predator control, the Forest Service adopted a number of approaches to enhance game and fish populations during the early 20th century. According to Lloyd Swift, officials first attempted to convince States to close seasons on animals such as elk, and they promoted buck-only laws that prohibited the shooting of female deer. Next, "there was a big movement to establish refuges—both State and Federal."[59] In 1906, for example, Roosevelt established the Grand Canyon Federal Game Preserve on national forest land. Nine years later, William T. Hornaday, one of the Nation's leading conservationists and the head of the New York Zoological Society, drafted a plan for wildlife refuges on the national forests. In general, the objective was to prevent hunting in selected areas, allowing game populations to increase and spread to other regions, where hunting was permitted.[60] Additional Forest Service management efforts included the transplanting of animals, such as elk and wild turkey, from places where they remained abundant to areas where they were depleted.[61]

Ranchers and farmers opposed the Forest Service's attempts to increase wildlife populations, claiming that livestock and game competed for forage and could not co-exist. "We of the West are not enthusiastic about these reservations," the *San Francisco Chronicle* reported in 1915. While conceding that "deer look more poetic than cows," the author noted that "it is the meat, milk or butter and not the picturesque that counts."[62]

The Forest Service was not in a position to ignore these protests. Until the late 1920's, grazing fees yielded more income for the Treasury than was generated by timber sales. The fledgling agency needed support for its wildlife policies, and could not afford to antagonize powerful livestock interests. To placate them, the Forest Service vowed in 1916 that refuge areas would interfere "as little as possible with other uses, industries or pursuits within the Forest."[63] In general, refuges were established on lands not suitable for agriculture or grazing.[64] Moreover, the Forest Service established its Fish and Game Division in 1917 under its Grazing Department, indicating the need to coordinate wildlife policies with livestock interests.

Many early agency officials recognized this need for coordination. Chief Forester W.B. Greeley viewed wildlife as a significant concern. He believed that "game management on the national forests should stand on all fours with management of timber." Yet he also conceded that "we cannot give wild life an absolute right of way on the national forests," since "to do so would often cause real suffering and start reactions that bode no good to the cause of wild life conservation."[65] By the 1920's, some Forest Service officials had observed that opposition to refuges had abated, in part due to the agency's efforts to address the concerns of livestock operators.[66]



COURTESY USDA FOREST SERVICE

During the early 20th century, the Forest Service was concerned with the bison. With the support of President Roosevelt, the agency established a buffalo herd on the Wichita National Forest in 1907, in an effort to protect these nearly extinct animals. This forest became a wildlife refuge in 1936.

Another area where the Forest Service worked to gain public support was recreation. In 1915, Federal legislation recognized recreation as a legitimate use of national forests. The following year, Congress created the National Park Service, and some Forest Service personnel regarded the new agency as potential competition for forest lands. Forest managers thus developed opportunities for tourism in the reserves, expanding the road system and building campgrounds to accommodate automobile travelers. In 1917, the Forest Service reported that 3 million people had visited the reserves that year.[67]

By 1921, the agency had observed that while the national forests remained "chiefly valuable for the production of wood and the conservation of water," their "usefulness for recreation and as a home for wild life" was "very great and in their management this value should receive full consideration."[68]

The Forest Service was aware that much tourist enjoyment of forests was derived from hunting and fishing. Greeley, for example, informed the considerable readership of *The Outlook* magazine in 1924 that the wildlife on the national forests could become "one of the most highly prized recreational assets of the American people." Even so, he feared that the increase in numbers of visitors—encouraged by the new system of road extensions and resulting automobile travel—threatened "wild life populations as never before." He recommended educating the public about the need for fire prevention as well as the vigilant enforcement of State fish and game laws.[69]

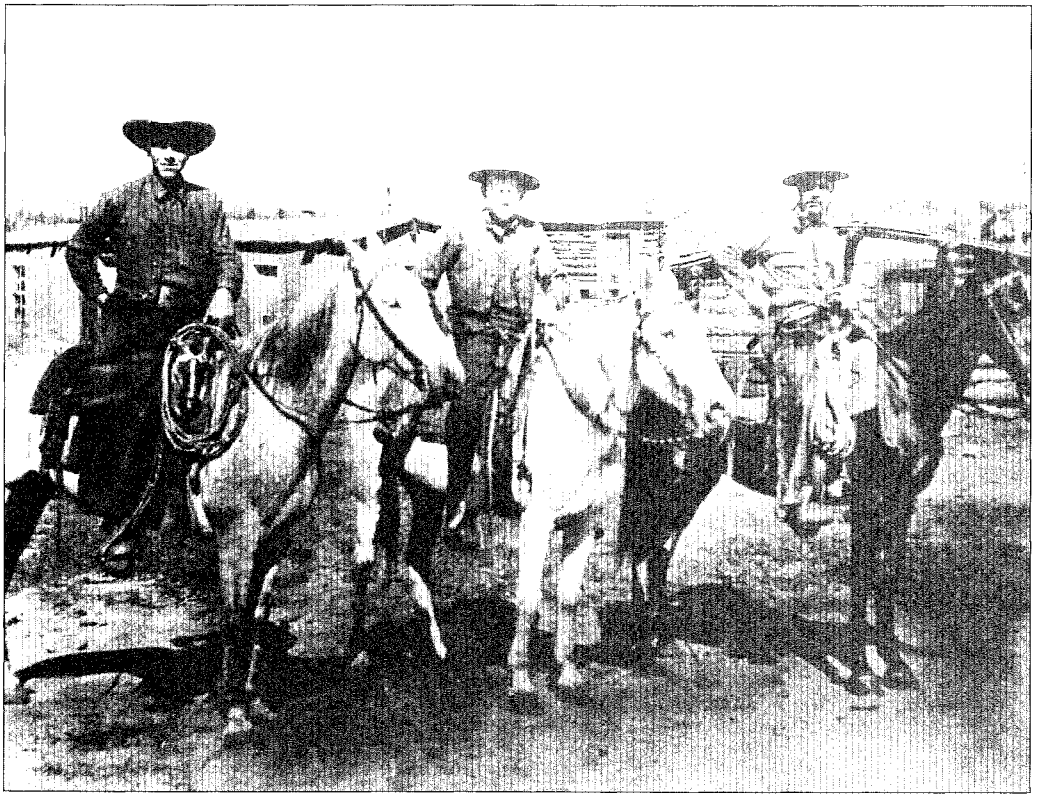
Greeley also suggested establishing additional game refuges, and "a few large stretches of real wilderness" that would remain "permanently closed to the road builder and the automobile." Echoing Roosevelt, he explained the advantages of wilderness areas as follows:

> The social value of unspoiled open spaces as a background for a great industrial nation must not be ignored in the feverish development of resources and expansion of highway mileage . . . Nature herself has marked out a number of them in the national forests. Not only will they afford secure haunts for wild life; they will recreate the youthful vigor of the American people.[70]

National forest lands became the focus of the movement to preserve roadless areas. In 1924, more than half a million acres in New Mexico's Gila National Forest became the country's first official wilderness area.[71]

Aldo Leopold and the Forest Service

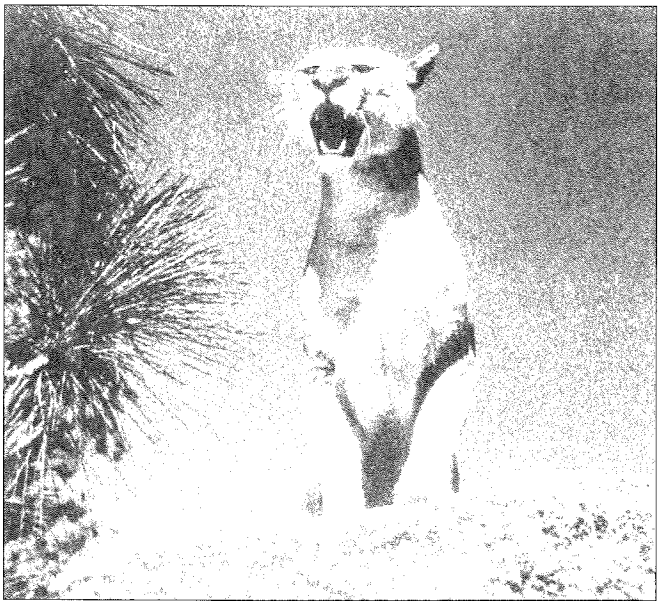
This wilderness designation resulted largely from the efforts of Aldo Leopold. As the author of *A Sand County Almanac*, Leopold would later inspire a generation of scientists and environmentalists. He began his career in the early 20th century as an employee of the Forest Service. In that capacity, Leopold suggested that the "principle of highest use" required "that representative portions of some forests be preserved as wilderness." He defined this term as "a continuous stretch of country preserved in its natural state, open to lawful hunting and fishing, big enough to absorb a two weeks' pack trip, and kept devoid of roads, artificial trails, cottages, or other works of man."[72]



COURTESY USDA FOREST SERVICE

Aldo Leopold, pictured left, in western garb.

In general, Leopold's activities in the Southwest exemplified the wildlife work of the Forest Service during the early 20th century. After graduating from Yale's School of Forestry, he took a position as an assistant in the Apache National Forest in the Arizona Territory in 1909. Here Leopold relinquished his "fancy eastern clothes," donning the boots, leather chaps, jeans, and bandanna of the "true western ranger." Completing his outfit was a "hat broad enough to shade himself and the Arizona Territory."[73]



COURTESY USDA FOREST SERVICE

Aldo Leopold advised "going out after the last lion scalp and getting it."

While working in the Southwest, Leopold assembled data on the wildlife and fish species in the region, asking rangers, ranchers, and farmers what they knew about the topic. In 1915, he organized this information in the first *Game and Fish Handbook* issued by the Forest Service. Written for rangers, the handbook listed many of the species that they could expect to encounter. It also encouraged rangers to appreciate species diversity. "The value of game," Leopold observed, "lies in its variety as well as its abundance."[74]

During his years in the Forest Service, Leopold actively promoted game conservation. He met with agency officials and sport hunters to organize local game protective associations, for example, and he advocated enforcement of game laws and creation of game refuges. Like Pinchot, he became a master of public relations. He solicited support from businesses, pointing out that recreation in the national forests could bring money to the local economy. He sold the idea of refuges to ranchers by forming an alliance with sport hunters, who, like livestock owners, wanted to eliminate predators. Leopold thus advocated a common approach to wildlife protection: restrictions on hunting and removal of carnivores.[75]

In 1915, Leopold, while working on the Carson National Forest in New Mexico, founded *The Pine Cone*, the official bulletin of the New Mexico Game Protective Association—and, as secretary of the organization, he edited the publication. Here Leopold promoted policies to enhance game populations, which included killing predators and "varmints." Game protection, he suggested, "is going to *make or break* on predatory animals." He therefore advocated "going out after the last lion scalp, and getting it." Leopold also helped

COURTESY USDA FOREST SERVICE

Aldo Leopold is pictured sitting in the front row, fifth from the right.

coordinate the Forest Service, Biological Survey, and the Sportsmen's Association of Southwestern New Mexico to survey the deer population on the Gila National Forest. At times the wildlife job seemed overwhelming:

> I am organizing game protective associations . . . securing the reintroduction of locally extinct species, stocking hundreds of waters with trout, fighting suits for violation of the game laws, giving illustrated lectures to the public, hammering on game protection through the newspapers, raising a fight on predatory animals. . . . While making good progress I think the job will last me the rest of my life.

Leopold, who became supervisor of the Carson National Forest, remained with the Forest Service in the Southwest until 1924, when he accepted a position at the U.S. Forest Products Laboratory in Madison, Wisconsin.[76]

The Crisis on the Kaibab Plateau

So successful were efforts throughout the West to increase game animals that overpopulation began to cause problems in some areas. Leopold's efforts to increase game animals reflected agency attitudes during the early 20th century. In general, Federal and State game policy was restrictive, "based on the principle that conservation was best accomplished by arbitrary limitation of the seasons and bags and by closed seasons." Issues of greater complexity—such as how the food supply and distribution of the sexes affected game species—were not understood. Biologists knew little about the population dynamics of wildlife species.[77] Restrictions on shooting and predator control throughout the West resulted in rapid increases in game, creating problems in some areas.[78] Nowhere was this point more evident than on the Kaibab National Forest in northern Arizona.

The Grand Canyon National Game Preserve was located here, since it provided ideal habitat for mule deer. This area furnished the animals' range year round. The higher elevations were covered with white and Douglas-fir, Engelmann spruce, and aspen, while the lower reaches featured Ponderosa pine, pinyon, juniper, and "varied shrubbery," including cliff rose and bitter brush.[79] This became one of Theodore Roosevelt's favorite hunting grounds, and other visitors similarly recognized its merits. In 1882, for example, the geologist C.E. Dutton regarded the Kaibab Plateau "as the most enchanting region." He described this area in lyrical terms, reporting "a constant succession of parks and glades—dreamy avenues of grass and flowers winding between sylvan walls or spreading out into broad open meadows."[80]

In the early 20th century, mule deer populations declined dramatically in the West. The Grand Canyon National Game Preserve, created in 1906, protected between 3,000 and 4,000 of these animals. Here the deer shared the range with thousands of cattle and sheep. Game hunting was not allowed, and government employees killed the wolves, coyotes, and mountain lions that preyed on the deer.

COURTESY NATIONAL AGRICULTURAL LIBRARY

Theodore Roosevelt considered the cougar to be a "most formidable" foe.

By the early 1920's, the size of the Kaibab deer herd had swelled to 100,000. The animals could not migrate beyond the preserve, as the high plateau was surrounded by desert. Consequently, they severely depleted the forage, and many starved. Recognizing this problem, Forest Service personnel studied the feeding habits of the deer. Ranger Benjamin Swapp, for example, analyzed the stomach contents of 167 of these animals. In his game report for 1920, he recommended that the Kaibab Game Preserve be opened to hunting to reduce the numbers of deer, but no action was taken at that time. In 1923, approximately 20,000 of these animals starved. "It was an appalling sight to see," recalled Swapp.

"I found seven under one tree. I opened them only to find a small handful of small sticks, undigestible, in their stomach[s]."[81] A drought in 1924 worsened the rangeland conditions, presenting the Forest Service with an unprecedented crisis.[82]

That year, Secretary of Agriculture Henry C. Wallace dispatched a committee of wildlife and grazing interests to investigate the Kaibab Plateau. Among the groups represented were the National Parks Association, Audubon Society, Boone and Crockett Club, American Game Protective Association, and the American National Livestock Breeding Association. The committee found rangeland conditions to be "deplorable," and "moving swiftly towards utter destruction."[83] This group of diverse interests reached a single conclusion: the Kaibab deer population had to be reduced.[84]

The preferred method was to transplant the deer to other game preserves. To this end, more than 100 men—including Navajo Indians and the novelist Zane Grey—attempted to drive the deer across the Grand Canyon to the South Rim. Their plan, sanctioned by the Arizona Game and Fish Department and tolerated by the Forest Service, was ambitious and colorful. Armed with tin cans, cowbells, and other noisemakers, the men lined up on foot and horseback. As one account described the scene, "A motion picture outfit was there at South Canyon water hole," and "Zane Grey was there with his fine horse and Japanese servant, who kept snapping pictures of Grey every turn he made." Other participants were not so well prepared. Some were boys and young men who had traveled from as far away as Ohio and Oregon in search of adventure. With few provisions and supplies, they proceeded in "pellmell" and "unorganized" fashion, and the operation quickly deteriorated. Adding to these problems, the deer proved reluctant and uncooperative. Accordingly, the drive "was abandoned as impossible." Similar attempts to capture the deer and ship them out of the area also failed.[85] Regional Forester Dick Rutledge described the drive as "the most interesting failure" he had ever witnessed.[86]

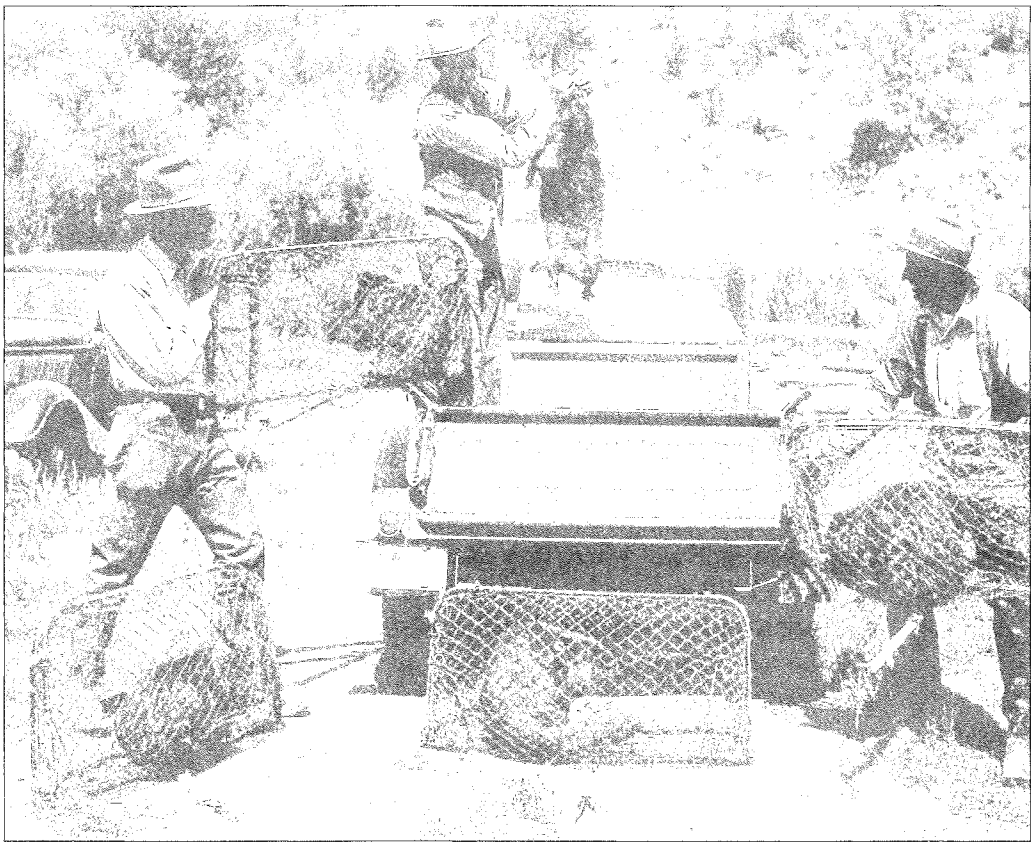
In desperation, Forest Service officials turned to another solution—killing the deer on the preserve. This decision sparked a conflict with the State of Arizona centering on which agency had jurisdiction over wildlife management on the Kaibab National Forest. On November 15, 1924, the Forest Service began issuing permits for hunting on the preserve, and detailed many of its rangers from the Intermountain Region to shoot the deer. The State opposed this measure and arrested three hunters. Governor G.W.P. Hunt and State Game Warden G.M. Willard further warned the public that Arizona intended to enforce its game laws. Several issues fueled the ensuing controversy: resentment of wealthy, out-of-State hunters; fear that wildlife was being "slaughtered" by the Federal Government; and consideration of States' rights.[87]

This dispute resulted in a lawsuit that reached the Supreme Court in 1928. In Hunt *v. United States*, the court ruled in favor of the Forest Service, noting that the Federal Government had a right to protect its property if endangered by excess game. This litigation established a crucial precedent for Federal control of wildlife on Federal lands. In the meantime, the Forest Service and the State had agreed to allow controlled hunting in the preserve, creating a joint committee to monitor conditions.[88]

The Kaibab crisis also influenced the development of game and range management. Widely publicized in conservation, outdoor, and scientific publications, it demonstrated the need for developing a more complex approach to wildlife protection. A number of issues required extensive study, including predator control, irruptions in game populations, and the relationship between habitat degradation and declining species. As historian James B. Trefethen explained, the Kaibab Plateau taught wildlife managers two lessons. First, inviolate refuges could become "death traps" without predators. Second, "Where man upsets the natural balance between plants and plant-eaters and between predators and prey, he must assume the function of a controlling agent if he wants healthy animals and a healthy range."[89]

Accordingly, during the late 1920's and early 1930's, wildlife became an important component of forestry research. The Biological Survey, for example, launched a study of the relationships between game populations and "livestock and other forestry interests."[90] This agency assisted the Forest Service by assigning biologists to forest and range experiment stations, where they investigated such topics as wildlife species and woody plants. In 1928, the McSweeney-MacNary Act authorized and financed a national program of forest research, which included wildlife as well as forest diseases and insects, fire, range and watershed, forest products, timber survey, and economic analysis. During the 1930's, the Federal Government established cooperative research stations at universities, and these assisted the Forest Service and State game departments with wildlife research.[91]

Expansion of national forests in the eastern United States provided additional focus on wildlife. In 1911, the Weeks Act allowed for Federal purchase of cutover, tax-reverted forest lands. New national forests in this region were to provide food and cover for wildlife.[92] During the 1930's, the Forest Service began integrating wildlife management in the East with silviculture and timber harvesting, which spawned the slogan, "Good timber management is good wildlife management." Although eastern national forests were generally smaller than those of the West, they were subject to greater population pressures and a higher number of hunters. Unlike the West, however, ranching was not a prominent activity in the East, giving agency biologists greater ability to concentrate on wildlife in this region.[93]



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Transplanting beaver.

The Civilian Conservation Corps and the Forest Service

During the early 1930's, the Great Depression interrupted many Government activities, including the Forest Service's wildlife work. By 1933, however, New Deal legislation had rejuvenated conservation efforts. The Civilian Conservation Corps (CCC), for example, provided a substantial workforce of young people to staff forestry projects. Many enrollees were unemployed men who received a cash allowance of $30 per month—$25 of which was sent home. Most of their 1,300 camps were initially located on national forests. Here "Roosevelt's Forest Army," or "Tree Army," as enrollees were dubbed, constructed roads, campgrounds, fire towers, and trails.[94] They also contributed to forest wildlife management, building fences along refuge boundaries, and dams for stream improvements.[95] The Bureau of Biological Survey supervised much of the Forest Service's habitat enhancement work.[96]

The CCC devoted considerable effort to fisheries work on the national forests during the 1930's. Stocking and surveying streams and lakes were the kinds of labor-intensive jobs that were ideally suited for the CCC. During its life span, from 1933 to 1942, there was a burst of this activity in the national forests unlike anything seen before or since. Crews of CCC enrollees rode by truck to remote locations on the national forests and hiked to mountain lakes and streams carrying water pails filled with fry. "Watching a squad with its bucket loads scrambling over a broken rock field," wrote one admiring wildlife specialist on the Medicine Bow National Forest in Wyoming, "it is marvelous to see the speed they make without spilling any of the contents." Each truck carried a metal tank specially equipped with two compartments, one for the fish and one for ice-chilled water, and a gas-powered pump and sprinkler system for keeping the water oxygenated and cool. One of these tanks could carry up to 20,000 two-inch fingerlings from the hatchery to the stream or lake.[97]

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The Civilian Conservation Corps stocked streams on the national forests.

Stream and lake surveys, meanwhile, were conducted under a cooperative agreement between the Bureau of Fisheries and the Forest Service, using funds obtained through the CCC. A survey of lakes on the Willamette National Forest in Oregon was typical of this effort. Junior fish biologist F.C. Ziesenhenne spent the summers of 1936 and 1937 surveying 174 lakes in the Cascade Range. His job was to collect specimens of flora and fauna from each lake, note all inlets and outlets and other structural characteristics, determine whether the lakes were suitable for stocking or improvement, and locate suitable hatchery sites. Ziesenhenne procured all his scientific equipment from the Bureau of Fisheries while the Forest Service provided him with camping equipment, an inflatable boat, and a pack string of five mules. Such lake surveys, cursory as they were, helped direct fish stocking efforts.[98]

The improvement of streams and lakes for fish production was another labor-intensive activity that saw its heyday during the CCC era. The concept of making physical changes in natural streams in order to improve the quality of fish habitat first emerged in the early 1930's. With the advent of the CCC, stream improvement suddenly became feasible on a large scale. The Federal Government rushed a number of handbooks and bulletins on stream improvement techniques into production between 1933 and 1935. Much of the work was of an experimental nature, while evaluation of results followed slowly behind.

Fish biologists listed six aims of stream improvement: to provide cover and shelter for fish; to minimize extreme or rapid fluctuations in streamflow; to minimize soil erosion; to increase the production of fish food; to ensure favorable stream temperatures for the fish; and to provide favorable conditions for natural propagation. Dams and deflectors were the most commonly employed structures. The foremost challenge in designing and locating these structures was to avoid making changes that would inadvertently damage one element of the fish's habitat while enhancing another.[99]

H.S. Davis, a biologist in the Bureau of Fisheries, probably worked harder than anyone to promote the concept of stream improvement. In this endeavor he was aided not only by the publicity surrounding the activities of the CCC, but by the sudden vogue for habitat in the public's mind. "The average angler," Davis claimed, regarded stream improvement "as the answer to his fondest dreams and the open sesame that will insure a full creel any time he may choose to spend a few hours on his favorite stream." Davis boasted to his colleagues at the annual meeting of the American Fisheries Society in 1934 that stream improvement had become the most publicized phase of fisheries management.[100]

Cooperation with the Bureau of Fisheries

The CCC's work on stream improvement sparked some bureaucratic tension between the Forest Service and the Bureau of Fisheries. During the early 1930's, these two agencies had confirmed an agreement that the Bureau of Fisheries was better equipped to investigate fish habitat conditions on the national forests.[101] When CCC funds became available in 1934, however, the Forest Service employed a number of wildlife technicians, along with Clarence M. Tarzwell, a biologist with the Bureau of Fisheries. Tarzwell conducted training sessions for the newly recruited wildlife technicians near Logan, Utah,

after which they went to various national forests to supervise stream improvement work by the CCC. Tarzwell also studied the results of stream improvement work on Rock Creek on the Deerlodge National Forest in Montana, followed by a more extensive study of methods and results of stream improvement in the Southwest. Based on these studies, Tarzwell developed new specifications for stream improvements in a bulletin published by the Forest Service's Intermountain Region. The Bureau of Fisheries objected that the Forest Service's employment of wildlife technicians to supervise stream improvement, together with its publication of the bulletin, were not in the spirit of the two agencies' cooperative agreement.[102]

This was more than a dispute over agency jurisdiction. Tarzwell's previous work for the Bureau of Fisheries had been concentrated in Michigan. Tarzwell believed that it was necessary to adapt methods developed in the East to the different conditions encountered in the West. Mountain streams in the West had a greater gradient and a greater seasonal fluctuation of flow. Biologists in the Bureau of Fisheries attacked the Forest Service's bulletin, insisting that Tarzwell had overgeneralized from his study of a single stream in Montana.[103]

As a result of the dispute, the Forest Service and the Bureau of Fisheries entered a new cooperative agreement on March 18, 1935. The agreement outlined a comprehensive program to develop the streams and lakes on the national forests, including survey and improvement of streams and lakes, rearing and planting of fish, and regulation of angling (in cooperation with the States). Concerning stream improvement, the Forest Service would undertake the construction of all improvements "with the technical advice of the Bureau of Fisheries."[104] Some of the CCC's stream habitat improvement work in the Southwest assured opportunities for future recovery, saving declining species such as the Gila trout from extinction. The CCC's work on the Gila National Forest's Diamond Creek provided this population with enough habitat to survive through drought, fire, and grazing by livestock, until transplants could be made.[105] Decades later some of these early stocking efforts provided future biologists opportunities to "restore" genetically correct species where they had been extirpated.

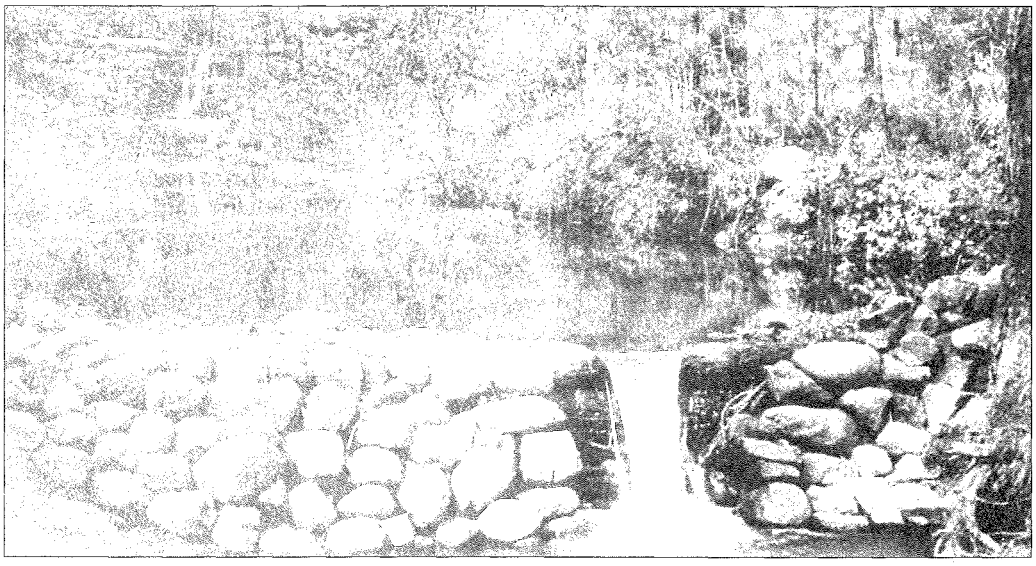
Conditions in the Alaska Territory posed some unique problems for cooperation between the Forest Service and the Bureau of Fisheries. Both the Chugach and Tongass National Forests contain a considerable number of lakes and streams, and Forest Service officials in the 1930's recognized the potential to develop some truly outstanding sport fishing there. But Dolly Varden trout, a natural predator of salmon fry, were considered a menace to the salmon industry. The Alaska game law (a Federal law, since Alaska was still a territory) did not extend protection to trout. There was neither a closed season nor a catch limit nor any restriction on the use of nets. Because of the importance of the salmon industry to the territorial economy, the federally appointed Alaska Game Commission did not want anything to do with resident fish. Similarly, the Bureau of Fisheries was not enthusiastic about the development of trout fishing in Alaska because this conflicted with its mission to manage the anadromous stocks in Alaska. While the Forest Service and the Bureau of Fisheries cooperated on a number of fish stocking efforts in isolated lakes on the Chugach

and Tongass National Forests between 1929 and 1931, these populations were overexploited as soon as they became established.[106]

Forest Service officials worked with the Alaska Sportsmen's Association in the 1930's to obtain protection of Alaska's game fish, particularly Dolly Varden trout. They wanted the territorial bounty removed on Dolly Varden, and they wanted the Bureau of Fisheries to impose fishing restrictions. Failing that, they contended that the Bureau of Fisheries should relinquish control of Alaska's game fish to another agency. Toward the end of the decade the Forest Service brought this matter to a head by canceling all permits for Dolly Varden fish traps on national forest lands. Finally responding to the sportsmen's demands and the complaints of the Forest Service, the Bureau of Fisheries issued regulations in 1940 that prohibited all commercial fishing of trout in Southeast Alaska. These regulations, which met with the "hearty approval" of forest officers in Alaska, placed the territory's sport fisheries on a new legal and administrative footing that was more like what existed in the rest of the United States.[107]

In the Forest Service's Southern Region, cooperation between the Forest Service and the Bureau of Fisheries focused on fish stocking. In the Southern Region, five trout-rearing stations were built in wildlife management areas, and the Forest Service conducted training schools in fish planting and transportation. The mix of coldwater and warmwater streams in the South gave stream and lake surveys exceptional importance in that region. The Bureau of Fisheries assigned two investigators to the region. One was stationed on the Pisgah National Game Preserve and specialized in trout problems in the Southern Appalachians. The second, stationed at the Bureau of Fisheries Experimental Station at Welaka, Florida, adjacent to the Ocala National Forest, specialized in warm water lakes and streams. These men advised the Forest Service on what species of fish should be planted in each stream and lake. In a typical year the Forest Service planted 125,000 large fingerling trout in the Southern Appalachians and a larger number of fingerling largemouthed bass, bream, and crappie in the warm water lakes and streams of the piedmont and tidewater areas.[108]

It was in the West, meanwhile, that cooperation between the Forest Service and the Bureau of Fisheries had the most pronounced results. The amount of stream improvement accomplished on western national forests in the 1930's was remarkable. By 1938, a total of 352 miles of stream improvement had been completed in the Forest Service's Southwest Region.[109] By that same year, a total of 145 miles of stream improvement and 254 rearing ponds had been completed in the Forest Service's Rocky Mountain Region.[110] In California's High Sierra, Forest Service personnel led CCC crews in building scores of check dams near the headwaters of mountain streams. Each of these structures was pierced by a small-diameter pipe that permitted a continuous flow of water through the dam. This type of improvement was vital for keeping many streams flowing through California's dry summers.[111]



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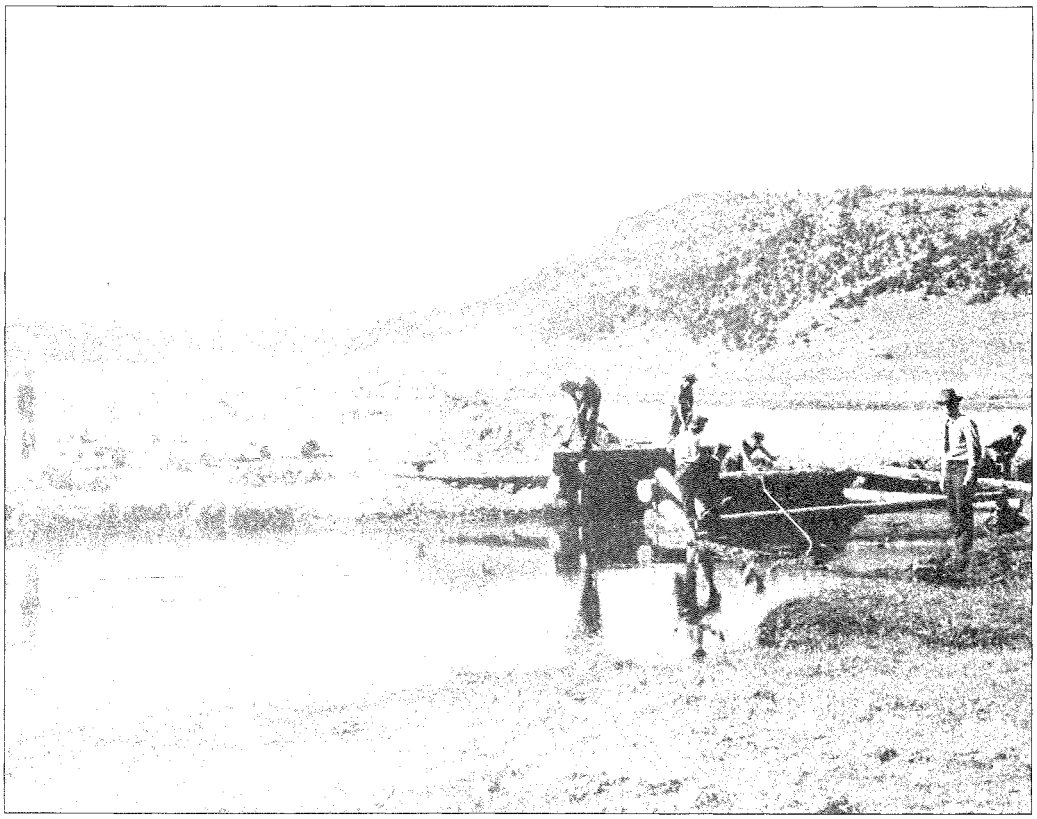
The Civilian Conservation Corps workers improved habitat for fisheries.



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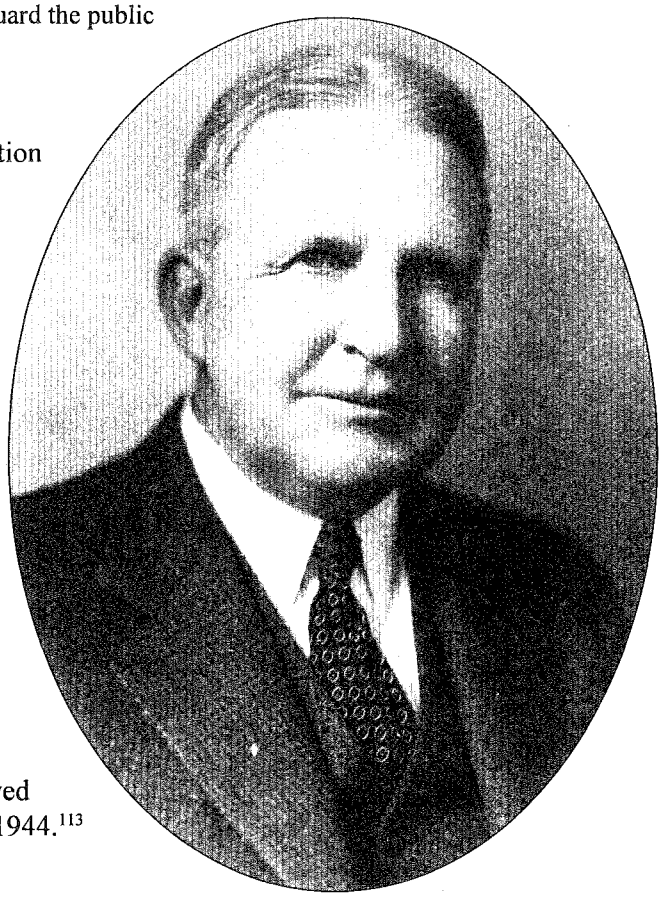
The Wildlife Division

The Forest Service's work with the CCC and the Bureau of Fisheries during the 1930's represented an increasing emphasis on wildlife and fisheries in the agency. In 1935, a conference of regional foresters observed the growing importance of this resource in managing the reserves. They adopted the following policy:

> The Forest Service will recognize and define the true place of wildlife in the National Forests, and will work progressively and aggressively to create the physical conditions and establish the principles of management essential to maintain appropriate numbers of all suitable species of game animals within each region and/or administrative unit. To that end a permanent technical personnel will be developed and specific plans for wildlife formulated as rapidly as controlling circumstances will permit.
>
> In the execution of progress and plans of wildlife management every effort will be made to cooperate with and through State and other local agencies but the legal powers of the Federal Government will be invoked (only) when no other course of action adequately will safeguard the public interest.[112]

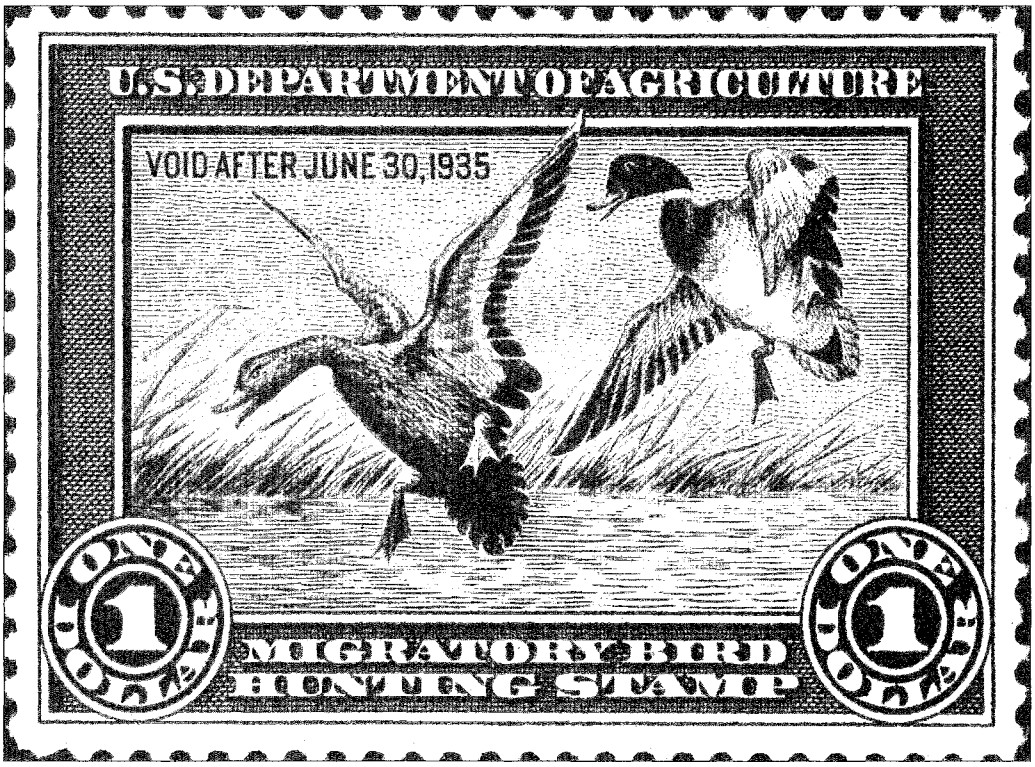
This policy culminated in the creation of the Wildlife Division in 1936. Homer Shantz, a noted authority on soils, became its first director. As a former president of the University of Arizona, Shantz proved to be an effective promoter and "ambassador." He produced an appealing film called "Realm of the Wild," for instance, that described wildlife on the national forests. It proved to be one of the most popular of the Department of Agriculture's films. Shantz served as a role model and an inspiration to his assistants, including Lloyd Swift, who followed him as director of the Division in 1944.[113]



Homer Shantz, first director of the Wildlife Division. COURTESY LLOYD SWIFT

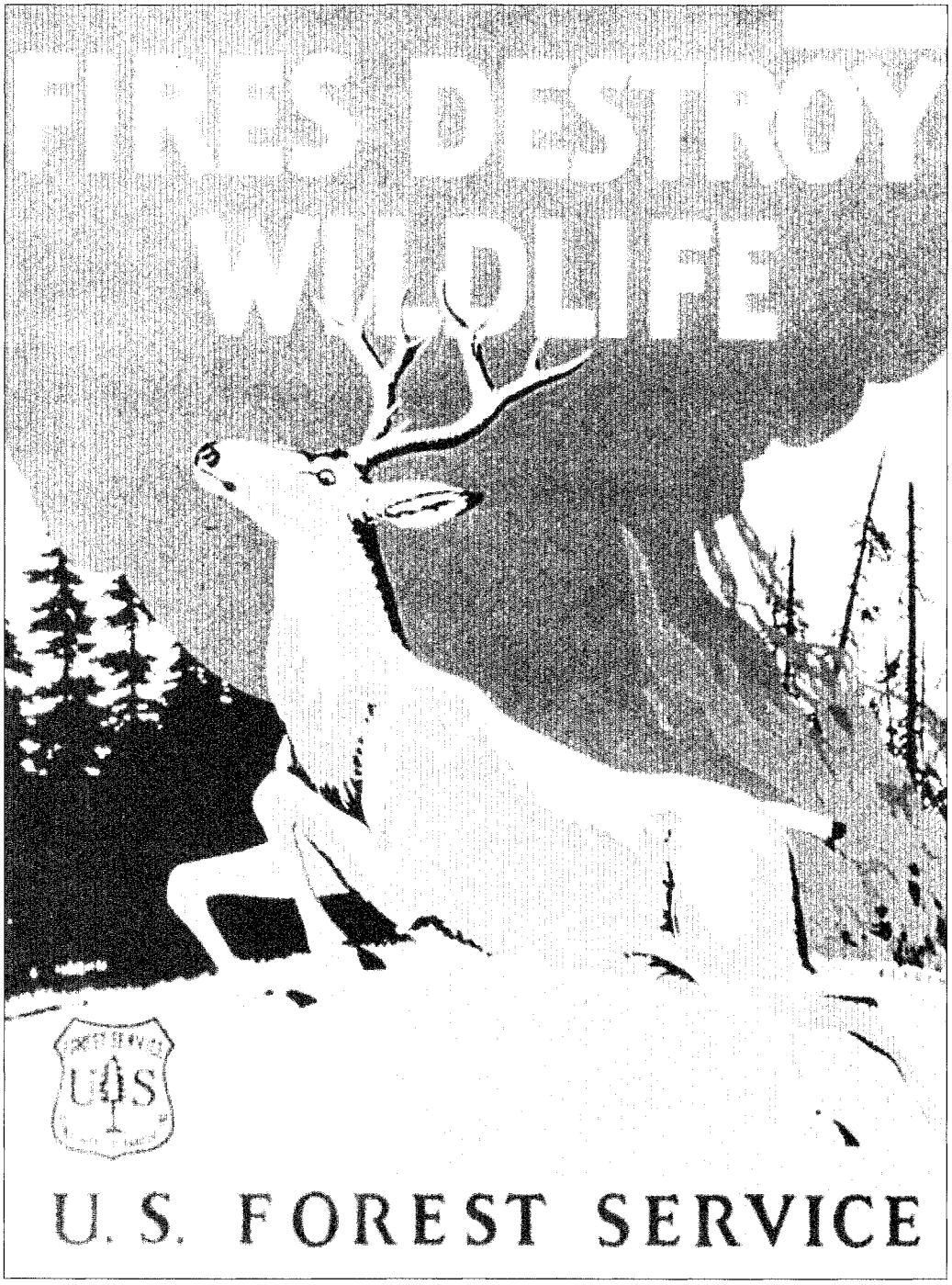
During the mid-1930's, the Forest Service assigned 61 people to wildlife work, including range examiners and aquatic biologists. The Great Lakes Region employed wildlife technicians on 11 of its forests. Aldo Leopold, who was by then a professor of Game Management at the University of Wisconsin, provided technical advice to this new staff.[114]

In Shantz's estimation, these developments signaled that the Forest Service's role in wildlife conservation had become "preeminent."[115] In the following decades, the agency continued to build on the strategy established during the 1930's, devoting increasing attention to wildlife and its relation to other resources and uses.



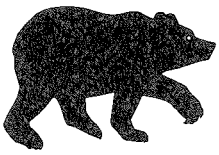
COURTESY NATIONAL POSTAL MUSEUM, SMITHSONIAN INSTITUTION

The first migratory bird hunting stamp was issued by the Department of Agriculture in 1935.



COURTESY ALFRED RUNTE

The national forests protected wildlife as well as watershed, rangeland, and timber during the early 20th century. At that time, agency officials viewed fire as a menace to these resources.



CHAPTER THREE

CHAPTER THREE
WILDLIFE AND FISH VALUES

"Brown bears serve no good purpose . . . We have too much to do to make room for settlers and industrial workers to permit this menace to hang over us. The bear ought to be exterminated."

. . . *Juneau Empire, 1930.*

"An emergency is declared to exist! . . . Our unique brown bear of Alaska is doomed to as complete extinction as the California grizzly."

. . . *Stewart Edward White, 1930.*

The Forest Service's management of wildlife and fisheries reflected changing attitudes toward the natural world. During the early 20th century, sport hunting interests became increasingly organized and vocal, encouraging the agency to expand its early emphasis on timber and grazing to include protection of habitat for game populations. In the 1930's, the Forest Service further broadened its wildlife and fisheries work to include a wider variety of species, signaling the gradual development of nonconsumptive uses of the national forests.

The Greatest Good of the Greatest Number Over the Long Run

The early Forest Service accommodated a number of interests, including logging, mining, livestock grazing, and recreation. Conservationists advocated multiple, sometimes competing, uses of the national forests from the outset. As described earlier, Gifford Pinchot and John Muir personified a fundamental difference in perspective on how to weigh competing uses. As Chief Forester, Pinchot favored activities that provided economic benefits over intangible, nonconsumptive uses, such as the aesthetic appreciation that Muir advocated. "Wilderness is waste," Pinchot was fond of saying, describing a position that clearly set him apart from Muir.[1] Accordingly, his founding principles established a hierarchy of forest uses aimed at sustaining local industry and stable rural communities—a concept that encouraged good public relations between the agency and the locals. The dominant industry in an area was to receive consideration over minor industries, and the homebuilder was to enjoy preference overall. In cases of conflict, Pinchot stressed, the Forest Service was to be sensitive to local interests and perspectives. Pinchot instituted a strong bias in the Forest Service in favor of local people who made their living from the land.[2] As Forest Service historian Harold K. Steen has pointed out, Pinchot emphasized forest users more than uses.[3]

The Big Blackfoot Valley in western Montana provides a revealing case study of changing values and conflicting uses. In the early 1930's, residents of this area decided they were getting a raw deal. They lived in a sportsmen's paradise—a verdant land abounding with elk, deer, moose, grizzly bear, and trout-filled lakes and streams. Yet the sheep barons, most of whom paid no property taxes in the valley, exploited the land for their own wealth,

ruining the place for the sport hunters. The watersheds had eroded, and streamflows were about half that of twenty years earlier. Continued overgrazing on the national forests, these residents asserted, would soon destroy game and fish populations. Their paradise was in jeopardy.[4]

Concerned citizens formed the Upper Blackfoot Sportsmen's Association, beginning a campaign to oust the sheepmen from the nearby national forests. They took their message first to the local ranger in Lincoln, then to the forest supervisor in Helena, later to the Forest Service office in Washington, D.C., and finally to President Franklin D. Roosevelt. They argued that local residents could derive more income from recreational use of the valley by accommodating wealthy sportsmen than they had gained from the "Predatory Wealth" of the absentee sheep owners who lived on the other side of the State. They alleged that sheep herders and "a Government hunter" were employed in killing grizzly bears, and that if the animal were protected and allowed to multiply, their valley would attract big game hunters from all over the world.[5]

How was the Forest Service to mediate this conflict? If the two forest uses were truly incompatible, whose interest should prevail? The Upper Blackfoot Sportsmen's Association raised some basic issues that Forest Service officials encountered repeatedly in a variety of circumstances throughout the century. Wildlife values defied easy analysis. They reflected social and aesthetic considerations to a greater extent than other forest resources, such as timber and range. Wildlife values challenged the Forest Service's standard prescription for balancing multiple forest uses. People prized wild animals in such personal ways that it was difficult to weigh this resource against other uses in finding the "greatest good of the greatest number over the long run"—and not necessarily the greatest unit output or dollar return.

At first glance, the conflict between the Upper Blackfoot Sportsmen's Association and the sheepmen appeared to be fairly straightforward: two interest groups wanted to exploit different natural resources on the national forest, each for their own economic gain. But it was not that simple. The petitioners raised aesthetic considerations. They took pleasure in the natural beauty of their surroundings, claiming it was their "birthright." They wanted to share the aesthetics of the wildlife resource with others, insisting that the valley should serve as the "recreational grounds" for the people of the State.[6] These were social, as well as economic, uses of the forest.

Did the members of the Upper Blackfoot Sportsmen's Association have more claim than the sheepmen to a local interest? The association was careful to describe its members as "natives" of the valley; indeed, it claimed that most were "born of pioneer families." Yet the organization's leadership came from the nearby cities of Helena and Great Falls, and it asserted that the sport hunting and fishing opportunities in the valley would benefit people from around the State. Whether the sport hunters had closer community ties to the valley than the sheepmen was open to question.[7]

COURTESY USDA FOREST SERVICE

The Forest Service established "Livestock Exclosure" areas to provide habitat for game.

The ideas espoused by the Upper Blackfoot Sportsmen's Association were typical of organizations that formed throughout the nation in the 1930's. The spread of sport hunting associations put pressure on the Forest Service to reevaluate livestock grazing in many areas. Sportsmen complained that forest officers were too eager to support the livestock industry and that the agency was failing to consider the growing significance of the wildlife resource to sport hunters. There was some irony in this complaint, given the fact that the growth of sport hunting in the 1920's and 1930's was largely made possible by increases in big game populations on the national forests. Nevertheless, the Forest Service was sensitive to charges that it was not managing the national forests for the greatest good.

In 1935, the regional foresters discussed the issue at their annual conference. As noted, they adopted a statement of policy pledging the agency "to recognize and define the true place of wildlife in the National Forests."[8] The following year, Chief Forester Ferdinand A. Silcox formed a separate Wildlife Division, which drew the agency's wildlife experts out of the Range Division, where they had been subordinate to officers whose sympathies lay with the livestock industry. For the first time in its history, the Forest Service had a cadre of managers focused on wildlife values. This development advanced wildlife to "a major status" in the agency. Increased funding revealed the changing "scope and intensity" of

WILDLIFE PROGRAM FUNDING IN THE 1930'S

The creation of a separate Division of Wildlife Management in the Washington Office in 1936 heralded a period of increased funding for wildlife management activities. Working without a specific line item for wildlife management in the Forest Service budget, expenditures for this component of national forest administration were calculated internally for each fiscal during the 1930's. The funds paid for new staff assignments not only in Washington but in the regional offices and on the national forests. The Forest Service augmented these expenditures for the wildlife job with other accounts, including approximately $500,000 of Civilian Conservation Corps labor and $2,000,000 of materials for fish and game improvements such as nursery ponds, stream and lake improvements, and fencing of game-refuge boundaries.

year	amount
1931	$145,253
1932	$155,761
1933	$135,266
1934	$116,245
1935	$306,526
1936	$598,796
1937	$676,137
1938	$716,121
1939	$623,594

wildlife and fisheries work. Although Forest Service appropriations were not earmarked for this activity in congressional budget estimates, wildlife expenditures grew from $145,253 in 1931 to $623,594 in 1939, indicating the growing significance of the agency's "wildlife job."[9]

In the late 1930's, the new division's chief, Homer L. Shantz, defined how wildlife values fit into the Forest Service's larger program of multiple-use. The national forests, Shantz explained, had been established to conserve the resources of timber, grazing, and wildlife; to protect watersheds and streamflow; and to prevent soil erosion and floods. Protection of the watersheds and soil came first, for as these declined, the essential goal, productivity of the land, declined as well. Next in priority, the Forest Service had to "give every possible consideration to the two prominent western industries, lumbering and grazing," for these affected the welfare of hundreds of thousands of people. Last in priority but nonetheless a stated goal, the wildlife resource would be developed in order "to produce the greatest crop and thereby contribute to the aesthetic and recreational value of the forests, lakes and streams, and to insure the greatest maintained take of game and fish." Multiple-use implied a balanced program, not necessarily a combination of uses on all areas of the national forests, Shantz noted. Some areas produced timber primarily, others might be set aside for wildlife, and still others for recreation.[10]

Shantz valued wildlife habitat primarily for the quantity of game and fish it could produce. His concept of the greatest good was to benefit the sport hunter, to maintain the national forests in a condition that would serve the American tradition of hunting and fishing. Shantz and his small staff of biologists generally saw sportsmen as their most significant user group—the equivalent of stockmen for the Forest Service's Division of Range Management. Local sportsmen's associations were analogous to the local stockmen's associations; they were important partners because they served to communicate their members' concerns to the Forest Service on the one hand, and to convey the aims of Government regulations to their members on the other. The Forest Service's philosophy of wildlife management, and its ties to wildlife conservation groups outside the Government, were strongly oriented toward the interests of sport hunters.[11]

But there were other interests besides sport hunting in the wildlife conservation movement, and there were other ways to value wildlife habitat besides its ability to yield a harvestable crop of fish and game. During the 1930's, an increasing number of conservationists pushed the Forest Service toward a broader understanding of its mission. In some cases, these individuals conceived of habitat as sanctuary, where animal species that were threatened with extinction would be given respite from hunting. In other cases, they promoted a holistic conservation effort that would protect nongame and game species alike.

These demands on the Forest Service were significant for two reasons. First, they generally came from individuals and organizations who were located far from the national forests at issue. They involved a more urban and national constituency than the Forest Service was accustomed to serving. Second, they represented nonconsumptive uses of the national forests. Inasmuch as the Forest Service conceived its mission in terms of ensuring that the land would provide a sustained yield of products for society's use, nonconsumptive uses were an awkward fit. These uses, for example, could not be easily quantified. Managing habitat as sanctuary or as nature preserve did not contribute to the stability of local communities whose economies were tied to the timber or livestock industries. To argue that national forests should play an important role in protecting rare species and in preserving ecological processes and relationships—even at the expense of logging and grazing—was to challenge some of the basic tenets of national forest administration that Pinchot had established.

Brown Bears on the Tongass

One of the Forest Service's first encounters with nonconsumptive wildlife values involved the brown bear on the Tongass National Forest in Southeast Alaska. The fate of this appealing species captured the attention of wildlife conservationists throughout the Nation in the 1930's. During the previous decade, the Forest Service had laid the groundwork for a pulpwood industry on the immense Tongass. The remoteness of this region from markets posed a formidable challenge to the pulp industry, but the lush growth of Sitka spruce and western hemlock on the large coastal islands, together with the abundance of cascading streams that could be developed for hydropower, provided compensating factors. In 1927, the Forest Service sold an option for 1.6 billion board feet of timber to the Crown Zellerbach Company. Pulp mills and logging operations were in the planning stage when a collapse in the paper market following the stock market crash of 1929 brought a suspension of all activity. But the suspension of activity did not quell the controversy over the area's brown bears.[12]

COURTESY USDA FOREST SERVICE

Alaska brown bear pelts, 1930's.

Most of the timber sale was located on Admiralty Island, near Juneau, in the heart of the Alexander Archipelago. Nearly 100 miles in length, Admiralty Island featured a rugged coastline, towering mountains, and dense forests of Sitka spruce and western hemlock—an environment that supported an unusually dense population of brown bears. The island was already known by mammalogists from the work of C. Hart Merriam, who claimed that no less than five species of grizzly and brown bear inhabited it. (Merriam's taxonomy included hundreds of species of bears altogether.) John M. Holzworth, a New York lawyer and sport hunter, estimated the island population at about 3,000, or approximately half of the world's total stock for these five species. Described by one source as a "relentlessly loud" gadfly, Holzworth expended considerable energy in publicizing his calls for protection of Alaska's bears. He had spent three summers in Alaska filming these animals with a movie camera, and his illustrated book, *Wild Grizzlies of Alaska*, appeared in 1930. Holzworth formed a committee for protection of Alaska's grizzlies, and secured resolutions and endorsements from the New York Zoological Society and the American Society of

Mammalogists recommending that Admiralty Island be preserved as a wildlife sanctuary or national park.[13]

At first, Holzworth and other conservationists directed their criticism not at the Forest Service but at the Alaska Game Commission, whose decision to permit an open season on Alaska brown bears in 1930 would lead, they feared, to the animal's extermination. Stewart Edward White, a noted sport hunter and nature writer who lived in California and hunted big game in Alaska, brought attention to the matter with an article in *The Saturday Evening Post*. He downplayed the ferocity of bears as products of "b'ar stories," assuring readers that these animals prefer to avoid humans. "An emergency is declared to exist!" he warned. "If this regulation is permitted to remain in effect, our unique brown bear of Alaska is doomed to as complete extinction as the California grizzly."[14] White's article was followed by numerous editorials in outdoor magazines echoing the same theme: Alaskans still had the frontier mentality that bears were vermin; non-Alaskans should refuse to allow this fatal weakening of the Alaska Game Law, which was a Federal law. Newspaper editorials in favor of a bear sanctuary appeared throughout the United States.[15]

The Forest Service, finding its plans for an Alaskan pulpwood industry jeopardized, opposed the creation of a bear sanctuary or national park. Chief Forester R.Y. Stuart argued that the timber on Admiralty Island was "absolutely necessary" for the development of a pulp operation on the north unit of the Tongass. The Forest Service was committed to the sale of that timber, and to exclude it would prevent the industrial development of the northern portion of Southeast Alaska. Moreover, it was Stuart's judgment that the Admiralty Island timber could be harvested without exterminating the bear population.[16]

COURTESY LISA MIGHETTO

This advertisement appeared in *Field and Stream* in 1935.

The chief forester proposed an alternative sanctuary for the brown bear: the transfer of a different portion of the Tongass National Forest to Glacier Bay National Monument, where hunting was prohibited under the laws and regulations governing national parks. Conservationists insisted that the latter area did not support as many bears, and now they attacked the Forest Service. Holzworth, White, and others accused the agency of collusion with the Alaska Game Commission in calling for an open season on brown bears, and they alleged that the Forest Service had a secret plan to clear the island of bears in order to facilitate logging operations.

These attacks became heated. White alleged in a second article in *The Saturday Evening Post* that the Forest Service had used the fatal mauling of forester Jack Thayer in 1929 to institute a "quasi-

Popular journals sometimes exaggerated the ferocity of wild animals, fueling "bearanoia." This illustration appeared in *Pacific Rural Press* in 1873.

official" policy of shooting bears on sight.[17] The press had sensationalized Thayer's gruesome death, fueling "bearanoia," and the story "struck a raw nerve in Alaska." Local residents strongly supported the Admiralty timber sale, and one Juneau newspaper asserted that the "brown bears serve no good purpose . . . We have too much to do to make room for settlers and industrial workers to permit this menace to hang over us. The bear ought to be exterminated."[18] Holzworth's charges against the Forest Service in a Senate committee hearing on the Admiralty Island brown bear reflected the rising tensions. For evidence, he cited a seemingly duplicitous letter from the Tongass National Forest's forest examiner, Jay P. Williams. In the letter, Williams warned his superior that it would be poor public relations to support extermination of the brown bear, yet in a later paragraph he offered two methods for accomplishing it (hunting them above timberline in the spring, and using poison bait when the animals congregated at the salmon runs). Regional Forester Charles Flory protested that the letter was taken out of context.[19]

Bucking public opinion, officials in the Forest Service and the National Park Service negotiated a land transfer from the Tongass National Forest to enlarge Glacier Bay National Monument rather than make a national park out of Admiralty Island. Nearly everyone seemed to gain by this plan: the pulpwood industry retained access to the Admiralty Island timber; the Forest Service obtained assurances from the National Park Service that the monument addition would provide the long-awaited impetus for recreational development in the region; and the enlarged boundaries of Glacier Bay National Monument made that area more effective as a wildlife sanctuary.[20] The only problem was that no other area in Southeast Alaska matched Admiralty Island's reputation for having such an abundance of bears. Wildlife conservationists remained unsatisfied.

Forest Service officials insisted that they could manage the timber and protect the habitat for Admiralty Island's bears. To this end, the agency prepared a bear management plan in the mid-1930's to accompany its timber management plan—the first instance of multiple-use planning undertaken by the Forest Service in Alaska. The bear management plan featured a refuge area closed to hunting, strict procedures for the protection of salmon streams—key habitat for the brown bear—from siltation caused by logging operations, and a cutting rotation that would limit each year's harvest to no more than 5,000 acres of timber on all of Admiralty Island's 1,100,000 acres. As events would have it, the pulpwood industry did not move into Southeast Alaska until the mid-1950's, so these plans were not implemented for another two decades. The eventual timber sale, a 50-year sale of 7.5 billion board feet to Georgia-Pacific Alaska Company in 1955, still centered on Admiralty Island and carried basically the same provisions for protection of habitat.[21]

The controversy over Admiralty's bears revealed several characteristics of the wildlife conservation movement. Publicity and public opinion were important. Most Americans had never heard of the Tongass National Forest before they read about Admiralty Island's bears. Suddenly, the Forest Service's plans for the island were in the national spotlight. In the end, Forest Service officials had to weigh the sentiments of countless Americans who had never seen or ever hoped to see a bear on Admiralty Island, yet cherished the knowledge that the bears were there and would not be exterminated. That kind of broad-based sentiment was something new to consider in defining the greatest good of the greatest number over the long run.

Anti-hunting sentiment fueled the controversy. Holzworth, himself a sportsman, promoted the ethic of the nonhunter by touting his personal decision to take up wildlife photography. "It affords a much greater thrill," he wrote, "and one is soon weaned away from the rifle, with beneficial results both to the hunter and to what remains of the fast dwindling big game animals of the wilderness."[22] Already in the 1930's, anti-hunting sentiment was beginning to divide the wildlife conservation movement.

Finally, conservationists argued that Admiralty's bears, together with their wilderness domain, offered Americans a valuable lesson in humility. The brown bear reminded human beings that there were forces in nature larger than themselves. Noting the spiritual value of protecting the bears, one senator remarked, "I think it bespeaks the dawn of a new day when

the tourists and wild life can live together . . . for the benefit of human beings who can use them without abusing them."[23] Another conservationist concerned with the brown bear's habitat observed, "A Nature sanctuary should be an area where Nature, not certain elements of it only, but all Nature, is sacred from interference."[24] In the controversy over Admiralty's bears, wildlife conservationists and wilderness preservationists began to find a commonality of interests.

COURTESY USDA FOREST SERVICE

Visitors view bears at Admiralty Island National Monument, Tongass National Forest.

The Forest Service's Alaska Region accepted these nonconsumptive wildlife values to the extent that its multiple-use orientation would allow. An official pamphlet on the Tongass National Forest published in 1940 stated that "hunters with gun and camera" came from all over the world "to hunt or view the wild game." The pamphlet announced that the Forest Service had recently implemented a wildlife management program on the Tongass, which would guarantee to the American people the perpetuation of all resident species, from the Alaska brown bear to many species of song birds.[25]

THE BEARS OF ADMIRALTY ISLAND

Sixty years after conservationists first made the Admiralty Island bears famous, the animals remain an important tourist attraction. At Pack Creek Stan Price State Wildlife Sanctuary, visitors may take a 1-mile trail through the deep woods to an observation tower on upper Pack Creek. From the tower, visitors can observe up to a dozen different brown bears fishing for pink and chum salmon. Human intrusion in the wildlife sanctuary is limited; visitors must secure permits in advance and must keep to the trail and a designated section of beach. Camping is permitted only on nearby Windfall Island.

Brown bears outnumber resident people on Admiralty Island, averaging one per square mile. The island also has the highest concentration of nesting bald eagles in the world, and it is home to Sitka black-tailed deer, river otters, and dozens of species of birds, including great blue herons, ravens, marbled murrelets, belted kingfishers, Stellar's jays, green-winged teal, and harlequin ducks.

Admiralty Island is now a national monument under Forest Service administration. The Forest Service assists the Alaska Department of Fish and Game through its "Watchable Wildlife" program to develop bear-viewing opportunities for the public.

Encouraging Wildlife Values Within the Agency

Most wildlife and fisheries biologists in the Forest Service shared a desire to protect vanishing species and to manage habitat for the benefit of nongame as well as game animals. They were limited not so much by their vision as by their influence within the agency. The idea that national forests provided habitat for a range of species, not just game and fish, was introduced in the Forest Service Wildlife Manual in 1941. It appeared earlier in some of the wildlife handbooks produced in each region. These documents, produced for internal use rather than for public relations, reflected a genuine effort on the part of the wildlife staff to broaden the Forest Service's mission in the wildlife field.[26]

The Forest Service's Eastern Region published one of the most progressive wildlife handbooks of this era. Setting priorities for management of various species, the handbook attempted to accommodate both nonconsumptive and consumptive wildlife values—to protect faunal diversity and to produce more game animals at the same time. According to this handbook, first priority was accorded to animals in danger of extinction. Next, where two species of animals competed for the same range, the one having the most exacting life requirements would have preference over the one with greater environmental tolerance. After these directives were met, management procedures for other species would be on the basis of demand in order to produce the greatest good for the greatest number of wildlife users.[27] Here was a clear example of how Pinchot's first rule for managing forest use—providing the greatest good for the greatest number—was supplanted by new priorities.

Such qualitative changes in wildlife values, however, were not immediately evident everywhere in the Forest Service. Other regional wildlife handbooks produced during the 1940's and 1950's continued to emphasize big game, upland game birds, and trout.[28] These handbooks reflected another significant trend in wildlife values in the two decades after World War II: increasing public use of the national forests for hunting and fishing. Just as sportsmen's associations throughout the West had protested the Forest Service's accommodation of the livestock industry during the 1920's and 1930's, these groups argued in the 1940's and 1950's that the national forests were yielding too much to the timber industry.

Even so, the Forest Service indicated that its objectives for wildlife management had broadened since 1905. The goal in 1940 was "to recognize the important recreational, aesthetic, economic, and educational values of wildlife as a major product of national-forest lands."[29] That this statement appeared at all in a Forest Service publication is significant, indicating that some officials had become aware of changing perceptions and the increasing diversity of forest users. This development challenged Pinchot's initial premise of providing the greatest good of the greatest number over the long run, requiring the Forest Service to evaluate and refine the concept of multiple-use. It would gain considerable momentum in the 1970's, when endangered species became a significant issue.

During the 1930's, the Forests Service's management activities incorporated bears.

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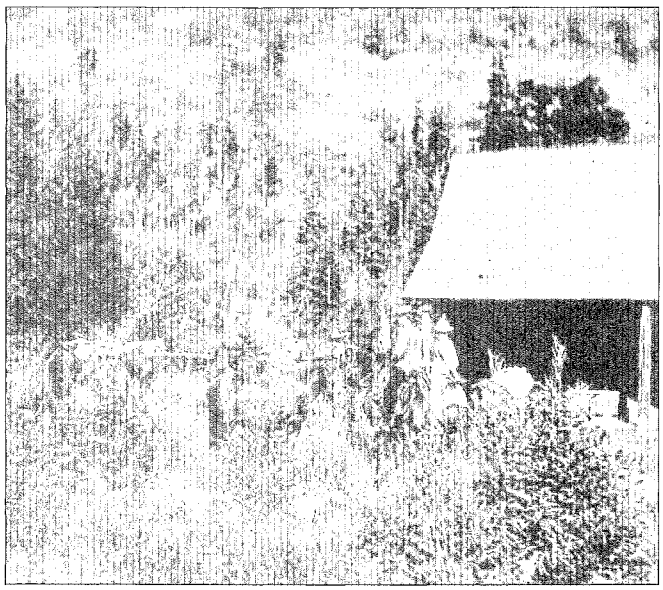
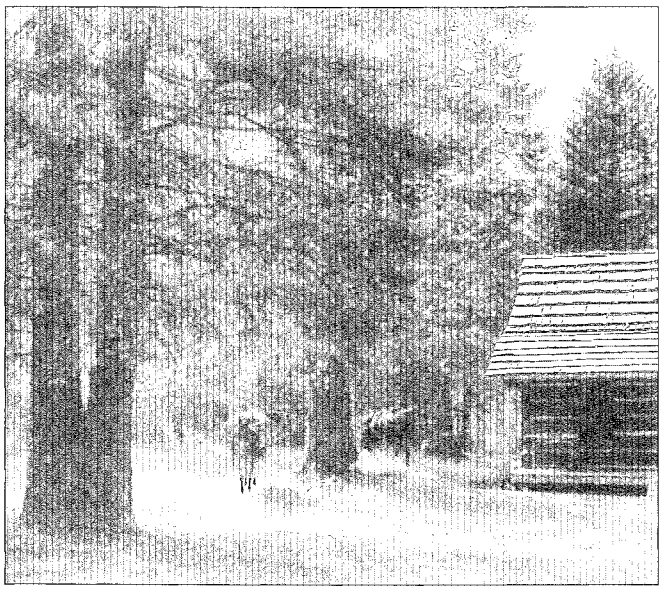
Section Two
Beginnings of Habitat Management
1930's to 1970's



COURTESY USDA FOREST SERVICE

1911

This group inspected A.W. Sampson's research activities at the Standley Sheep Allotment. Fire had swept through the area around 1889—and new seedlings of smooth brome grass and timothy are visible in the foreground. The tall weed in the foreground is western coneflower.



COURTESY USDA FOREST SERVICE

1992

Overstory of trees include Engelmann spruce, grand firs, Douglas-fir, and lodgepole pine. The pasture around the cabin is nearly devoid of forage, due to tree crown closure.

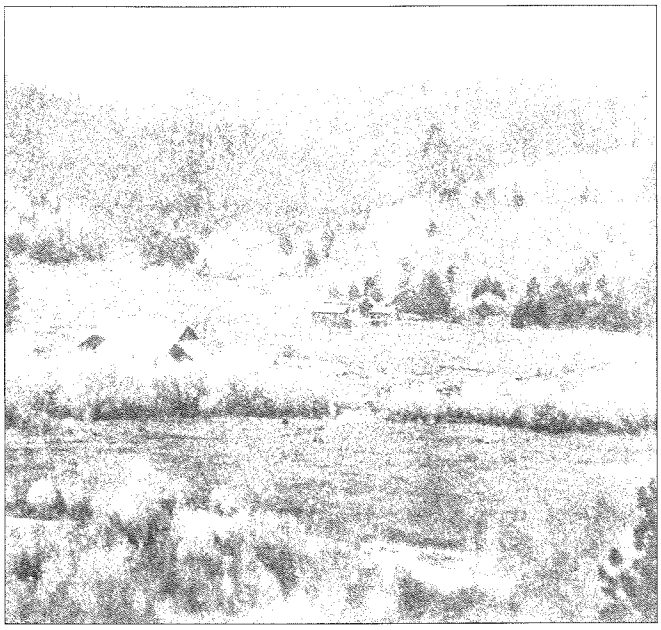
Blue Mountains Ecosystems Mountain Meadows and Riparian Habitats

These photographs were shot from the same vantage point in Wallowa County, Oregon, 81 years apart.

In an attempt to understand the changes to forest ecosystems of the Blue Mountains in Oregon and Washington, Jon M. Skovlin and Jack Ward Thomas of the Forest Service compared photographs from the early 1900's with shots taken from the same vantage point in the late 20th century. Skovlin and Thomas thus analyzed the long-term trends affecting the forest, including fires, insect, and disease depredation.

Blue Mountains Ecosystems
Mountain Forests

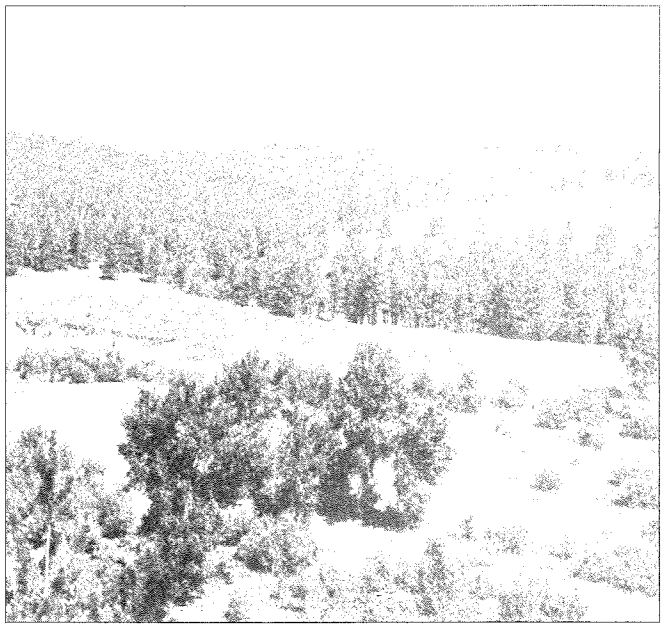
These photographs were shot from the same vantage point in Union County, Oregon, 48 years apart.



COURTESY USDA FOREST SERVICE

1919

Timber in the draw behind the homestead was heavily cut. Alder and willows along the spring branch appear thick and continuous.



1967

Evidence of the homestead has nearly disappeared. The standing dead snags on the right horizon resulted from the Spring Creek fire in 1965.

Chapter Four

CHAPTER FOUR
COOPERATION WITH THE STATES: THE 1930's

"We must recognize that wildlife management is not a matter of local interest and use, but because of its inherent universal appeal and its educational, moral, aesthetic, inspirational, and recreational values it becomes a problem of far reaching national importance."

. . . Arthur Cramer, Assistant Supervisor, Gallatin National Forest, 1937.

After the Kaibab disaster, the Forest Service came to regard the conservation of game as a shared Federal-State responsibility. While the agency gave tacit support to the legal doctrine of State ownership of wildlife, it insisted on its legal right as a land manager to protect forest and rangeland from the ravages of too many game. Eventually, State and Forest Service officials agreed upon a basic formula for cooperation: State game departments would manage the harvest, the Forest Service would manage the habitat. In practice, the two endeavors were so deeply intertwined that cooperation with the States became a fundamental component of the Forest Service's wildlife program.

A New Deal for Wildlife

Campaigning for president during the Great Depression, Franklin D. Roosevelt promised Americans a "New Deal." The Federal Government, Roosevelt believed, should provide greater leadership to help citizens cope with uncertainty and to stimulate the Nation's economy. In addition, the Federal Government should take initiative in restoring the health of the land. Stumping in Montana in 1932, he proposed a grand scheme to plant a "shelterbelt" of trees 100 miles wide running north to south through the Dakotas, Nebraska, Kansas, and Oklahoma. He also proposed to create and deploy a "Tree Army" of unemployed young men who would do good things for forestry, soil erosion control, and wildlife.[1] Once in office, the Roosevelt administration promoted a stream of conservation measures in Congress. Taken altogether, these measures significantly enlarged the Federal Government's role in conservation and provided a "new deal" for wildlife that paralleled the president's sprawling New Deal reforms in social and economic policy.[2]

During his four terms as president from 1933 to 1945, Franklin D. Roosevelt provided a strong executive leadership in conservation not seen since the administration of his older cousin, Theodore Roosevelt. At the same time, Congress demonstrated unprecedented support for conservation initiatives. Both houses of Congress formed special committees on wildlife and charged them with investigating the status of wildlife in the United States. These committees held extensive hearings between 1933 and 1940.

Federal legislation on wildlife conservation in the 1930's showed a new level of concern for wildlife and fish habitat. Outstanding measures included the Duck Stamp Act of 1934, the Wildlife Coordination Act of 1934, and the Pittman-Robertson Act of 1937. The Duck Stamp Act provided for the collection of a $1 fee from duck hunters to raise funds for habitat restoration and protection of waterfowl refuges. The Wildlife Coordination Act directed Federal land managing agencies to take remedial action for fish and wildlife

wherever water impoundments or pollution affected habitat. The Pittman-Robertson Act provided Federal assistance to States for wildlife habitat research and restoration, giving the States funds for projects and professional personnel. Universities assisted by offering technical expertise. As Lloyd Swift recalled, the Pittman-Robertson Act proved to be "one of the most important and progressive steps in the wildlife story."[3] In general, Federal legislation in the 1930's accompanied an important shift in public perception as people became aware that destruction and degradation of habitat had superseded overhunting as the most pervasive threat to North American wildlife.

Natural disaster played an important role in awakening public opinion to the importance of habitat during this decade. As if the Great Depression were not enough to burden the American people, a prolonged drought throughout the Great Plains created the "Dust Bowl," adding to the sense of desperation. Many people recognized that the Dust Bowl was not entirely a result of capricious weather conditions; short-sighted agricultural practices compounded its effects. When thousands of ponds and other waterfowl breeding areas in the prairie States began drying up, causing duck populations to plummet, the public was unusually moved by the plight of the birds. Resident birds and humans alike suddenly found these areas uninhabitable.[4]

COURTESY USDA FOREST SERVICE

A herd of elk moves out of the forest in search of winter range.

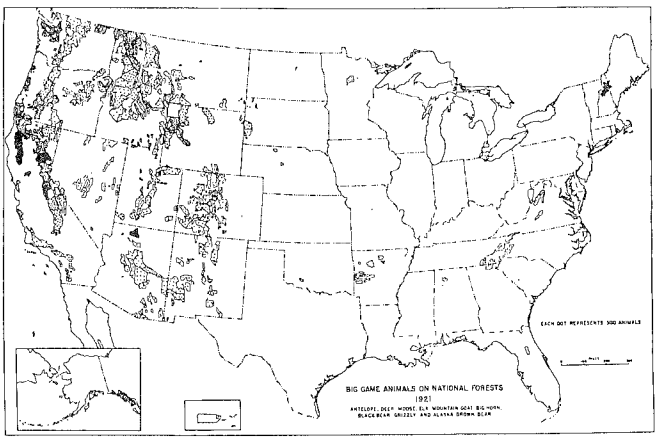
Few Americans would have recognized the word "habitat" before the 1930's. Derived from the Latin *habitare*, to dwell, it was principally a term used by ecologists to describe the natural abode or locality of an animal or plant. Even game managers rarely used the term "habitat" before the 1930's. Lacking a precise knowledge of wildlife-habitat relationships, game managers preferred the more general term "range" to describe an area occupied by a particular animal. Public apprehension over habitat destruction brought the word "habitat" into the popular lexicon in the 1930's. The term appeared in everything from nature magazines to Government manuals.

"Habitat" was the main focus of the First North American Conference on Wildlife Conservation, called by President Roosevelt in February 1936. Roosevelt convened this gathering of wildlife professionals in recognition of the fact that wildlife conservation depended on a cooperative effort between Federal, State, and private agencies and across State and national borders. The conference brought together more than a hundred biologists and administrators from State game departments, Federal agencies, research institutes, and universities. Participating Federal agencies included the Forest Service, National Park Service, Biological Survey, Bureau of Fisheries, and Bureau of Indian Affairs. Representatives from Canada and Mexico participated in the opening session. Held in the United States Government Auditorium on Constitution Avenue in Washington, D.C., the conference symbolized the new Federal leadership in wildlife conservation.[5]

Roosevelt invited the chief of the Forest Service, Ferdinand A. Silcox, to chair the conference, for he wanted to call attention to the importance of the national forests in wildlife conservation. In an era of heightened interest in habitat destruction and degradation, the national forest system acquired new significance as an immense cache of wildlife and fish habitat. According to Forest Service estimates, 75 percent of all big game in the United States outside of Alaska occurred on the national forests.[6] The character and extent of these lands gave the Forest Service an unparalleled opportunity to contribute to the conservation of North American wildlife.

In his opening address to the First North American Wildlife Conference, Silcox underscored the significance of habitat for wildlife conservation. "Pioneer conditions" could never be restored, Silcox said. Never again would anyone see the abundance of wildlife reported in the journals of Lewis and Clark: a prairie teeming with buffalo, elk, antelope, deer, moose, bighorn sheep, grizzly bear, prairie chicken, geese and ducks. It was not possible because many former "wildlife environments" were now occupied by farms and cities. If market hunting and wanton slaughter of wildlife had been a visible factor in the decimation of wildlife resources in the past, Silcox stated, now the most critical problem was the continuing trend toward habitat destruction. In 1936, most regions of the United States faced not only a scarcity of wildlife but also a related shortage of wildlife habitat in which wildlife populations could recover.[7]

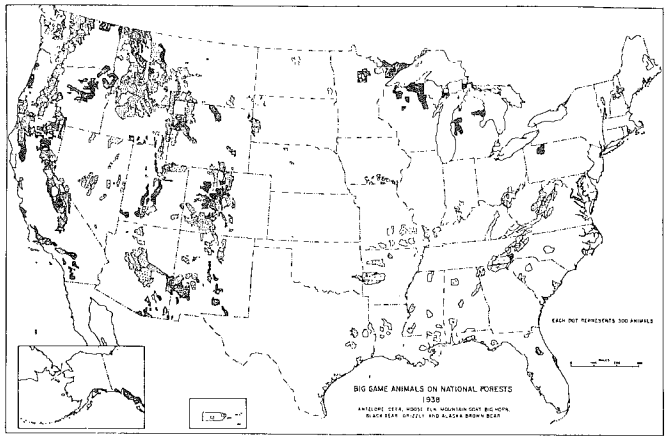
Cooperation with the States: The 1930's



COURTESY USDA FOREST SERVICE

Distribution of big game animals on the national forests in 1921.

According to Forest Service estimates in the 1930's, 75 percent of all big game in the United States outside of Alaska occurred on the national forests.



COURTESY USDA FOREST SERVICE

Distribution of big-game animals on the national forests in 1938.

The primary task, in Silcox's view, was to reverse the trend of habitat loss. Wildlife populations had increased during the past two decades in the national parks and national forests, but they remained depleted on much of the privately owned rangeland and public domain. The drought in the prairie States made the situation worse. If wildlife managers were to succeed in restoring and conserving wildlife, Silcox told the gathering, their effort had to begin with cooperation. Private, State, and Federal initiatives had to be "correlated, coordinated, and fused into cooperative national and international planning and action for the good of all."[8]

Silcox and his staff in the Division of Wildlife Management warned that it was not enough to protect these remaining areas; wildlife habitat must be restored on other public and private lands across the Nation. Although deer and elk herds had increased by two- and three-fold on many national forests since the early 1920's, the high and rugged forest lands that composed most of the national forest system were not these animals' favored range. With so little available habitat for big game outside the national forests, Forest Service officials worried that the national forests would be expected to carry too much of the burden for wildlife production or that they would be overstocked with big game the way the Kaibab Plateau had been overrun by deer in the 1920's.[9]

Coordination with Rangeland Management

Forest Service officials recognized that cooperation with the States would not succeed without cooperation from the livestock industry as well. Indeed, there were actually four parties involved in forging a closer relationship with State game departments: the Forest Service, the States, stockgrowers, and sportsmen. While the Forest Service administered millions of acres of productive rangeland on the national forests, the stockgrowers owned or controlled most of the superior big game ranges in the West, the States controlled the game harvest, and the sportsmen influenced State game departments. None of these four parties had cooperated effectively to mitigate the disaster on the Kaibab Plateau, and the lessons of the Kaibab remained fresh in Forest Service officials' minds as other western game ranges began to show similar signs of overstocking. The situation required better coordination of rangeland and wildlife habitat management.

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Sheep and herder, Crooked River National Grasslands, Oregon. The volcanoes known as the Three Sisters are in the distance.

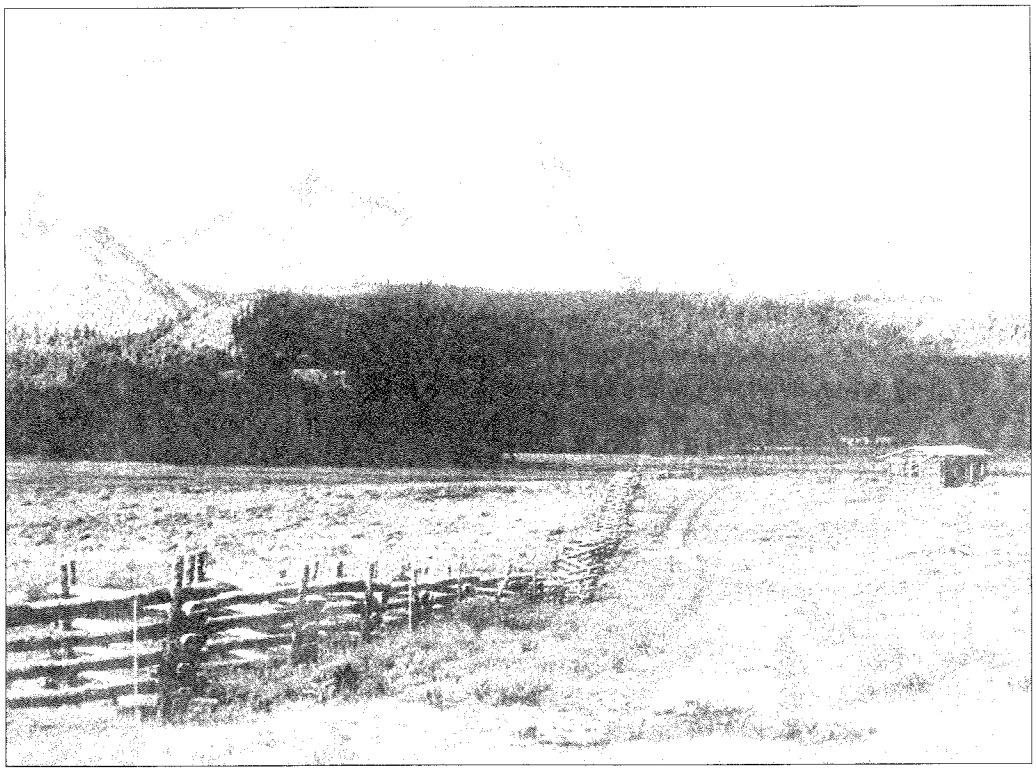
Sportsmen's organizations and State game departments had a straightforward solution to the problem: get the cattle and sheep off of the national forests so there would be more forage for deer and elk. This solution conflicted, of course, with the Forest Service's goals to support local industry and manage for multiple use. But Forest Service officials took pains to explain that reductions of big game or livestock involved more than the competing interests of sportsmen and stockgrowers. Big game habitat and livestock use were actually interdependent.

The Forest Service had a long relationship with western stockgrowers; indeed, the western livestock industry already occupied the national forest rangelands when the Forest Service took over administration of the national forests in 1905. There was no question that rangelands were overgrazed at that time. Beginning in 1910, the Forest Service sought to reduce the numbers of livestock permitted to graze on the national forests, only to lose all the ground it had gained when the livestock industry demanded and obtained emergency increases during World War I. These increases brought the numbers of livestock on the national forests to an all-time high of nearly 10 million head in 1920, from which point the Forest Service again imposed gradual reductions. Numbers of permitted livestock fell to 8 million in 1930 and to 6 million in 1937.[10] The livestock reductions strained the Forest

Service's relations with stockmen, but for many State game officials the livestock reductions were not drastic enough.[11]

Forest Service officials maintained that big game and livestock could readily occupy the same range, provided that both were kept at or below carrying capacity. Studies showed that food preferences varied widely among deer, elk, cattle, and sheep. Deer preferred browse, cattle preferred grass, and sheep preferred broadleaf forbs. Elk preferred more nearly the same plants as cattle, and would compete with cattle under certain conditions. On sheep ranges that were overstocked, sheep had been found to eat what the deer normally ate. Competition between big game and livestock became severe, however, only when rangeland resources were depleted. Coordinating the two uses was never simply a case of removing so many head of one species to allow so many head of another.[12]

In the early years, stockgrowers provided important assistance in restocking the rangeland with big game. The Forest Service needed the stockgrowers' continued support for big game management because so much of the critical winter range for deer and elk in the West was in private control or ownership. Two large ranches in California, for example, included the winter range for some 28,000 deer, while the Pitchfork Ranch in northern Wyoming included the winter range for that State's largest herd of antelope. According to one estimate, 40 percent of all western big game animals obtained a "free winter meal-ticket" from stockgrowers.[13]



COURTESY USDA FOREST SERVICE

Many herds of deer and elk migrate between summer range in the national forests and winter range in surrounding ranch country.

The seasonal movements of livestock and big game also suggested the importance of coordinating the two uses. The winter range for big game was often the spring range for livestock. These were the "short" ranges for both big game and livestock; that is, the area of least capacity, the limiting factor of the herd. When the Forest Service reduced the number of livestock permitted to graze on a national forest, those livestock often were left to pasture on the spring range outside the national forest during the summer months. Such occurrences worked to the disadvantage of both the livestock industry and the wildlife resource. In order to preserve the short range, the Forest Service was involved in much perennial "horse trading" with stockgrowers, permitting livestock to graze on the national forests in summer so that big game herds would have food in the winter.[14]

Range and wildlife officials in the Forest Service stressed the need to adjust national forest boundaries so that more winter range for big game would fall under Forest Service administration. According to Forest Service estimates in 1934, the national forests needed an additional 20 million acres to bring big game summer and winter range into balance. Estimates made 6 years later boosted the figure to 25 million acres. These estimates were tied to a growing body of evidence that suggested many big game ranges were already overgrazed. Submitting these figures to Congress, the Forest Service insisted that it could not permit summer ranges to be further stocked with big game when these areas did not have accompanying winter range.[15]

There were other complicating factors that caused Forest Service officials concern about deer and elk numbers. In some areas, deer and elk populations had expanded quite rapidly. Wildlife biologists attributed these occurrences to a variety of new conditions: stringent restrictions on hunting, elimination of predators, improving habitat (such as abandoned farms or early plant succession on cutover lands). Although the phenomenon was not well understood in the 1930's, wildlife biologists were aware of it and recognized that such herds needed to be reduced promptly to avoid a repetition of the Kaibab disaster.[16]

In a pattern repeated throughout the country, the Forest Service urged State game departments to liberalize hunting laws and reduce deer and elk herds only to encounter stiff resistance from State game officials and resident sportsmen. There were at least three factors at work in obstructing better cooperation. First, the Forest Service was suspected of bias toward the livestock industry (or, when it called for deer herd reductions in the East, of bias toward the timber industry). Second, many sportsmen needed to be educated about the importance of keeping game populations within the carrying capacity of the range. The carrying capacity principle applied to big game as surely as it applied to livestock. "Overgrazing is a fool's paradise," wrote Forest Service research biologist D. I. Rasmussen. The bonanza was short-lived and inevitably led to "reduced yield and, worse, a decreasing capacity of the land to produce."[17] It had taken stockmen 100 years to appreciate that fact; now it was the sportsmen's turn to learn it. Third, State game departments were politically frail in the 1930's. During the bleakest years of the Great Depression, many States practically abandoned their wildlife programs, leaving much of the game protection job to the Forest Service. Game commissioners saw their staffs reduced. Membership in the Western Association of State Game Commissioners dwindled, and those who attended the association's annual meetings complained of the high turnover of wildlife professionals

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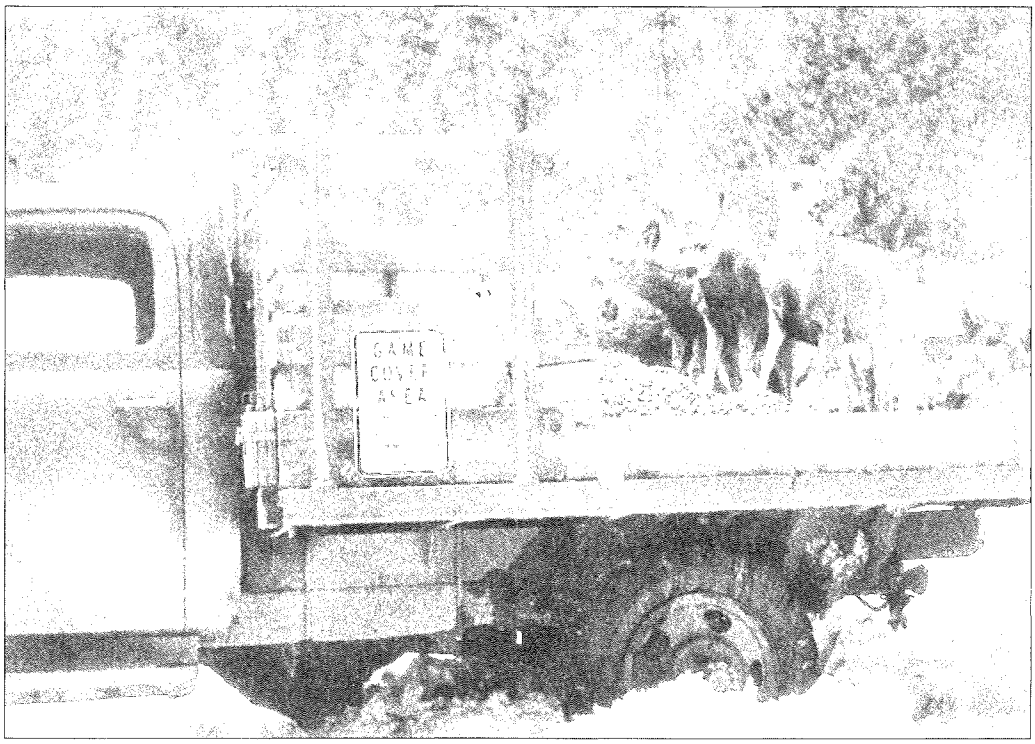
A lean deer reaches for forage at the "deer line."

from year to year.[18] As a result, State game departments had little ability to educate sportsmen. In the face of sport hunting opposition, they sometimes lacked strength to act in the long-term interest of the wildlife resource.

Surveying the scene in the early 1930's, western regional foresters concluded that the Forest Service needed authority to control big game herds with or without a State's cooperation. Assistant Chief Chris Rachford, a Washington-based expert on rangeland conditions, conceived the idea of a new regulation that would give the Forest Service leverage over State game officials. Rachford believed that the Forest Service would only achieve a breakthrough with the States when sportsmen gave up their devotion to buck-only laws. Federal leadership was needed to demonstrate that taking female deer and elk was good game management.[19]



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A State vehicle serves as feedlot for deer. Forest Service officials criticized this practice as artificial and short-sighted.

Regulation G-20A

The result was Regulation G-20A, two explosive paragraphs appended to the G-20 wildlife regulation at the end of the grazing section in the Forest Service's official manual, published in 1936. According to G-20A, the Secretary of Agriculture could designate any national forest or area within a national forest as having an overabundance of a specified game animal or fish. Within such an area, the Secretary could authorize public hunts in order to remove the surplus.[20] In Lloyd Swift's estimation, Regulation G-20A was "poorly promulgated." The public, he explained, "had become indoctrinated on programs of protection, such as closed seasons." Hunters were not to shoot females—and "in most areas the taking of antlerless animals was unacceptable." Controlling wildlife populations by hunting thus proved to be a difficult concept.[21]

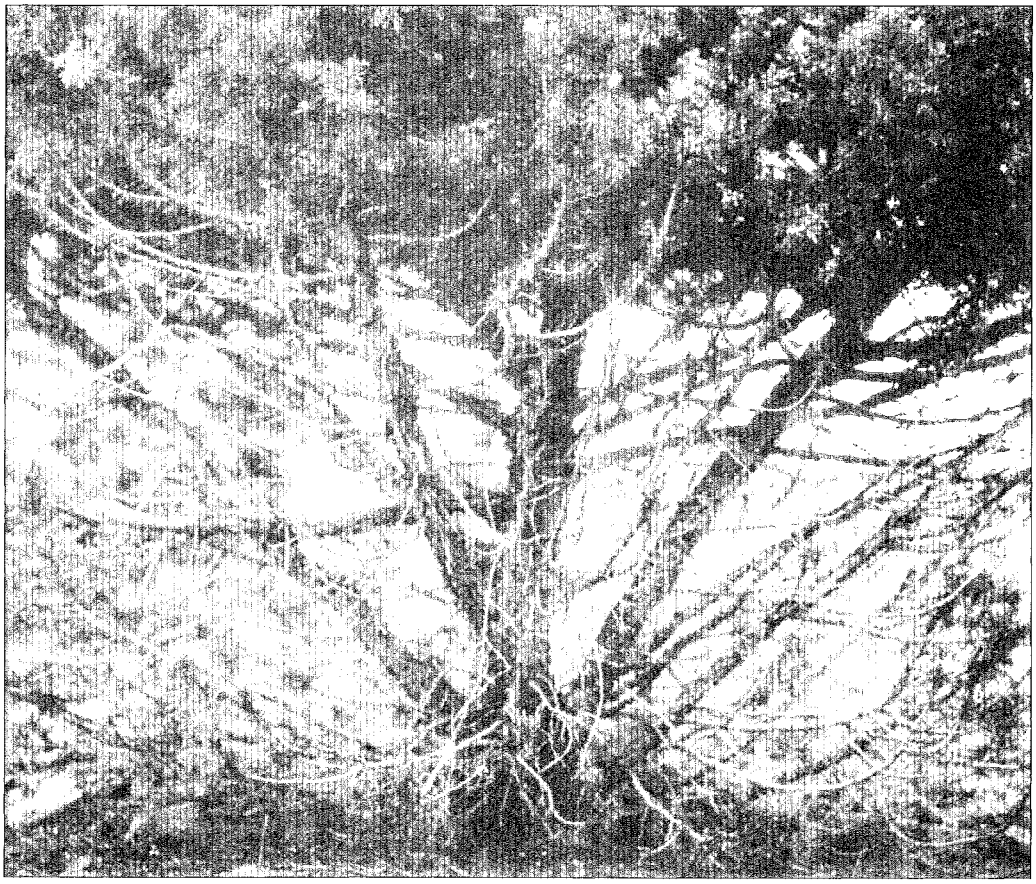
G-20A cast a long shadow over Forest Service cooperation with the States. State wildlife officials regarded the regulation as an infringement of their right to regulate the taking of wildlife and a challenge to the doctrine of State ownership of wildlife. At its annual conference in January 1935, the American Game Association held an entire session on "The Purpose and Effect of Regulation G-20A," with Chief Ferdinand A. Silcox leading the discussion. Afterward, State officials remained unpersuaded that G-20A was either necessary or legal. The regulation became a perennial topic of discussion at the annual meetings of the Western Association of State Game Commissioners and the International Association of Game, Fish, and Conservation Commissioners, both in formal sessions and out in the lobby of the hotel.[22]

State wildlife officials also regarded G-20A as an affront to their professionalism. They contended that the regulation only widened the breach between State and Federal officials. "These men heading up the [Federal] bureaus look at you and me and the rest of us . . .as we were fleas on a dog," complained one State game commissioner about his Federal counterparts. "We are kind of a nuisance that has to be endured."[23] The objectionable attitude apparently extended down the line. A Wyoming State game warden protested, "Any time we seem to be at variance with some forest ranger he takes out his book of regulations and refers to G-20-A . . . and he says, if Wyoming does not do thus and so the Forest Service will step in."[24] Rather than putting more backbone into State wildlife programs, these State officials argued, G-20A undermined them. "We have no objection to sitting around a table and shaking hands with a man, but we don't like to see him carry brass knuckles," another explained.[25]

Forest Service officials argued in defense of the regulation that it was a measure of last resort. They anticipated State resistance to the regulation, but they believed that G-20A could be effective simply by being at the Forest Service's command. Rocky Mountain Regional Forester Allen S. Peck, for example, predicted that the "mere mention" of G-20A would assist Colorado's exceptionally weak Department of Game in getting a game refuge measure through the State legislature.[26] In the long run, G-20A probably did succeed in strengthening State wildlife programs.[27]

Big Game Herd Reductions: Washington State

State game departments and the Forest Service encountered one problem of overstocking after another in the 1930's and early 1940's. Overgrazing by big game occurred on specific ranges rather than across whole regions, but where it did occur the results could be devastating. Unlike cattle and sheep, deer and elk could not be moved to another range. Deer would starve within a few miles of good browse, and as starvation began to spread throughout the herd, the animals would eat all the browse within their reach, establishing a visible "browse line" in the young trees and shrubs. These plants, once cleaned to the browse line at about five feet (for deer), or about 9 feet (for elk), did not, as a rule, put out any new growth below the line. They continued to grow above the line and produce seed but yielded no food value for the deer and elk.[28] Once a browse line appeared, large numbers of deer and elk were likely to starve each winter. At that point, the desperate herd became a public issue, and wildlife officials were dealing with people's passions as well as a biological catastrophe. A few representative instances of conflict and cooperation between the Forest Service and State game departments in this era illuminate various facets of this pattern.



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A juniper affected by overbrowsing. It can take years for vegetation to recover from such damage.

Competition between stockmen and sportsmen played a conspicuous part in the demise and recovery of the Yakima Rocky Mountain elk herd in Washington State. The elk herd occupied the Yakima River drainage on the east slope of the Cascade Range, where it ranged from the crest of the mountains to the ponderosa pine-covered foothills. The summer range was located in the Snoqualmie National Forest and had been grazed by sheep and cattle since about 1910. The winter range was mostly on State and private lands, and had been stocked with cattle since the early 1880's. Below the winter range were irrigated farms.[29]

Elk were indigenous to the area but had been exterminated by the early 1900's. In 1913, local sportsmen persuaded the county game commission to import some Rocky Mountain elk from Yellowstone, financing the project with local subscriptions. The transplant consisted of 42 cows and 8 bulls, and in the ensuing years the herd appeared to thrive in its new environment. In 1922, the Rattlesnake Game Reserve, consisting of 110,000 acres of summer range on the Snoqualmie National Forest, was established to protect the herd. In 1927, the county game commission began to allow the hunting of bull elk outside the reserve. In 1933, management of the herd was transferred to the newly created Washington Department of Game, and open seasons on bull elk continued with 50 to 60 bulls being taken annually.[30]

Stockmen complained of damage to hay stacks and fences as early as 1927, while Forest Service range studies indicated overbrowsing on the elk herd's summer range in the early 1930's. Sportsmen claimed that the problem had arisen because the Forest Service permitted stockgrowers to graze cattle on the Rattlesnake Game Reserve. When the agency closed the game reserve to cattle grazing, however, it only made the situation worse. Cattle were now pastured during the summer on the private lands where the elk normally ranged in the winter, further reducing the amount of winter forage for the elk. Realizing their predicament, Forest Service officials reopened the game reserve to cattle grazing 4 years later.[31]

Meanwhile, Forest Service officials urged officials of the Washington Department of Game to permit unrestricted, either-sex hunts to reduce the population. The State complied in 1938; 1,000 elk were killed from the herd. But sportsmens' associations condemned this action and the State restricted either-sex hunting to a small area from 1940 to 1942. Rangeland conditions grew worse, with the sportsmen and the Washington Department of Game blaming the livestock, and the stockgrowers and the Forest Service blaming the elk. Forest Service and State officials disagreed on the numbers of elk, as each relied on their own yearly estimates.[32]

It took a harsh winter to break the impasse. When snow fell early in the winter of 1942, the elk herd drifted from the foothills down to the orchards and alfalfa fields. Farmers shot more than 100 elk as the animals came onto their property, and requested that State game officials remove the carcasses. The Washington Department of Game paid more than $20,000 in damage claims. In the fall of 1943, the State authorized another either-sex hunt and 1,200 elk were culled from the herd.[33]

The winter of 1942-43 marked a low point in Forest Service relations with the Washington Department of Game. That June, the department's director, B. T. McCauley, complained bitterly about the Forest Service's stance to his colleagues at the annual meeting of the Western Association of State Game and Fish Commissioners. For 2 years, officials of the Forest Service had been hounding his department to reduce the game herds, he said. The State's newspapers were full of Forest Service estimates of 9 to 12 thousand elk Statewide, and 6,400 head in the Yakima herd alone. "Colorful talkers" and "good speakers," McCauley complained, "have gone constantly through the State of Washington to the littlest game clubs in the smallest areas and up to the big knife and fork clubs in the large cities—harping on the same thing—damage, the ruin of forest areas. Gentlemen, they have overdone it."[34] The main issue for McCauley was who controlled the game—the States or the Federal Government—and he believed the Forest Service had overstepped its authority.

McCauley argued that the basic problem in working with the Forest Service was that he did not trust the agency's game estimates. He alleged that the Forest Service's figures consistently ran about 40 percent higher than those of the State game departments. What was worse, the Forest Service published its figures in all of the livestock association magazines without giving any consideration to the lower estimates made by the States.[35]

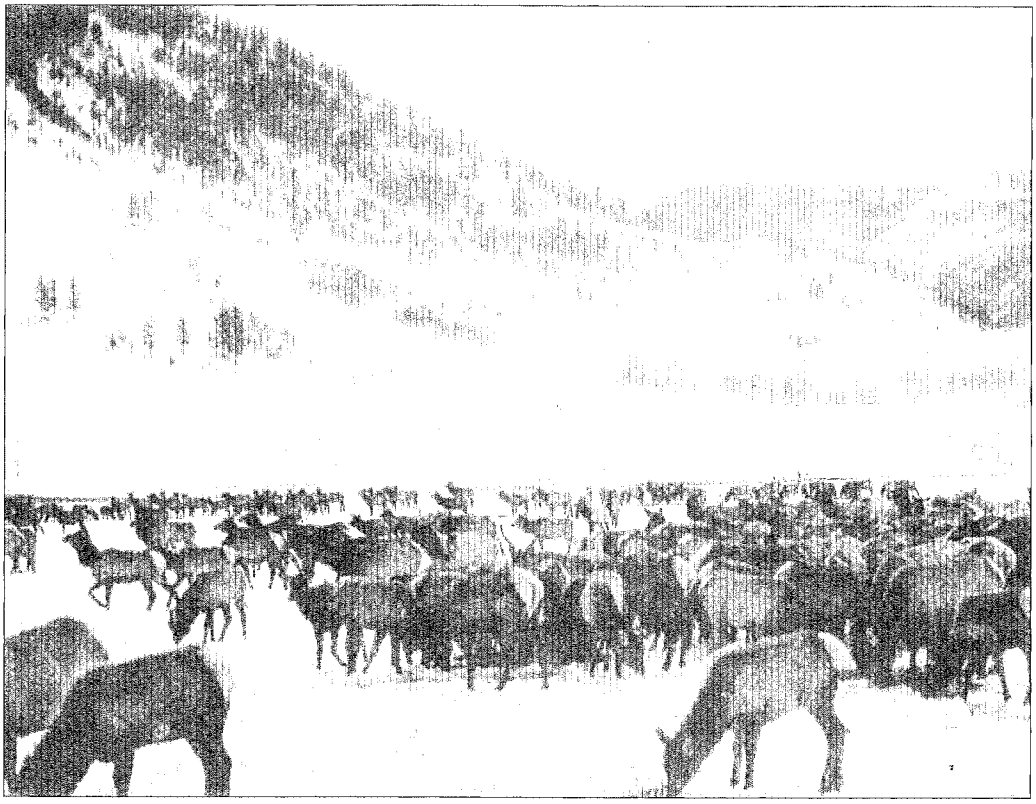
That fall, the Forest Service's director of wildlife management, Homer L. Shantz, and the Washington Department of Game's director, B. T. McCauley, committed their agencies to work together and to stop criticizing one another. Glenn E. Mitchell, biologist in the Pacific Northwest Region, and J. Burton Lauckhart, biologist with the Washington Department of Game, were assigned to develop a cooperative plan. Mitchell and Lauckhart proposed to begin with a joint count of the elk on its winter range, from which an estimate would be made and accepted by both parties. An estimated natural increase of 20 percent would be computed annually and checked against subsequent winter counts. The plan committed the State to hold annual hunts that would aim to crop the annual increase, with half the number being females. The goal was to hold the herd in check while a more rigorous investigation of forage utilization could be made. To Mitchell's and Lauckhart's surprise, both the sportsmen and the stockmen supported the plan.[36]

In 1948, Mitchell and Lauckhart described the success of their plan at the Thirteenth North American Wildlife Conference. The joint count established an estimate of 2,750 elk in 1944, revised slightly upward in subsequent years. The herd sustained legal kills of around 1,000 animals per year from 1944 to 1947, suggesting that either the rate of increase was higher than 20 percent or that the population estimates were low. While browse on the summer range showed overuse, perennial grasses on the winter range were increasing. The forage supply on the winter range was the limiting factor. Mitchell and Lauckhart stated that the plan had brought the Forest Service and the Washington Department of Game into much closer working relations, and they predicted that the managed herd would yield 500 to 700 legal animals per year.[37]

Big Game Herd Reductions: Utah

In Utah, the Forest Service played a larger role in management of big game than in any other State. The Utah legislature established a Board of Big Game Control in 1933 to recognize problem areas, to recommend hunting seasons and the number of animals to be harvested, and to establish weapons requirements. The Board consisted of five members appointed by the governor: the director of the Utah Fish and Game Department, who served as chairman; a representative of the Utah Wildlife Federation, another from the Utah Cattleman's Association, another from the Utah Woolgrowers Association; and an official of the Forest Service to represent public lands.[38]

To monitor the condition of big game herds and their habitat, the Board of Big Game Control established an Interagency Committee composed of Utah's chief of Game Management as chairman, the Forest Service's regional wildlife staff director, and the U.S. Grazing Service's wildlife staff director from its Utah State Office. Field personnel from these three agencies collaborated on range and population trend studies and met annually to prepare a joint recommendation to the Board. The Board then held public meetings at five locations throughout the State followed by an executive meeting to establish big game hunting regulations for the year. With two members of the Board representing the livestock interests and two representing the sportsmen, the Forest Service representative often provided the swing vote for herd reduction on a particular range.[39]



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Elk on feeding grounds in Jackson Hole, Wyoming, on the border of Teton National Forest, 1983.

The Forest Service had more success cooperating with State officials in Utah than it did in Washington. The agency led the Board on "show-me" trips on the national forests to give members a firsthand look at rangeland conditions. It took a practiced eye to recognize overgrazing on Utah's sparsely vegetated ranges, for an amateur could be misled by an abundance of green but unpalatable plants where forage plants had been mostly consumed. The Intermountain Region's director of wildlife staff, Orange A. Olsen, declared these "show-me" trips to be a valuable educational tool.[40]

Rangeland carrying capacities and game counts continued as points of contention in Utah. A research team with the Utah Cooperative Wildlife Research Unit conducted an intensive study of the Logan Canyon deer herd's winter range to compare three different methods of forage quantification. Rangeland reconnaissance (the standard Forest Service method) indicated a carrying capacity of 308 deer months, while the two other methods (clipping and weighing samples of forage and calculating air-dry weight for a total area, and monitoring utilization of key plant species) gave results of 630 and 622 deer months respectively. This study, together with similar studies elsewhere, led the Forest Service to adopt more credible methods for calculating rangeland carrying capacities.[41]

Meanwhile, in the area of game censusing, Forest Service and Utah State biologists had an unusual opportunity to develop cooperative approaches. Olsen worked closely with State game wardens in establishing census methods and outlining areas on the national forests where the game would be counted. As he pointed out, the accuracy of the initial counts for each herd was less important than the compilation of census data year after year. The data helped Forest Service and State officials deduce population trends. Olsen was a pioneer in the use of aircraft for wildlife research. Tragically, he died in a plane crash in 1945 while counting elk on the Bridger National Forest.[42]

Big Game Herd Reductions: Wisconsin

Problems with too many deer developed later in the eastern national forests. The cutover timber and farm lands that came into the national forest system under the Weeks Act were not equivalent to the large tracts of wildland that composed the national forests in the West. Deer populations had been nearly wiped out in many of these eastern areas. Despite restocking efforts, buck-only laws, and the elimination of mountain lions and wolves in the eastern States, deer population levels remained low throughout much of the region as late as the 1930's. Wherever deer herds did exceed carrying capacity in eastern States, the Forest Service faced determined opposition to any herd reduction.[43]

In Wisconsin, deer habitat began to improve in the 1920's with the regeneration of pine forests and the suppression of forest fires. As the deer population responded to the favorable changes in its habitat, Forest Service officials grew concerned about the potential for deer to damage young forest growth. They also saw signs that the growing deer herd was becoming a threat to itself. In 1933, the Forest Service enlisted the help of the Civilian Conservation Corps to conduct the first Statewide deer census. After the census was made, Forest Service officials announced that the deer herd was too large and needed to be reduced by an open season on bucks and does.[44]

The Forest Service underestimated how entrenched the buck-only hunt had become in the sportsmen's code. Wisconsin sportsmen immediately formed a "Save the Deer Club." Officials in the Wisconsin Department of Conservation denounced the deer census figures as a fabrication by the U.S. "Foreign" Service. In 1935, the department initiated its own deer census with the help of the Civilian Conservation Corps. When the results of this census approximated the Forest Service's estimates, State officials began to moderate their position. However, they remained unprepared for the Forest Service's precipitous announcement in January 1936 that some 14,000 deer of both sexes would have to be slaughtered in the winter yards on the Chequamegon National Forest or face imminent starvation. As Forest Service biologist Ernest Swift later recalled, "With no preparation for public acceptance, this recommendation threw any prospect of deer management into chaos and nearly returned it back to the dark ages."[45]

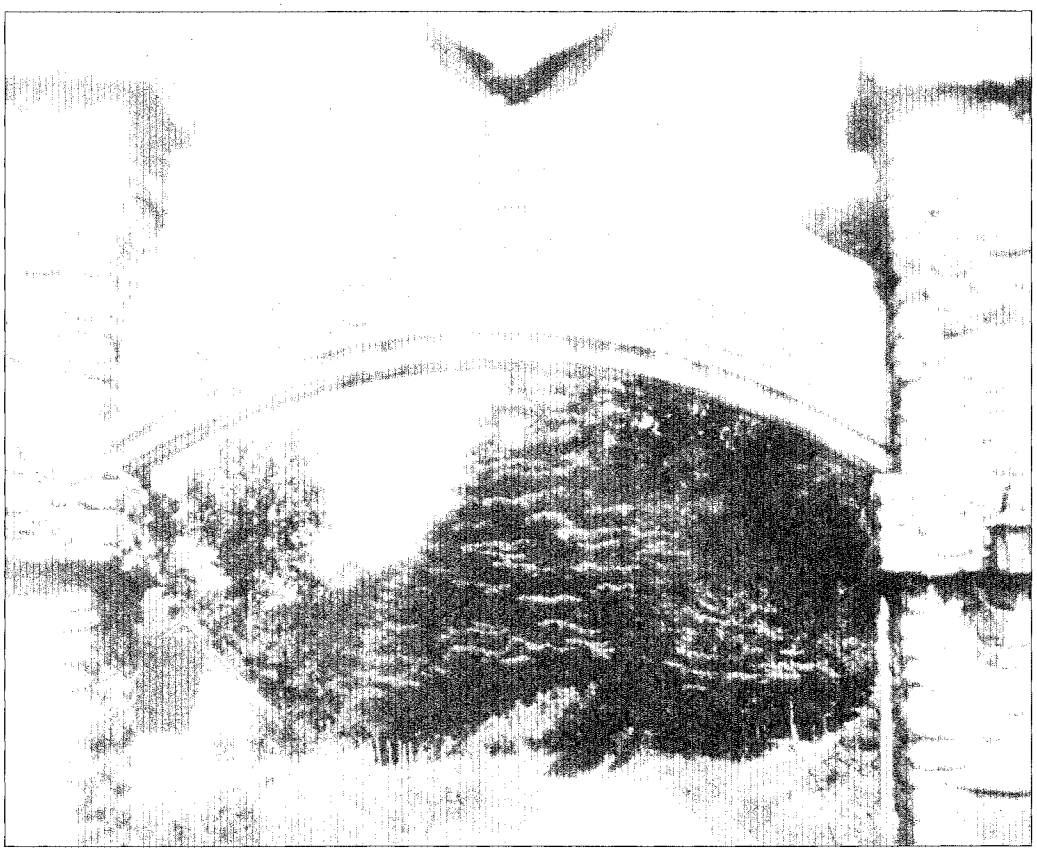
After a fleeting experiment with an open season on does in 1949 and 1950, Wisconsin reverted to the one-buck law. The Forest Service warned that the deer would have an adverse effect on forest regeneration, causing long-term injury to the lumber and paper industry. Several years later, in the 1950's, industrial foresters employed by Wisconsin's lumber and paper companies began to echo the same warning, while a study conducted with Pittman-Robertson funds lent further support to the Forest Service's position that the deer were too numerous. In 1957, the State legislature passed a law authorizing a "party permit," according to which four hunters could jointly purchase a $5 permit to kill one doe in addition to their standard quota of one buck each.[46]

Big Game Herd Reductions: North Carolina

In the Forest Service's Southern Region, the single instance of overstocking in the 1930's was also one of the most famous. It involved the deer herd on the Pisgah National Forest and Game Preserve in North Carolina. The situation that developed here was reminiscent of the Forest Service's contest with the State of Arizona over management of the Kaibab deer herd, but it also contained many elements that were peculiar to the Southern Region. Ultimately, the legal fight that ensued over the Pisgah deer herd led the Forest Service to replace its controversial regulation G-20A with another, W-2.

The Pisgah Game Preserve was formerly a part of the estate of George W. Vanderbilt. As a private game refuge, the area had been stocked with deer, turkey, grouse, and wild boar. The North Carolina general assembly ceded jurisdiction over the wildlife resource in this area to the Federal Government, and in 1916 it was proclaimed a Federal game preserve and placed under the administration of the Forest Service. Covering 98,000 acres in the western North Carolina uplands, it soon stood as one of the few remaining forested areas of that size in the South.[47]

The Forest Service managed the area as a game preserve. While the Secretary of Agriculture prescribed regulations pertaining to hunting, fishing, camping, fees, and issuance of permits, the Forest Service assigned Federal wardens to patrol the preserve. Forest Service officials hoped that the preserve would establish a breeding area from which surplus game would spread to the surrounding country. But when the white-tailed deer herd grew as expected, the anticipated outward expansion failed to occur. Agency officials attributed the deer's reluctance to leave the preserve to two main factors: intense hunting



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Entrance to the Pisgah National Forest.

pressure around the edges of the preserve, and the prevalence of dogs in the surrounding mountains. These problems lay outside the Forest Service's jurisdiction. By the early 1930's, the increase in deer was causing a shortage of deer forage and severe damage to forest reproduction, and Forest Service officials determined that it was necessary to hold the preserve's first regulated hunt.[48]

That the Forest Service should authorize a hunt, hold a public drawing, and collect license fees from North Carolina residents struck many members of the North Carolina general assembly as an infringement of States' rights. The general assembly repealed the cession of jurisdiction it had made in 1915 and pressured the game commissioner to establish State licensing requirements. Hunts were held under Federal auspices in 1932 and 1934, then under State auspices beginning in 1936. Forest Service officials insisted on charging a Federal fee in addition to the State resident and non-resident license requirement initiated by North Carolina in 1936. The Forest Service raised the Federal fee in 1937, claiming that more funds were needed to defray the cost of its restocking program.[49]

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At the age of 6 months, young deer from the Pisgah Fawn Nursery were loaded into special shipping cases and transported to the national forests in the South by rail or truck.

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Feeding fawns at the Pisgah Fawn Nursery, Pisgah National Forest, North Carolina, 1935.

The Federal hunting fee was one source of conflict, the restocking program another. The restocking program involved live-trapping adult white-tailed deer and fawns, rearing the fawns in pens, and shipping the deer to other national forests in the South. The restocking program, like the mule deer herd reduction program on the Kaibab 10 years earlier, challenged the doctrine of State ownership of wildlife. In 1935, North Carolina's Commissioner John D. Chalk protested the removal of deer from the State when the deer could be used to restock other national forest areas in North Carolina.

The Forest Service maintained that these areas were already adequately stocked. Failing to reach agreement with the State on this issue, the Forest Service cancelled the public hunt on the Pisgah Game Preserve in 1935. While the Forest Service and the State reached an accommodation on the public hunt for 1936, 1937, and 1938, the Forest Service continued to trap about 200 deer on the Pisgah each year for shipment out of the State in defiance of the State's game laws. In January 1939, Commissioner Chalk ordered the arrest of two Forest Service rangers who were transporting deer. The State subsequently dropped charges against the two rangers, but the Forest Service continued the case, bringing action against the commissioner in *United States of America v. J.D. Chalk et al.* The Federal district court rendered a verdict in favor of the Forest Service on November 20, 1939. The State appealed the decision to the circuit court, which again ruled in favor of the Forest Service on August 30, 1940. The State sought to appeal the decision, but the Supreme Court declined to hear the case.[50]

The legal contest over the Pisgah deer herd reduction and restocking program was a turning point in Forest Service cooperation with the States. Like *Hunt v. United States*, the case turned on the issue of whether a Federal land managing agency could exercise Federal authority over wildlife on Federal lands in order to protect wildlife habitat and other natural resources from damage. The attorneys for the State of North Carolina argued their case on the basis of the *Geer v. Connecticut* decision of 1896 and other case law that supported the doctrine of State ownership of wildlife, just as the attorneys for the State of Arizona had argued in *Hunt v. United States*. Once again, the court did not even mention *Geer* in its decision but affirmed the power of the United States to protect its property. The court's decision in *United States v. Chalk* supported the Supreme Court decision in *Hunt v. United States* of 12 years earlier, and extended it to national forest lands acquired under the Weeks Act.[51]

In the course of the Pisgah deer case, State resentment of G-20A resurfaced. State game commissioners all over the Nation rallied behind Chalk and the State of North Carolina. State officials expressed support in resolutions adopted by the Southern Association of Conservation Officials, the Association of Midwest Fish and Game Commissioners, the Western Association of State Game and Fish Commissioners, and the International Association of Game, Fish, and Conservation Commissioners. All of these resolutions charged that the Forest Service had attempted to usurp the rights of the States to regulate the taking of game on the national forests. State wildlife officials linked the Forest Service's stridency in the Pisgah deer case with G-20A and condemned both in testimony before the House Select Committee on Conservation of Wildlife Resources. Forest Service

officials had never seen such a united stand in defense of the doctrine of State ownership of wildlife.[52]

The decision by the court presented the Forest Service with an opportunity to revoke G-20A from a position of strength rather than weakness. In April 1941, Acting Chief Forester Earle H. Clapp invited the International Association of Game, Fish, and Conservation Commissioners to collaborate with the Forest Service in devising a new regulation to replace G-20A. The Association's president, Seth Gordon of California, eagerly responded. Members of the Association contributed ideas during several sessions with the Forest Service, and when the new regulation was approved, Gordon informed Clapp that "the members of the International Association will at all times stand ready to work with you and your staff to accomplish the desired objectives in a cooperative way."[53]

Regulation W-2

The regulation, W-2, provided a new foundation for Forest Service-State cooperation. W-2, a Forest Service regulation, declared that it was the agency's responsibility to determine the extent to which national forest areas would be devoted to the production of wildlife in combination with other uses, and it was the joint responsibility of the Forest Service and the State game departments to formulate plans for securing and maintaining desired population levels of wildlife species. Further, the Forest Service would cooperate with State game officials in the planned and orderly removal of game, fish, and furbearers in accordance with the requirements of State laws.

Cooperation was a basic premise of W-2. As one Forest Service manual in 1952 observed, "In no other phase of national forest administration is cooperation more essential than in the field of wildlife management."[54] W-2 brought the two phases of wildlife management, manipulation of habitat and regulation of the harvest, as close together as the doctrine of State ownership of wildlife would allow. The States were primarily responsible for the protection and utilization of wildlife and fish, while the Forest Service was primarily responsible for managing wildlife and fish habitat on the national forests. Neither phase alone could provide a balanced program, so both the States and the Forest Service were bound to cooperate to make their programs succeed.

Chapter Five

CHAPTER FIVE
COOPERATION WITH THE STATES: FROM WORLD WAR II TO THE 1970'S

"In no other phase of national forest administration is cooperation more essential than in the field of wildlife management."

. . . *Forest Service Manual, November 1952.*

Cooperation with the States became routine in the 1940's and 1950's. The Forest Service developed cooperative agreements with the game and fish commission or department of each State. Forest Service and State biologists conducted joint studies and surveys in the field, while Federal and State administrators met on a regular basis to keep the cooperative relationship on track. Despite the routine nature of Forest Service cooperation with the States, however, State officials remained wary of Federal encroachment on the doctrine of State ownership of wildlife.

Strengthening of State Wildlife Programs

State wildlife programs varied widely. They were generally stronger in the West, where the relative abundance of big game and thousands of miles of quality fishing streams gave wildlife management a higher profile. Pennsylvania had a model department of fish and game in the East, while the California Department of Fish and Game was one of the most well-funded programs in the West. Problems of insufficient funding were common to nearly all State programs, but were most severe in the South. The director of Texas's Department of Fish and Game, Howard Dodgen, thought that his State had one of the most poorly funded programs in the nation.[1]

State wildlife programs varied widely in their political organization as well. The typical political evolution began with the appointment of a State game warden. When a single individual was in charge of both policy and administration, he was not in an enviable position. In State after State, governors formed a politically appointed fish and game commission to shield the warden from the politics of hunting and fishing regulation. As the warden's role gradually expanded from law enforcement to scientific management, fish and game departments were established. By the 1940's and 1950's, most States had both a commission and a department, with the commission continuing to bear the brunt of public pressure and the department playing a technical role in fish and wildlife management.[2] But the relative size and stability of these complementary entities were different in each State.

Associations of State wildlife professionals were another important feature in the political landscape. The Western Association of State Game and Fish Commissioners had the most direct involvement with the Forest Service; parallel organizations existed in the Midwest, Northeast, and South. An umbrella organization, the International Association of Game, Fish, and Conservation Commissioners (IAGFCC), served as a strong advocate for States' rights in wildlife and fish management. Forest Service wildlife officials frequently attended the annual meetings of these associations.[3]

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State fish and game commissions grew stronger in the 1940's and 1950's. This management area in Montana was purchased with proceeds from fishing and hunting licenses and wildlife restoration funds.

Despite the unevenness of State wildlife programs, they showed a definite trend toward professionalization. Not only had they come far since the first State wildlife laws were passed in the late 1800's, they had made up lost ground from the 1930's. Elliott S. Barker, State game warden of New Mexico, later recalled the "dark years" of the Great Depression at a meeting of the IAGFCC. After taking office in 1931, Barker had found State license revenues dropping year after year. The revenue from sales of hunting and fishing licenses was the lifeblood of all State wildlife programs, and Barker had lost his director of fisheries, chief of law enforcement, director of game management, publicity director, and chief of predator control during the early 1930's. Public relief agencies such as the Civilian Conservation Corps provided some help, Barker noted, and the Pittman-Robertson (P-R) Act of 1937, with its Federal aid to States for wildlife work, went even further in putting the New Mexico State program back on its feet. In the next decade and a half, license revenues climbed to 600 percent of the level when Pittman-Robertson was passed.[4]

The Pittman-Robertson Act, although a Federal law, was a turning point in the professionalization of State wildlife programs (see Chapter 4). The law established a "Federal aid to wildlife restoration fund" in the U.S. Treasury. The fund was comprised of revenues derived from a Federal excise tax on sales of firearms, shells, and cartridges. Most of the fund was to be apportioned among the States, one-half on the basis of

geographic area and one-half on the basis of the number of hunting license holders in each State. P-R funds could be used to pay up to 75 percent of the cost of wildlife restoration projects.[5]

The most important feature of the law was that it used a "carrot and stick" approach to encourage States to professionalize their wildlife programs. Recognizing that license revenues provided the financial base for all State wildlife programs, Congress declared in the act that no State would be eligible for P-R funds until it had a law prohibiting the diversion of license revenues for any other purpose than the administration of its fish and game department. Some State politicians objected to this provision as a Federal intrusion on States' rights, but eventually all 50 States passed the required law.[6]

Once Pittman-Robertson put State wildlife programs on a stable financial base, the return of prosperity after World War II began to have a measurable effect on the quality of State wildlife programs. The return of prosperity gave people more leisure time, and sport hunting and fishing increased proportionally. License revenues rose, producing healthier budgets for State wildlife programs. The rate of turnover of State wildlife directors and their staffs, so abysmally high in the 1930's, showed a positive trend during the next decade.[7]

Lloyd Swift, appointed director of Wildlife Management in the Forest Service in 1944, welcomed the improvement of State wildlife programs. Most States appointed a Federal wildlife projects coordinator; some created a whole division for habitat management and staffed it with wildlife biologists. Sometimes State wildlife officials worked with Forest Service biologists; sometimes they undertook projects on their own. By the 1950's, many State wildlife programs were moving away from their traditional emphasis on law enforcement and were developing highly trained staffs with college degrees in wildlife biology or wildlife management. Soon the entire corps of State biologists outnumbered Federal biologists in the Forest Service, Fish and Wildlife Service, and National Park Service.

Retrenchment in the Forest Service Wildlife Program

During World War II, Congress continued to support the Forest Service wildlife program out of concern that overpopulations of big game could damage the rangeland and reduce the livestock industry's beef production. Moreover, the War Production Board had an interest in maintaining healthy populations of hide and furbearers for use in manufacturing military gear.[8] After the war, however, Congress saw less reason to support wildlife and fish habitat management in the Forest Service as State wildlife programs expanded. Congressional support for the program waned, and in 1948, Congress eliminated wildlife and fish habitat management from the Forest Service budget altogether. Wildlife Management Director Swift and his small staff had to be supported out of general funds for national forest administration.[9]

Swift made the best of the situation. Although the Forest Service's wildlife and fish staff was reduced to a skeletal organization, congressional support for the service as a whole had never been stronger. As the agency moved toward intensive management of the national

forests, wildlife and fish habitat management had to be integrated into this aggressive multiple-use program—coordinated with grazing, timber production, and other uses. At the same time, the Pittman-Robertson Act now gave the States funding and the ability to do much more with wildlife management on the national forests. Therefore, Swift reasoned, he and his staff had an unprecedented opportunity to improve habitat conditions on the 187 million acres of forest and rangeland in the national forest system. Their task was fundamentally one of coordination: coordinating with other functions in the Forest Service, other Federal agencies, and the States.[10]

In the West, range surveys continued to be an important aspect of Forest Service cooperation with the States. An example of this kind of program was the series of measurements of livestock and game utilization of forage on the Interstate Deer Herd Area in southern Oregon and northern California. Utilization measurements were made according to a regular schedule and the results were used to determine adjustments that the Forest Service should make in livestock use and that the States should endeavor to make in big-game numbers. Cooperation sometimes took another form, with the States acquiring the base property of permittees who had grazing preferences on the national forests. Where

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Range surveys were an important part of Forest Service cooperation with the western States.

this occurred, the Forest Service entered into a memorandum of understanding with the State. The Forest Service agreed to consult with State wildlife officials regarding any change in livestock use on the affected rangeland, while the State agreed to work with the Forest Service in developing a program to protect and enhance the food, water, and cover conditions for wildlife in the habitat management area.[11]

The Forest Service and the States cooperated in various research projects. State biologists were sometimes assigned to work at a forest experiment station, or State funds were transferred to the Forest Service to conduct a particular research project. Occasionally Forest Service and State researchers joined together on a project team.[12]

In the early 1950's, Congress renewed its funding for wildlife habitat management on the national forests. Amounting to less than half a million dollars, however, the Forest Service budget item remained smaller than that of most State wildlife programs. Under the influence of "Operation Outdoors," a multi-million dollar initiative to develop recreational resources on the national forests, Congress began to make modest increases in the Forest Service's budget for wildlife work in 1957. Assistant Chief of the Forest Service Ed Cliff described the Forest Service's combined recreation and wildlife program as a "sleeping giant," and hailed two back-to-back increases in the annual wildlife budget as "encouraging and significant."[13] Increases continued in the early 1960's.

Funding for wildlife habitat research by the Forest Service also grew during the late 1950's and early 1960's. In 1966, the research arm of the Forest Service was funding eight separate wildlife habitat projects throughout the West. These programs were located at Berkeley, California; Tempe, Arizona; Fort Collins, Colorado; Rapid City, South Dakota; Missoula, Montana; Boise, Idaho; Provo, Utah; and La Grande, Oregon. Each project had the encouragement and concurrence of the fish and game department in that State.[14]

Throughout this period, Swift worked closely with western State directors to ensure their support for Forest Service initiatives in wildlife and fish habitat management. Although Swift stood by the Forest Service's Regulation W-2 as a basis for cooperation, many State officials still mistrusted the Forest Service and worried that the Federal agency would someday make a bid for control of the game harvest on national forest lands. Occasionally tempers still flared at conferences just as they had in the 1930's when Regulation G-20A was on the Forest Service books. Swift insisted that this was unproductive, and once threatened to walk out if State directors made any more attacks at public meetings.[15]

Swift initiated "show me" trips for the State directors to demonstrate the Forest Service's commitment to the wildlife resource. The first such trip began in Washington, D.C., and included a visit to the Francis Marion National Forest in South Carolina, where some of the western directors saw wild turkeys for their first time. These trips became an annual affair and served an important role in solidifying the cooperative relationship between the Forest Service and the States.

Cooperative Management in the South

Cooperative management took a different tack in the Southern Region. There the Forest Service established Wildlife Management Areas (WMA's) within certain national forests, and it entered cooperative agreements with the States whereby the Forest Service assumed responsibility for the game harvest within the WMA's.

The Forest Service's cooperative agreement with the Virginia Commission of Game and Inland Fisheries, made in 1938, served as a model. It provided for the appointment of Forest Service employees as special State game wardens, and it placed the Forest Service in charge of practically all phases of wildlife management, subject to the approval of the Virginia Commission of Game and Inland Fisheries. The agreement covered all of the George Washington and Jefferson National Forests in the western highlands of Virginia, designating the entire 1,400,000 acres as a cooperative wildlife management area.[16]

The Forest Service favored this plan because it gave the agency a dominant role in wildlife management. Virginia accepted the plan because it had scarcely any big game to manage in 1938. When the cooperative wildlife management area went into effect, the area featured only one small white-tailed deer population confined to 2 western counties on the Jefferson National Forest. The forests contained, in addition, a small population of black bear and a herd of approximately 200 elk, the latter maintained on a 60,000-acre tract of private land within the purchase area of the forest. Other important game animals included wild turkey and bobwhite quail.[17]

The Forest Service devoted considerable energy to educating the public about the plan before any proposals were made to the Virginia General Assembly. Agency officials discussed the plan in dozens of fish and game clubs in western Virginia. They pointed to their accomplishments on the 30,000-acre Big Levels Refuge on the George Washington National Forest, where 3 years of experimentation with habitat improvement, predator control, and stricter law enforcement was producing measurable increases in the number of deer, wild turkeys, and bobwhite quail. Early in 1938, the Virginia General Assembly established the Virginia Commission of Game and Inland Fisheries, and on June 13, 1938, representatives of the new commission and the Forest Service signed the Virginia National Forests cooperative agreement.[18]

The announced objectives of the cooperative program were remarkably progressive. A pamphlet described its seven goals as follows:

- to maintain sufficient breeding stock of all species such that sportsmen and trappers would be able to harvest a maximum sustained yield of game animals, fur bearers, birds, and fish;

- to increase and stabilize the carrying capacity by improving the wildlife and fish habitat;

- to effect as nearly as possible a natural balance of wild birds and other animals;

- to maintain animal populations not to exceed the maximum natural carrying capacity for any one species;
- to manage wildlife populations in coordination with all other forest uses;
- to protect the aesthetic values of wild animals and birds of both game and nongame species;
- to control the number of undesirable species such as to effect good ecological and biological balance.[19]

In calling for the protection of nongame wildlife values and the preservation of biological communities, the authors of this agreement were anticipating major developments in the wildlife management field that lay 40 years in the future.

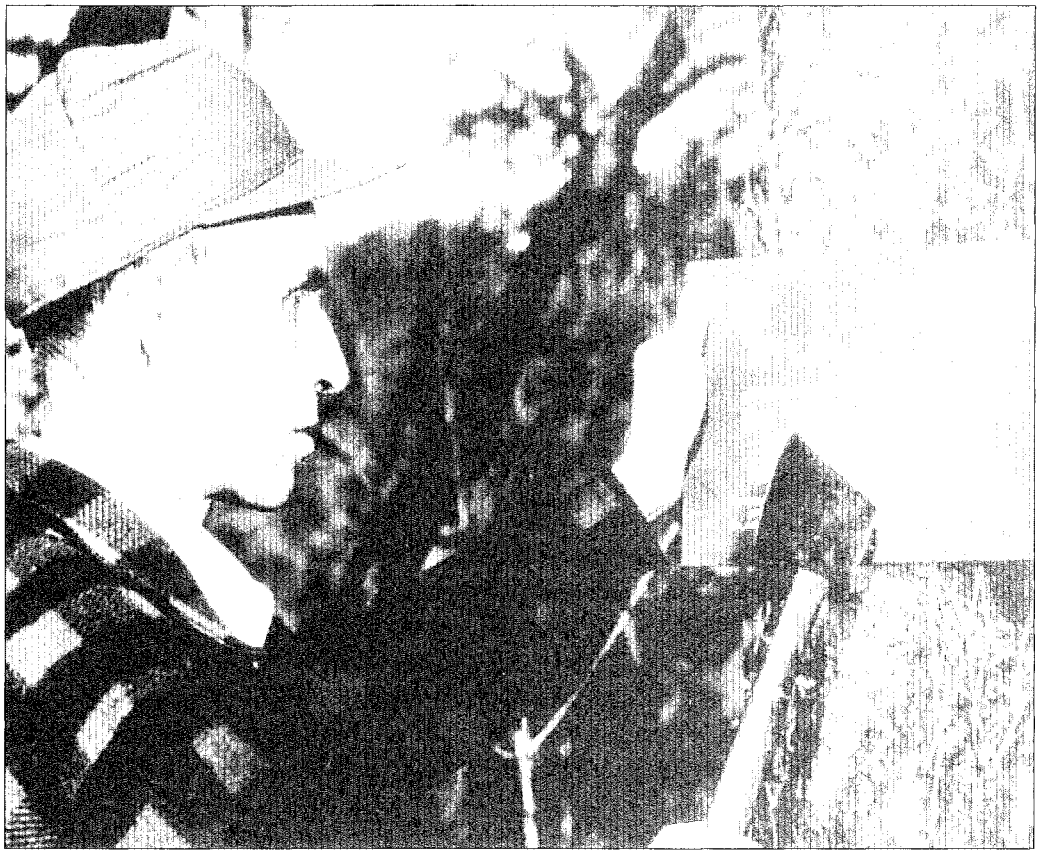
The traditional emphasis on big game management remained at the heart of the plan. The commission issued a special national forest stamp. Sportsmen had to pay a $1 fee for the privilege to hunt in the wildlife management area. Proceeds from the sale of stamps were divided on a 50-50 basis between the States and the Forest Service, and all such revenue was to be used exclusively for the development, stocking, and protection of the wildlife management area. Stamp sales amounted to $100,000 after 7 years of operation, with law enforcement consuming a majority of the funds. Virginia's first legal deer hunting season took place in six counties on the Jefferson National Forest in 1945.[20]

Cooperative agreements with other southern States followed a similar pattern: designation of cooperative WMA's, detailed working plans for game management and habitat improvement on the areas, and provision for sale of stamps with the proceeds to be equally divided between the Forest Service and the State. In other southern States, however, only portions of the national forests were designated as WMA's. Most of the areas covered 50,000 acres or more and included diverse habitat types. Altogether, 25 WMA's were established in the Southern Region between 1936 and 1941. On each WMA the Forest Service established a warden's residence, while the State paid for the warden's salary and travel expenses.[21]

The WMA's were popular and necessary because wildlife numbers were still at a low ebb across most of the South. Nearly the entire region had been deforested by 1920, and suitable habitat for game was still minimal 20 years later. Moreover, southern States were generally behind other States in enacting wildlife conservation laws. With limited wildlife resources, southern States committed minimal funds to fish and game conservation programs and law enforcement was poor. Free-roaming domestic dogs and cats held down wildlife numbers even as habitat conditions improved.[22]

Wildlife management areas in the South were reminiscent of the game refuge system in the early 20th-century West, where wildlife conservationists had sought to concentrate law enforcement in a few areas in order to make it effective. As with game refuges, wildlife officials hoped that surplus game on the WMA's would occupy surrounding areas. However, hunting pressure around the WMA's was too intense to allow this to happen. As many WMA's became overstocked in the 1950's, the old pattern repeated itself.[23]

An important feature that set the WMA's apart from the old game refuges, however, was the legal or managed hunt. For a number of years the Forest Service played a significant role in managing the hunt in most southern States. Agency officials, deputized as State game wardens, staffed check stations on all roads leading into the WMA's. In cooperation with State wildlife officials, Forest Service personnel recommended open and closed areas, bag limits, hunting hours, standards for guns and ammunition, rules for use of hunting dogs, license requirements, safety regulations, and procedures for selecting hunters. Hunter success was high; therefore, adjusting the number of hunters permitted to take part in the hunt was normally the most accurate method for cropping the herd by a given amount. No one claimed that the managed hunt was an exact science—Forest Service biologist Malcolm Edwards stated that officials determined the total kill by "a combination of road count,



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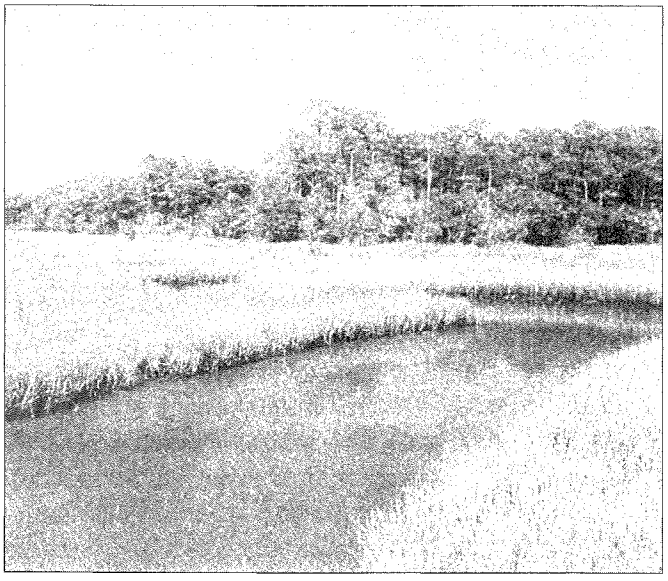
Posting sign banning hunting.

observation of browse conditions, and the grace of God"—but it served as the most important management tool for controlling big game populations.[24]

In 1960, Forest Service officials began to suggest that the WMA's had outlived their usefulness. Strict law enforcement and habitat improvements had succeeded in bringing back wildlife and fish populations on the WMA's, but these resources needed to be developed on the rest of the national forests as well. The time had come to expand wildlife and fish management efforts to cover all national forest lands in the South. A wildlife biologist in the U.S. Fish and Wildlife Service's regional office in Atlanta, C.W. Jackson, was the most vigorous proponent for this reform and urged the States along. He found a willing partner in Clyde Patton, head of the North Carolina Wildlife Resources Commission. With Patton's concurrence, the forest supervisor of the National Forests in North Carolina issued a plan in 1962 for achieving forest wide wildlife management. Other forest supervisors in the South followed his example.[25]

The push for forest-wide wildlife management prompted talk of Federal intrusion on States' rights. Southern sportsmen's associations opposed it. As many sportsmen saw it, WMA's provided a surplus of deer that drifted out to surrounding areas and were shot. Hunters needed only a State license to get their deer outside the WMA's. Many of them would be paying a fee to the Forest Service for the first time if WMA's became forestwide. Some State game departments took over management of the WMA's, placing their own wardens in the guard houses and at the check stations. Other State game departments resisted the move to forest-wide wildlife management, on the grounds that their law enforcement capability would be spread too thin.[26] Despite these objections, however, the Forest Service moved ahead incrementally, forest by forest and State by State, proceeding as fast as public opinion and the financial resources of the State game departments would allow.[27]



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Croatan National Forest, North Carolina.

In 1972, North Carolina again set an example for other southern States when it issued a single hunting stamp that was good for all four national forests in the State as well as State-owned land. North Carolina thus became the first southern State since Virginia to require a stamp for hunting anywhere on the national forests. Not only did this increase revenues, it also saved the expense of staffed check stations around the WMA's. As a result, the North Carolina Wildlife Resources Commission and the Forest Service both had more money for habitat improvement. The system worked very well for both North Carolina and Virginia.[28]

Federal "Preemption" and the Sikes Act

A series of congressional acts in the early 1970's caused State fish and game officials renewed anxiety over Federal "preemption" of the doctrine of State ownership of wildlife. First came a law that banned the use of aircraft in sport hunting. This was followed by the Wild, Free-Roaming Horses and Burros Act of 1971, the Marine Mammal Protection Act of 1972, and the Endangered Species Act of 1973. Congress passed this legislation in response to growing public concern for wildlife, much of it in favor of a larger Federal role in wildlife protection. The issue of aerial gunning, for example, took the House Committee on Wildlife and Fisheries by storm in 1969 in the weeks and months following an NBC-TV special on wolves. Committee members had never seen so many letters on a single issue arrive in such a short span of time.[29]

Conflicts over State versus Federal authority in wildlife management were especially acute in Alaska, where the Marine Mammal Protection Act took away the State's authority to regulate the taking of seals and walruses. In addition, the need for Federal protection of native subsistence hunting and fishing in Alaska, recognized initially in the Alaska Native Claims Settlement Act of 1971 and subsequently in the Alaska National Interest Lands Conservation Act of 1980, introduced a unique area of Federal authority over wildlife in that State.[30] Although marine mammal and subsistence hunting and fishing protections were primarily the responsibility of other Federal agencies, the laws created new areas of responsibility for the Forest Service on the Tongass and Chugach National Forests.

Nervous about the trend in national wildlife law, the Western Association of State Game and Fish Commissioners held a session at its annual meeting in 1976 with the provocative title, "A Congressional View of the Question: Will the Trend Toward Congressional Preemption of the States in Fish and Wildlife Matters Continue?" Congressman Robert L. Leggett, the first speaker, said that the phrasing of the question made him feel "a bit like the proverbial man who was asked if he'd stopped beating his wife yet." Leggett disputed that such a trend existed. Instead, he saw increasing respect in congressional circles for "the superior abilities and capabilities at the State level for successfully dealing with many of our fish and wildlife management and habitat conservation problems."[31]

Leggett was referring in part to the Sikes Act of 1974, a law that many expected to be a bellwether of improved Federal-State cooperation. The measure built on an earlier law which authorized the Departments of Defense and Interior to develop wildlife and fish habitat on military reservations in cooperation with State fish and game departments. The previous legislation also provided for the issuance of special hunting permits and the assessment of hunting fees with proceeds to be used according to the cooperative plan. The new law, the Sikes Act, provided more funds for existing plans and extended the concept of cooperative plans and hunting fees to lands administered by the Forest Service and three other Federal land managing agencies. It authorized expenditures of up to $10 million each by the Departments of Agriculture and Interior to carry out these measures in fiscal year 1974 and each of the next 4 years. The intent of the law was to stimulate greater Federal-State cooperation.[32]

The States did not give the Sikes Act an enthusiastic reception. Some States' rights advocates insisted that the legislation was superfluous: State fish and game departments already had cooperative agreements with Federal agencies and the law's explicit authorization for States to regulate hunting and fishing on these lands only averred a right that States already claimed and exercised. However, new cooperative management plans under the Sikes Act were supposed to give State fish and game departments a larger role in decisions affecting habitat. Moreover, States were given the option to require a special public land management area stamp for hunting, fishing, or trapping, with the revenues to be used for habitat improvement.[33]

The Forest Service, for its part, was slow to embrace the Sikes Act. Officials were indifferent toward it when the bill was in committee. "Our present system is working very well," Chief Ed Cliff testified before a House committee in 1971. "We expect this strong Federal-State cooperation to continue."[34] The Forest Service did not want the burden of collecting sportsmen's user fees on the western national forests, nor the requirement of developing redundant cooperative agreements with all the States. Some officials observed that the Sikes Act gave the Forest Service no authorities that it did not already possess under the Multiple Use–Sustained Yield Act of 1960.[35]

After Congress enacted the legislation, the Forest Service advocated the national forest stamp plan. Regional offices directed forest supervisors to promote the idea with the States, but many forest supervisors found the idea disagreeable or the task itself unpleasant. With few exceptions, such as a pilot project in New Mexico, States were either suspicious or uninterested in that provision of the law.[36] Florida National Forests Supervisor Joe Ribole thought the Sikes Act was oversold. There was "a lot of noise at the top of the stairs," Ribole remarked, "and only a mouse came down."[37]

Despite some disappointment over the States' reception of the Sikes Act, however, Forest Service officials generally believed the law was a positive development for Federal-State cooperation. Chief John McGuire insisted that the administration must include funds for implementing the plans in the agency budget or "the whole planning effort and the intent and purpose of the Act would appear negated."[38] Although the Department of Defense received allocations of funds specifically for planning under the Sikes Act, none was ever provided to the Forest Service.[39] Nevertheless, the act's provision for cooperative planning was duly implemented, with 18 Statewide wildlife plans completed by May 1976. In the long run, the Sikes Act increased opportunities for cooperative management with the States.

CHAPTER SIX

CHAPTER SIX
COORDINATION WITH FORESTRY

"The time has come to face up to the fact that the harvest of wood, a forester's function, has greater influence on game than any active technique available to the wildlifer."

. . . Robert H. Giles, Jr., 1962.

The national forests served as a vast outdoor laboratory for the birth and development of modern wildlife habitat management. When this new scientific discipline first took shape as an offshoot of forestry in the 1930's, it seemed ideally suited to the agency's commodity-based model of national forest management. A basic premise of the new science was that silvicultural treatments, properly modified to improve wildlife habitat, could increase the output of forest products and wildlife simultaneously. A basic element of the Forest Service biologist's work, therefore, was to coordinate wildlife habitat needs with other forest uses. Gradually it became apparent that these two forest uses, complementary as they were in theory, were fraught with tension and ambiguities in practice.

Birth of a Science

In pre-Columbian North America, Native Americans possessed a practical knowledge of the relationship between forest succession and wildlife abundance. They frequently set fire to forests and grasslands so that the land would produce more game. They knew from experience that fires resulted in forest clearings and richer soils, which after a winter or two, produced lush growths of forage for deer and other animals. By regularly burning patches of forest and grassland, Native Americans created the conditions for animals to thrive in greater numbers than the land would otherwise sustain.

The Europeans who emigrated to North America came from cultures in which traditional knowledge about the relationship between forest succession and wildlife abundance had long been forgotten. While they sometimes grasped why Native Americans set fires, more often they dismissed or even opposed the practice, believing it was primitive and destructive.[1] Ironically, when contemporary Americans set aside forest reserves and established the Forest Service at the turn of the century, they started with a less sophisticated understanding than Native Americans had possessed three centuries before.[2] Most Americans were content with the simple idea that "the forest is the home of the animals."[3] Even wildlife conservationists perceived forest reserves primarily as game refuges where wild animals received protection from market hunters and other threats of civilization. It was not until the 1920's and 1930's that forest managers began to rediscover—on a new scientific basis—the relationship between forest succession and wildlife abundance.

One of the first scientific studies to demonstrate the relationship was that of Herbert L. Stoddard on the bobwhite quail. A researcher with the U.S. Biological Survey, Stoddard's study examined why this upland game bird was decreasing even on huge, private quail preserves. Stoddard found that the quail needed early successional growth associated with disturbances such as fire. The fire suppression effort led by the Forest Service, however, was gradually eliminating quail habitat. Stoddard suggested that controlled burning of forests provided a management tool for producing more quail.[4]

Two years after the publication of Stoddard's *The Bobwhite Quail* (1931), Aldo Leopold produced his classic treatise, *Game Management* (1933). With this book, Leopold laid the conceptual groundwork for the wildlife management profession. Wildlife management, he maintained, was the art and science of manipulating the animals' environment to influence the productivity of animal populations.

As a professional forester by training, Leopold was keenly interested in how the game manager could coordinate his efforts with the work of the forester. Agronomy and animal husbandry were allied sciences that dealt with the coordination of plant and animal crop production from the same land, Leopold noted. Forestry and wildlife management should be treated as allied disciplines in the same sense. Foresters and wildlife managers had to develop a rigorous understanding of how to coordinate the production of timber and game crops in an "organized process of give-and-take."[5]

Leopold presented the basic premises of game management in eloquently straightforward terms. All the relevant factors in an animal's environment, Leopold explained, could be divided into two sets. "Decimating factors" had a direct influence on wildlife numbers. They were those factors that killed animals, such as hunting, predators, disease and parasites, starvation, and accidents. Welfare factors had an indirect influence. They were the essential habitat requirements of any animal population and included food supply, water supply, and special factors. Deficiencies in the welfare factors reduced the productivity of an animal population by decreasing its breeding rate and increasing its vulnerability to the decimating factors. The totality of all these factors operating on an animal population was called "environmental resistance."

Leopold observed that among the several factors influencing the productivity of a wildlife species at a given place and time, one factor generally overshadowed the others in its effect. Leopold called this the "limiting factor." Game management, Leopold stated, consisted largely of identifying the limiting factor and controlling it. Once a limiting factor was controlled, a different environmental factor would emerge as the limiting factor and the game manager would then address that one. In this sense, game management was systematic. But Leopold hastened to add that the game manager must always be alert to changes in the environment from influences outside of his own efforts. "Limiting factors shift not only with the purposeful accomplishment of controls, but with accidental changes in weather or other environmental conditions," Leopold wrote. In other words, the game manager had to coordinate his job with everything else that was happening to the wildlife habitat. This included the harvesting of timber.[6]

Ralph T. King, a researcher at the Roosevelt Wildlife Forest Experiment Station in New York, underscored the importance of forestry to wildlife management in an influential article, "The Essentials of a Wildlife Range," published in 1938. King defined the essentials of a wildlife range as "those things that must be present or provided on every range if it is to support any wildlife at all." These essentials corresponded to Leopold's welfare factors. They included the material items of water, food, and cover, and two additional factors that were more in the nature of pattern: juxtaposition and interspersion. It was not enough for a range to contain sufficient quantities of water, food, and cover, King pointed out; a good arrangement and distribution of these elements was necessary to make the wildlife range productive.[7]

King explained the concept of juxtaposition as simply the requirement that food, water, and cover must all occur in close enough proximity for a species to use them. Research on various game animals during the 1930's revealed that each species had a "cruising radius," or an average yearly limit of how far an animal would venture in its quest for food, water, and cover. For most small mammals and upland game birds, the cruising radius was surprisingly small. Herbert Stoddard's work on the bobwhite quail, for example, showed that the average yearly radius for this ground-dwelling bird was not more than one-half mile. Therefore, King observed, food, water, and cover must all be present within a species' cruising radius in order for a range to be habitable.

The other factor relating to pattern—interspersion—was based on another property of each species known as "saturation point." This phenomenon was not well understood, but was thought to be some biological mechanism within the species that limited population density in a given area. King defined interspersion as the "distribution over the entire range of all the food, water and cover requirements in a manner that renders it possible for each unit of the range, as determined by the species' saturation point, to produce its share of the total maximum population."[8]

Forestry had enormous potential to affect the pattern of vegetation on a wildlife range and thereby increase the game crop. Thinning, clearing, burning, and planting each influenced vegetative growth in the forest understory and thus the food supply for wildlife. Characteristically, the edge between mature forests and clearings provided the kind of juxtaposition of wildlife requirements that King described as one of the essentials of a wildlife range. For many species with small ranges, the juxtaposition of food and cover along forest edges was so important that the productivity of the range was directly proportional to the sum of the edges between environmental types.[9] Forest cuttings, if properly coordinated with wildlife requirements, could improve a wildlife range by increasing the amount of edge.

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A basic principle of wildlife management is to recognize the "edge effect" to advantage. Here a forest edge in the Allegheny National Forest of Pennsylvania has been planted with timothy, rye, wheat, and oats in the knowledge that the edge area contains a greater abundance and diversity of wildlife than either the forest or meadow alone.

Encouragement from the USDA Biological Survey

These ideas formed the theoretical basis for coordination of timber and wildlife habitat management. It remained for land management officials to see that the ideas were put into practice. One of the most vocal proponents of coordination in the 1930's was Ira N. Gabrielson, Chief of the Biological Survey under the Department of Agriculture. A prolific writer and speaker, Gabrielson publicized the importance of forestry and the national forests to wildlife conservation. He started from the position that wildlife management had to dovetail with other land uses. Most of the land that was suitable habitat for wildlife was devoted primarily to other purposes. In all of this area wildlife was an incidental product of the land. Even on the national forests, Gabrielson conceded, the lands had to be managed "primarily for the forest purposes for which they were created and definitely set aside." The most important task of the wildlife manager was to devise methods for modifying land uses so that wildlife would indirectly benefit.[10]

Addressing foresters, Gabrielson emphasized three kinds of forestry practices that could be modified and coordinated with wildlife habitat management. First, he recommended that

cutting operations be spread out and arranged in as small a unit as was economically feasible. The purpose was to maximize the amount of edge between mature stands and clearings. Logging engineers and foresters would point out that small units were less economical than large ones from the standpoint of logging operations, but this was one of the trade-offs of multiple-use management. The spread of truck logging in the 1930's made the smaller units more feasible.

Gabrielson's second recommendation to foresters was that they moderate their tree-planting program in the East, where hardwood forests were being steadily converted to conifer. Large blocks of conifer forest did not make good habitat for most wildlife species because the dearth of understory plants and fruit- and nut-bearing hardwoods in these forests meant a lack of food supply. His third recommendation was that foresters reexamine their program of timber stand improvement to take into account wildlife habitat requirements. Too often the forester's method of timber stand improvement was to remove the very trees and shrubs that were most beneficial to wildlife: old snags, fruit and nut producers, berry bushes, and dense ground cover.[11] These three forest management practices—sizable cuttings, forest type conversion, and timber stand improvement—would be the principal points of conflict between timber and wildlife habitat management for many years to come.

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Small clearcuts were often the most effective method of improving habitat for many species of wildlife. The pond was established to provide a breeding and resting area for waterfowl, while the area around the pond was clearcut to improve habitat for deer and other animals.

Gabrielson was heartened by Forest Service pronouncements that the national forests would be managed according to the principle of multiple-use. The chief forester announced in 1935 that the agency was renewing its long-standing commitment to manage the national forests for recreation as well as timber production. Multiple-use remained fairly ill-defined in the 1930's; generally it meant that one resource (usually timber) was the dominant use in any given area but that other uses (particularly recreation) would be developed secondarily. As historian David A. Clary has pointed out, Forest Service officials reserved their enthusiasm for multiple-use for certain forests where a timber program alone could not be justified.[12] Gabrielson had no illusion that timber would not remain the dominant concern of the agency, but he was hopeful that multiple-use would alert more foresters to the possibilities of enhancing wildlife habitat through modification of forest management practices.[13]

Coordination in the 1940's and 1950's

The Forest Service demonstrated its commitment to improving coordination of wildlife and forest management by establishing a separate division of wildlife management in 1936. As noted in previous chapters, a major impetus for this change in the organization was to give wildlife managers an equal footing with rangeland managers in coordinating wildlife needs with livestock grazing use. The division's first director, Homer L. Shantz, gave more attention to the effects of livestock grazing than he did to forest management practices. Nevertheless, Shantz and his staff made some important strides in the coordination of wildlife and forest management. One of the division's accomplishments before World War II was the preparation of a *Forest Service Wildlife Manual.* An early draft of this document stated its purpose boldly:

> All forest officers are expected to treat wildlife as a product of the forests. All forest officers have an inherent interest in the resource and its opportunities. Failure to take an active part in its protection and correlated development and management is considered neglect of duty.[14]

Lloyd Swift, who succeeded Shantz as head of the division in 1944, continued his predecessor's emphasis on coordinating wildlife needs with livestock grazing use. Swift and his staff recommended modification of rangeland-use practices to benefit wildlife and fish habitat. Examples included fencing of stream bottoms and critical winter deer and elk ranges to keep out livestock, reseeding of grasses to lessen the use of shrubs by livestock, rotation grazing to allow the reproduction of streambank vegetation, development of water sources for both livestock and wildlife, and allowance for wildlife in range surveys.[15] Swift had a greater challenge in trying to coordinate wildlife with forest management.

After World War II, Swift's repeated requests for more funding for the wildlife resource were overshadowed by demands from the timber industry that the agency step up the level of timber production on the national forests to avert a timber shortage. Congress supported the timber industry, promoting a reorientation of national forest policy to accommodate higher timber production levels. The Forest Service obliged, assuring Congress that it could meet these production levels through "intensive management." Meanwhile, in its zeal

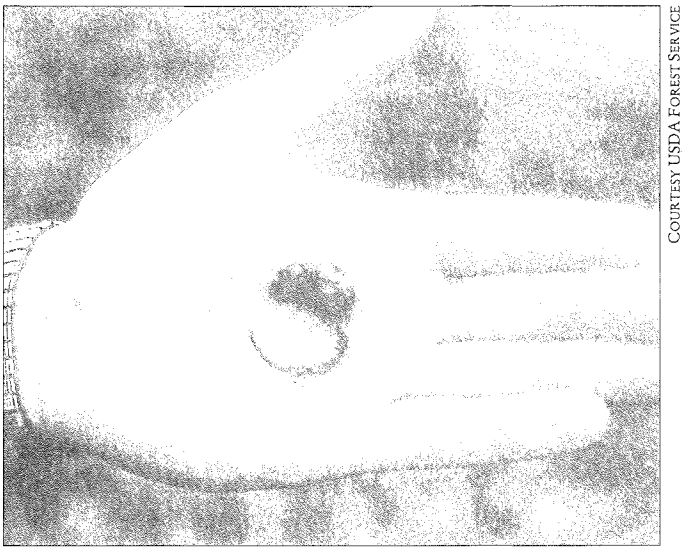
Animal Damage Management

Early animal damage management efforts included an emphasis on controlling species that caused damage to forest and rangeland resources. Although Federal programs to control such nuisance animals—or "varmints"—were originally centered in the Bureau of the Biological Survey, and later the Fish and Wildlife Service, this unglamorous activity fell within the Forest Service's purview as well for many years. Through the 1980's, each region had a specialist devoted to animal damage management. Mountain lions, wolves, and coyotes posed a threat to livestock. The Forest Service, and other Federal, State, university, and private-industry cooperaters, experimented with various methods of poisoning, trapping, and hunting to control their numbers. By the 1990's, predator control, a component of animal damage management, was consolidated under Animal Damage Control (ADC) of the USDA Animal and Plant Health Inspection Service (APHIS).

Animal damage management efforts were most pronounced in the western States, where in addition to threatening livestock nuisance animals often inhibited reforestation. A variety of control measures targeted porcupines, pocket gophers, rabbits, mountain beaver, chipmunks, deer mice, black bear, elk, and deer. Poison baits were used most commonly to control small mammal populations. Measures to control deer damage included spraying of young trees with repellants and fencing of young stands to keep deer out until the trees were above browse height. Although such efforts continue, the Forest Service has shifted emphasis to a habitat management approach to reduce animal damage.

Courtesy USDA Forest Service

Pocket gopher used in Forest Service and ADC/APHIS research project to improve baits to reduce potential impacts to non-target species on National Forests and other lands.



Courtesy USDA Forest Service

Radio transmitter developed by ADC/APHIS staff for telemetry work on bait development research on national forests in Idaho.

to reduce the national debt, Congress refused Chief Forester Lyle Watts's request that it restore funding for the Forest Service's peacetime wildlife program.[16] Indeed, in 1948, Congress eliminated the budget line item for wildlife and fish altogether, insisting that the whole wildlife program (including Swift's salary) could now be supported out of general funds.[17] Not until the end of the 1950's would the Forest Service succeed in getting larger appropriations for wildlife and fish habitat management.

Swift and others made strenuous efforts to obtain new sources of funding for wildlife and fish habitat management outside the Forest Service budget. There was, for example, a legislative proposal to set aside 10 percent of timber sale receipts for wildlife, fish, and recreation. The Forest Service rallied support among many State wildlife officials but the bill was not passed.[18] Meanwhile, Congress justified its elimination of wildlife from the Forest Service budget on the grounds that State wildlife programs were becoming more substantial and could now do the job. This argument ignored the fact that State biologists focused on regulating the hunt, leaving no one to manage the habitat. Moreover, intensive forest management only increased the need for coordination between different forest uses.

Recognizing that rangers primarily trained in forestry would be doing the wildlife job, Swift aimed to produce the kind of wildlife habitat manual that they could use. In 1951, he initiated a general revision of the *Forest Service Wildlife Manual*. He brought Ralph Hill, who was in charge of wildlife management in the Rocky Mountain Region, to Washington, D.C., to work on it. A major limitation of the *Manual*, however, was that it could not deal with the tremendous variety of forest types, timber management practices, and wildlife habitat needs that occurred from region to region.[19]

To remedy this shortcoming, Swift included a requirement in the *Manual* that each forest develop a "Limited Wildlife Management Plan." Swift's idea was that the plans would outline how wildlife needs would be coordinated with other uses on each forest.[20] But progress on the plans was slow and in many cases the forests and regions together did not have the staff to get them done.[21] In the case of the Nebraska National Forest, for example, two draft plans in a row were rejected. "They first painted the wildlife picture so brightly that it was obvious it was not realistic," Ralph Hill explained to Swift. "The second draft was the reverse, and gave wildlife little place in management of the Nebraska National Forest."[22] Eventually, the wildlife plans were subsumed in multiple-use land management plans for each forest.

Swift maintained that the plans were necessary because the job of wildlife habitat management depended to a great extent on the district ranger, who seldom had much background in wildlife biology. The agency's growing emphasis on timber production in the 1950's only increased the need. On many forests, rangers were allotted a few number of days out of the year to devote to wildlife work, and even then the apparent demands of the job reduced the amount further. On one forest, district rangers were allotted a mere 5 days for wildlife and actually worked 3 and a half. On another forest, a ranger complained to an inspector from the Washington Office, "How can I do my wildlife job when I have so much in-Service pressure to do the timber, recreation, and range jobs?" This individual had logged 1 hour of wildlife work during the entire year.[23]

From Swift's point of view, the ranger who logged 1 hour of wildlife work was missing the point. Swift and others stressed the fact that manipulation of habitat fell into two broad categories: actions that were aimed directly at increasing wildlife productivity, called "direct habitat improvements," and actions that were initiated for other purposes and were then modified to benefit wildlife, called "indirect habitat improvements" or "coordination." Swift insisted that a multiple-use program provided abundant opportunities for coordination.[24]

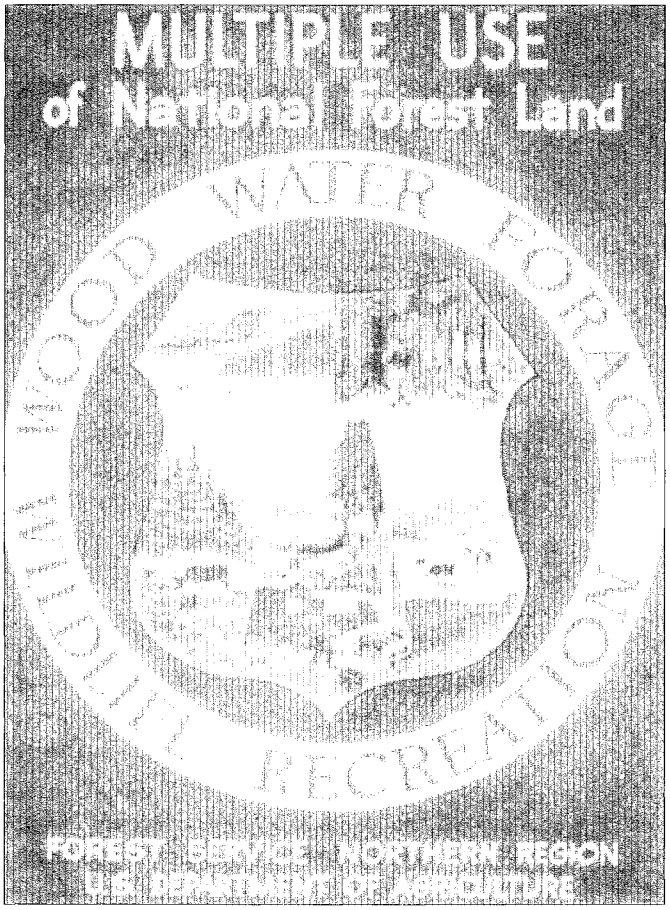
Even the stepped-up national forest timber program could be advantageous for wildlife managers, Swift believed. In the Pacific Northwest, the Forest Service used clearcutting on the national forests because Douglas-fir, the predominant forest tree in the region, regenerated more quickly in even-aged stands with abundant sunlight and logging costs were lower. "The system of clearcutting in small and staggered blocks creates a checkerboard of openings and forested areas," Swift observed. "Black-tail deer have benefited by this manipulation of the forest cover."[25] Moreover, logging roads could be converted to public use, allowing sportsmen better access to the game country and wildlife managers better control over the game harvest.

Coordination under the Multiple Use Act

The Multiple Use–Sustained Yield Act of June 12, 1960 (MUSY), declared that the national forests were to be administered for "outdoor recreation, range, timber, watershed, and wildlife and fish purposes." The law supplemented the purposes given in the Organic Act of 1897, namely, the protection of watersheds and the national timber supply. The multiple-use legislation was sought by conservationists who believed that the timber industry had grown too powerful, and it appeared to signal a greater emphasis on recreation, wildlife and fish in national forest management.[26]

The Forest Service maintained that the MUSY essentially codified what had been its administrative policy since Pinchot's time. Indeed, the law hardly affected the Forest Service's latitude to weigh one resource use against another and resolve conflicts as it saw fit. Although the act required the Forest Service to give "due consideration . . . to the relative values of the resources in the particular areas," it did not define "due consideration," leaving that for the Forest Service to determine. The Forest Service applied its own criteria for balancing multiple uses.[27]

The law's principal effect was to reinforce the Forest Service's long-standing goal of coordinating multiple uses. Forest Service Chief Richard E. McArdle stated at the Fifth World Forestry Congress in August 1960, "in most instances, forest land is not fully serving the people if used exclusively for a purpose which could also be achieved in combination with several other uses." The multiple-use doctrine was not "a panacea," McArdle noted, but it served to overcome problems of scarcity and to mediate between different interest groups.[28]



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The Forest Service reaffirmed its commitment to "multiple-use" management after passage of the Multiple Use–Sustained Yield Act of 1960. Some expected multiple-use to stimulate greater coordination of forestry and wildlife management habitat management; others believed that multiple-use only increased pressure on the Forest Service to maximize outputs of timber, range, and recreation.

Other wildlife biologists expressed their own views about the MUSY. Robert H. Giles, Jr., a wildlife biologist with the Ohio Cooperative Wildlife Research Unit, was one who welcomed the MUSY and the emphasis on interdisciplinary teams and greater coordination that it augured. "The time has come to face up to the fact that the harvest of wood, a forester's function, has greater influence on game than any active technique available to the wildlifer," Giles wrote. "In one sale a forester can destroy more habitat, kill more game, break more nests, move more animals, and influence more cover over a longer time than a game manager with today's funds can create, plant, stock, raise, or import in a decade." Realizing this fact, the biologist must provide guidance to the forester so that his own efforts would not be defeated, but in fact augmented.[29]

Other biologists, however, were less sanguine. Swift observed that the Forest Service used the Multiple Use–Sustained Yield Act to justify greater outputs of timber, livestock grazing, and recreation, placing greater pressure on wildlife and fish habitat. He was skeptical about the Forest Service's ability to meet growing resource demands in all categories on a sustained yield basis.[30] From the standpoint of managing wildlife and fish habitat, Swift noted, burgeoning use of the national forests by sport hunters and anglers was "both our joy

and despair."[31] Although it was true that the Forest Service had a responsibility under the MUSY to consider wildlife and fish equally with timber, livestock grazing, recreation, and watershed protection, the growing demand for those other resources made the wildlife job more challenging than ever before.

The multiple-use legislation afforded the Forest Service its first opportunity since the 1930's to bring more biologists into research and management. Paul Shields was among the new generation of field biologists who joined the Forest Service in this period. A student of Raymond Dasmann at Humboldt State University, he aspired to work for wildlife and the Forest Service. In 1958, he became the first field wildlife biologist hired on the Sierra National Forest in California. Within a few years, Shields recalled, the Pacific Southwest Region had about 9 biologists on 19 national forests.[32] Jack Lyon, a former State wildlife biologist who in 1962 became a research scientist in the Forest Service's Intermountain Forest and Range Experiment Station, remembered, "at the time it was sort of a status symbol to get a wildlife biologist on staff."[33] Biologists who were assigned to national forests often had to develop their own job descriptions. If they were fortunate, they worked under forest supervisors who were broad-minded and receptive to biologists' advice. Effective "team players" quickly learned how to function in an agency culture long dominated by foresters, rangeland experts, and engineers.[34]

The TSI Wars

Timber stand improvement, or TSI, had long been a part of national forest management. The goal of TSI was to improve the commercial value of a timber stand. Foresters accomplished TSI by eliminating dead or deformed trees and by thinning the stand to facilitate tree growth. Biologists, for their part, coordinated TSI with wildlife needs by identifying den trees and nut or "mast" producing hardwoods that would otherwise be marked for removal. Herman Olson, regional biologist in the Forest Service's Great Lakes Region, alerted Lloyd Swift to the difficulties of this task as early as 1948. As more funds were put into TSI under the Forest Service's plan of intensive management, the biologist faced mounting pressure to concede various types of trees that were beneficial for wildlife.[35]

TSI became controversial when it began to resemble another silvicultural practice known as forest type conversion. The goal of forest type conversion was to replace one forest type with a more commercially valuable forest type. The Forest Service had a partial precedent for forest type conversion on those eastern national forests that had come into the system as cutover lands and were planted with conifers by the Civilian Conservation Corps in the 1930's. Twenty years later, the Forest Service began to convert mixed stands of hardwood and conifer in eastern national forests solely to pine. Using TSI funds, the Forest Service began girdling, poisoning, or cutting down large numbers of hardwoods in order to release pine seedlings. The destruction of hardwoods to create commercial pine forest reached massive proportions on Kentucky's Daniel Boone National Forest in the early 1960's, provoking an outcry from sportsmen's groups and wildlife conservationists. The controversy soon stretched from Pennsylvania to Florida.[36]

Forest Service officials had to explain to a skeptical public how TSI and hardwood conversion would improve wildlife habitat as well as produce more wood fiber. In the New England and mid-Atlantic States, officials justified TSI and hardwood conversion on the grounds that they would create more deer browse and maintain the deer population at its current high level.[37] In the South, where squirrel hunting was popular, the Forest Service faced stiffer opposition. Sportsmen assumed that the destruction of hardwoods would result in fewer squirrels. Regional Forester Charles A. Connaughton stated that much of the criticism of TSI was based on hearsay; until the Forest Service had accomplished more research on this issue biologists and foresters would have to "play by ear."[38] In the meantime, biologists Herman L. Holbrook, William Zeedyk, and Donald Strode, duty stationed on three different forests, joined Connaughton in a concerted effort to articulate Forest Service actions to sportsmen's groups and State wildlife officials around the Southern Region. Looking back, these biologists came to refer to that experience as the "TSI Wars."[39] The TSI Wars marked the first instance of widespread sportsmen's opposition to the way the Forest Service was managing habitat within the forests.

The Advent of Clearcutting: Eastern and Southern Regions

Biologists on the eastern and southern national forests faced an even greater challenge as the Forest Service moved to even-aged management in the mid-1960's. Even-aged management was already the preferred method of silviculture on private forest lands in the East and South. Patch cutting, or clearcutting in solid blocks so that the trees regenerated in "even-aged" stands, was standard practice on those pine plantations where timber was grown for pulp. Even-aged management was already practiced by the Forest Service in the Pacific Northwest, too, although it had not yet reached the proportions there that would make it so controversial in the late 1960's. The introduction of even-aged management on eastern and southern national forests caused dismay because it was highly visible and affected some of the last remaining hardwood forests in the eastern United States.

Forest Service biologists had to rethink how to coordinate forestry and wildlife habitat management. According to the earlier silvicultural method of uneven-aged management, trees were selectively harvested, singly or in small groups, with a view toward maintaining a mixture of species and age classes within the forest. Uneven-aged management was thought to benefit wildlife in a number of ways. It protected streamflow and groundwater levels and maintained a diversity of shade trees and small openings that provided a good mixture of food, cover, and water on the forest floor. Forest fire suppression was thought to help wildlife because it perpetuated a good growth of underbrush. Because the Forest Service emphasized the habitat requirements of game species—deer, bear, wild turkey, and small, forest-dwelling animals such as squirrels and raccoons—it was relatively easy to maintain habitat diversity under this system. Often forest-edge species, including bobwhite quail and cottontail rabbits, were considered to be outside the Forest Service's responsibility even though these animals were sometimes found in abundance on the national forests after an area was cut or burned or adjoining lands were developed for human habitation.[40]

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Under even-aged management, changes in wildlife habitat were more dramatic. Trees were usually harvested by clearcutting. Hardwood stands managed under this system typically passed through several stages of regrowth, from grasses and weed to brush, sapling, pole, small sawtimber, and finally mature sawtimber. In an even-aged managed forest, stands of various ages and sizes would eventually be distributed throughout the forest, assuring a continuous flow of timber to the market. Foresters favored even-aged management because it increased timber output and because patch cutting represented the most efficient means of logging, both from an economic and administrative standpoint. Most trees grew faster in full sunlight than they did in the shade of other trees. As a crop, these trees reached harvestable size well before the end of their life cycle. This allowed a shorter rotation, or more frequent harvests on each acre of land, within the limits of sustained yield.

Even-aged management offered certain advantages for maintaining habitat diversity. Although an uneven-aged stand had the advantage of "vertical diversity," or multiple layers of foliage from floor to canopy, even-aged management offered the advantage of "horizontal diversity," or juxtaposition of clearings and mature forest in a given area.[41] Even-aged management provided more forest edge. Despite efforts to accomplish the same thing under uneven-aged management by group selection cuttings, these treatments were

never on a scale large enough to favor some wildlife species such as turkey, grouse, and warblers. Without large areas of new forest growth, wildlife species that were adapted to the early successional stage of a forest would eventually be displaced. Even-aged management, it seemed, would ensure a variety of age classes and successional stages in the forest at all times.[42]

Even-aged management, or EAM, presented biologists with more opportunity to influence forest planning. Foresters and biologists could arrange the size, shape, and distribution of even-aged stands to provide for the habitat requirements of whole ecological communities. As William Zeedyk explained:

> Before the Forest Service went to EAM, I spent too many hours pleading, "Please spare this tree, we need it for the deer and squirrels." At the same time the forester was saying, "Get rid of the deer, they're eating my seedlings!" Thank God for EAM! It has made us, foresters and game biologists, think about the forest, not individual trees.[43]

Coordinating timber management and wildlife needs on an unprecedented scale, biologists were now able to consider the habitat preferences of several wildlife species at a time.

Forest Service biologists in the Eastern Region were the first to develop a systematic approach for integrating wildlife and fish habitat with timber management planning. Robert Radtke, appointed regional biologist in 1965, led this effort. Each national forest was divided into "compartments" that conformed more or less to watershed boundaries. Each compartment was in turn divided into blocks of harvestable timber. The blocks were distributed so that a mosaic of age classes would be created over time. The goal was to develop a variety of successional stages of forest growth in each compartment so that a diversity of wildlife species would be protected. The Forest Service cooperated with the Missouri Department of Conservation in developing the first comprehensive wildlife habitat management plan for the Mark Twain National Forest in 1974. The plan featured a Habitat Diversity Index to measure habitat quality and quantity throughout the forests.[44] Biologists viewed the plan as an advancement on the older techniques of managing habitat for single species.

Featured Species Management

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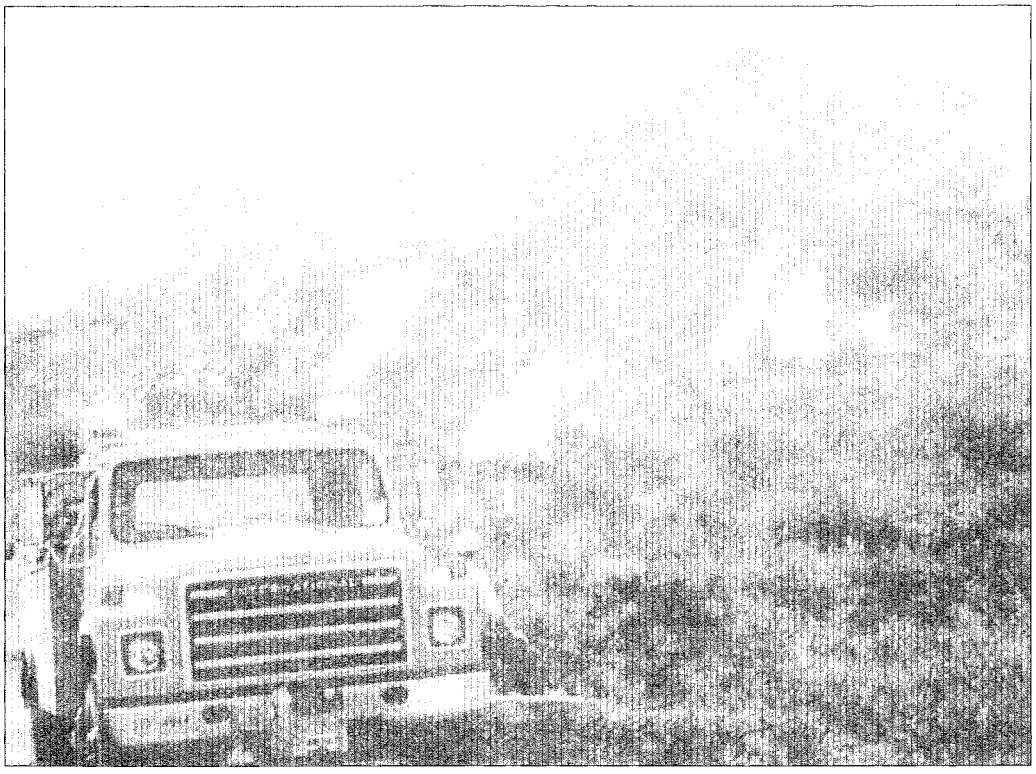
In the Southern Region, meanwhile, biologists Herman L. Holbrook and William Zeedyk proposed another system for the coordination of wildlife habitat and even-aged forest management. They called it "featured species management." According to this system, one wildlife species was selected for each timber management unit and silvicultural treatments were selected or modified based on the habitat requirements of that species. A featured species would influence the size, shape and distribution of even-aged stands, the length of rotation, the making of intermediate cuts, and the use of prescribed fire. Featured species management was based on the theory that groupings of wildlife species shared similar habitat needs. If managers selected the red-cockaded woodpecker as the featured species in a compartment containing open, mature longleaf pine forest, for example, then management decisions would tend to favor other piney-woods cavity-users as well, such as blue birds, crested fly catchers, nuthatches, tufted titmice, screech owls, other woodpeckers, and flying squirrels. By featuring different species in various timber management units, there would be a diversity of wildlife throughout the national forest.[45]

PRESCRIBED BURNING

Until recently, wildlife biologists in the Forest Service worked in an organizational culture that held a very dim view of fire as a management tool. The Forest Service's diligence in suppressing wildfire dated back to the great fires of 1910 and the Weeks Act of 1911, which laid the basis for Federal-State cooperation in forest fire protection. The agency's leadership in this area continued with the 10 a.m. policy of the 1930's, the aerial assault on wildfires in the postwar era, and the Smokey Bear campaign of public education. Intent on minimizing timber losses to fire, the Forest Service had little use for prescribed burning to improve wildlife habitat.

Gradually the policy and organizational culture of the Forest Service changed to accommodate fire as a management tool. Wildlife biologists and foresters recognized that fire was an essential component of forest ecology. By the 1960's, forest managers in the Southern Region authorized prescribed burning to improve habitat for bobwhite quail, wild turkey, and other game, and in the same decade, managers reintroduced fire on the Huron National Forest in Michigan for the benefit of the endangered Kirtland's warbler. Forest managers in the semi-arid West resisted the use of fire longer, but a change in philosophy was evident by the 1970's.



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Under featured species management, biologists worked closely with foresters to develop a set of silvicultural treatments, or "prescriptions," appropriate for the featured species. If wild turkey were featured in a unit of longleaf pine forest, for example, the prescription for fire might call for low-intensity burns on a cycle of 3 to 5 years in order to develop a relatively open understory with an abundance of fruit, forage, and insects. If quail were featured on an adjoining unit of longleaf pine forest, the prescription for fire might call for moderate-intensity burns on a 2-year cycle in order to provide nesting sites and an abundance of legumes, grass, and weed seeds. Similarly, prescriptions would vary for length of rotation, size of clearcuts, and other timber management options.[46]

Featured species management also served as a guide for direct habitat improvements. Biologists would identify the limiting factor in the environment for the featured species and recommend habitat improvements that would increase production of that species. The system helped wildlife managers to avoid treatments that were counterproductive or ineffective. As southern regional biologist Malcolm Edwards observed, direct habitat improvements were "practical only when providing an essential need in an otherwise balanced habitat."[47] If an area had insufficient water sources to support more quail, it did not do any good to increase the quail's food supply.

Southern regional biologist Herman Holbrook emphasized that the featured species system did not imply "dominant use." Featured species management was a response to the Forest Service's program of multiple-use. It implied a coordination of timber and wildlife considerations, and it was used to develop nonconflicting guidelines for the management of both resources simultaneously. Nor did the system imply "single species management." The system took into account other species that occupied the same environment. "Management to benefit the featured species," Holbrook stressed, "does not preclude use by other species, and is often beneficial to them."[48]

Holbrook and Zeedyk recognized that the featured species system had weaknesses. Biologists did not know enough about the habitat needs of familiar species such as wild turkey and white-tailed deer, much less an uncommon species like the red-cockaded woodpecker. Nor were the effects of even-aged management on forest ecology well understood. Forest Service research stations and other institutions had begun investigating these issues in the 1950's, but to obtain good results took time. Holbrook and Zeedyk saw featured species management as a stopgap solution pending more definitive research. They did not balk from rushing the new concept into service, however, pointing out that in natural resource management "there is no such thing as a no-action alternative."[49] They introduced the concept and its applications in a new handbook for the Southern Region, and pushed this document through a rigorous review by Forest Service researchers, southern State fish and game commissions, the Fish and Wildlife Service, and various university wildlife management programs. With the release of the *Wildlife Habitat Management Handbook* in 1971, featured species management became official policy on the southern national forests.[50]

Wildlife managers found featured species management to be a useful tool, but it was not the equalizer in coordinating timber and wildlife values that they had been seeking. The system could be manipulated to support the timber program. Although wildlife managers wanted to feature a variety of game and nongame species, incessant pressure to "get out the cut" led inexorably to a heavy emphasis on the production of deer and saw timber. Moreover, foresters sometimes pressured biologists to select new featured species when forest conditions changed. Because featured species management was based on linking wildlife habitat requirements to the whole cycle of forest succession, this practice corrupted the system.[51]

Storm over the Bitterroot

In the West, initial opposition to the Forest Service's stepped-up timber program came from wilderness groups such as the Sierra Club. Preservationists decried the practice of clearcutting on the western national forests. Initially they objected to clearcuts on aesthetic grounds. One great advantage of selective cutting, or uneven-aged management, was that the forest never changed very much to the untrained eye. Clearcutting, by contrast, spawned scenes of forest devastation. During the 1950's and early 1960's, the Forest Service managed to minimize public opposition to clearcuts by locating clearcuts in remote drainages away from the public eye. By the late 1960's, however, clearcuts on the national forests were fast becoming more prevalent and obvious.

Clearcutting first became a major public issue in western Montana, where the Forest Service permitted this practice on the slopes of the Bitterroot Mountains in full view of the populous Bitterroot Valley. Local residents were disheartened by the sight of clearcuts strewn with slash, waste material bulldozed into huge windrows or piled at the edge of roads, and masses of soil washed downslope. The Forest Service introduced "terracing" on the Bitterroot National Forest to reduce soil erosion and aid in reforestation, but the practice only deepened public suspicion that the agency was permitting clearcuts on too steep of terrain. Critics charged that logging of old growth timber on the slopes of the Bitterroot Mountains was not timber *management* but timber *mining*.[52] "The Forest Service is extracting a resource in a way that essentially destroys the resource," the Sierra Club's Brock Evans asserted.[53]

Faced with mounting public criticism, Regional Forester Neal M. Rahm and Joseph F. Pechanec, Director of the Intermountain Forest and Range Experiment Station, appointed a task force to conduct a comprehensive review of the multiple-use program on the Bitterroot National Forest. Local residents, however, complained that it would be a whitewash. Without waiting for the Forest Service's internal review, Senator Lee Metcalf of Montana suggested that a team of University of Montana professors conduct a separate study. At Metcalf's urging, Dr. Arnold Bolle of the School of Forestry assembled a study team.[54] The university report followed the Forest Service report and took a decidedly more critical stand toward the existing program. "Multiple-use management," it began, "does not exist as the governing principle on the Bitterroot National Forest." Consideration of outdoor recreation, livestock grazing, watershed protection, wildlife, and fish appeared as "afterthoughts," while timber harvesting on the Bitterroot National Forest exceeded sustained yield limits. Specifically, the authors called for an end to the controversial practice of terracing and the dedication of existing terraces to research.[55]

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Terraces in a clearcut on the Bitterroot National Forest. As clearcutting moved into steep terrain on the western forests, it aroused public concern.

The Bitterroot controversy soon acquired national significance. Senator Metcalf requested publication of the university report as a Senate document in December of 1970. The Sierra Club published a new "battlebook," *Clearcut: The Deforestation of America,* almost wholly concerned with Forest Service policy, the following year.[56] Organizations including the Sierra Club proposed a 2-year moratorium on clearcutting on all public lands pending more research findings, and Senator Frank Church of Idaho held subcommittee hearings on the issue from April to September 1971. Although the report by Church's subcommittee stopped short of supporting a moratorium, it proposed a set of guidelines for the Forest Service to put into practice. One such guideline was a 40-acre maximum size for clearcuts.[57]

Research biologists contributed to the debate as soon as their preliminary findings would allow. W. L. Pengelly, a professor of wildlife biology at the University of Montana and one of the authors of the Bitterroot report, was among the first to enter the fray. Pengelly argued that clearcuts on steep slopes and at high elevations had negative consequences for

wildlife that might outweigh the benefit of increased food supply and edge effect. Snow accumulations were heavier in clearcuts than in adjacent areas. Consequently, removal of the tree canopy at higher elevations could produce more summer forage while actually reducing the amount of forage available to deer and elk in spring or fall.[58]

Road construction on steep slopes posed another threat to wildlife, Pengelly found. The roads could form barriers to wildlife, with steep cutbanks on the uphill side and impenetrable mounds of debris on the downhill side. Clearcuts in mountainous terrain could reduce soil moisture as increased wind velocity dried out the site and increased sunlight resulted in earlier spring melting of the snowpack. Pengelly's research in the Coeur d'Alene National Forest of Idaho suggested that forage production in clearcuts was directly proportional to soil-moisture content. On drier sites, stands of timber probably had far more value as cover than they did for potential forage following logging.[59]

Elsewhere in the Pacific Northwest, clearcutting had its defenders in the wildlife profession. Edward F. Hooven, professor of wildlife ecology at Oregon State University, focused on the response of small mammal populations to successional changes after clear-cutting. Despite the study's narrow focus, Hooven offered a "wildlife brief" in support of clearcutting in Douglas-fir forests of the Pacific Northwest. His research indicated that big game populations as well as many small mammal populations increased a few years after sites had been clearcut and burned. Effects on birds and fish were less easily detected. Hooven recommended that staggered clearcuts of 30 to 60 acres would constitute a sound practice for harvesting Douglas-fir forests in western Oregon.[60]

Pengelly and Hooven could draw such different conclusions because the effects of clearcuts were so difficult to quantify and generalize. Perhaps the most influential study of wildlife responses to clearcutting at this time was that of Jay S. Gashwiler on the H.J. Andrews Experimental Forest in the Cascades of central Oregon. Gashwiler's study tracked small-mammal populations on a clearcut area and a control area of old growth forest from 1954 to 1965. On the clearcut area, some small mammals increased while others disappeared or persisted only in small numbers. During the 11-year study, population fluctuations were much greater in the clearcut area than in the control area of old growth forest. Gashwiler's study provided useful data on coniferous seed consumption by small mammals and birds, but as a guide to the effects of clearcutting on animal populations it presented an inconclusive picture.[61]

Other research focused on single species over a wider area. In 1970, State and Federal wildlife officials initiated a comprehensive study of elk-logging relationships in western Montana. This study called attention to the impact of logging roads on elk habitat. Wildlife biologists had previously taken the view that logging-road development was good for elk management because it provided more hunter access and more effective control over the hunter harvest. Declining populations of deer and elk in the 1960's forced wildlife managers to reconsider. Years before it completed its final report, *Coordinating Elk and Timber Management* (1985), the elk-logging study offered preliminary findings and management recommendations. Most notably, the study team found that elk were avoiding areas of heavy road development even when those areas contained good forage.[62]

The study found that roads were a key element in declining elk numbers. The location of roads, the manner of construction, the times of day they were used, the timing of public closures: these were the crucial factors. In its final report, the interagency research committee made 11 recommendations relating to road design and management. The committee's findings stirred some unusual cross-currents within the Forest Service. Instead of arguing with foresters about the size and distribution of clearcuts, wildlifers addressed the engineers in the outfit. It was a challenge to convince the engineering division, the largest division in the Northern Region, that lighter, temporary roads were more desirable than roads that were built to last.[63]

The Montana elk-logging study was notable for the fact that research and management worked together in an iterative process over the course of a decade. The committee made preliminary recommendations in 1974 and completed the study in 1985. Land managers implemented many of the committee's early recommendations, and the research team, headed by L. Jack Lyon of the Intermountain Forest and Range Experiment Station, modified many of its recommendations based on management experience. Most of the recommendations were directed at providing elk with more security.[64] Indeed, this was a theme that ran through most of the research on clearcutting and wildlife habitat in the 1970's: loss of cover associated with clearcutting had more serious consequences for many kinds of wildlife than had been thought previously.

The Montana elk-logging study focused on the food and cover requirements of a single species. In this respect it belonged to an older tradition in wildlife research and management that aimed at increasing or decreasing the productivity of one species—generally a game or predator species—by gaining a better understanding of its biology. Herbert Stoddard's *The Bobwhite Quail: Its Habits, Preservation and Increase* (1931) was a pioneering work in this genre; other influential studies included Stanley P. Young and Edward A. Goldman's *Wolves of North America* (1944) and *The Puma: Mysterious American Cat* (1946), R.J. Wheeler, Jr., *The Wild Turkey in Alabama* (1948), Olaus Murie, *Elk of North America* (1951), W.D. Taber and R.P. Dasmann, *Black-tailed Deer of the Chaparral* (1958), and the multi-authored *Elk of North America: Ecology and Management* (1982), edited by J.W. Thomas and D.E. Toweill, Jr. These kinds of works were valuable to land managers as far as they went, but as wildlife values broadened in the 1960's and 1970's to include nongame and endangered species, their focus seemed increasingly narrow.

Land managers needed information on the habitat requirements of a broad spectrum of wildlife. The western national forests still had insufficient guidelines to compare with certain eastern national forests' system of managing for habitat diversity or southern national forests' system of featured species management.[65]

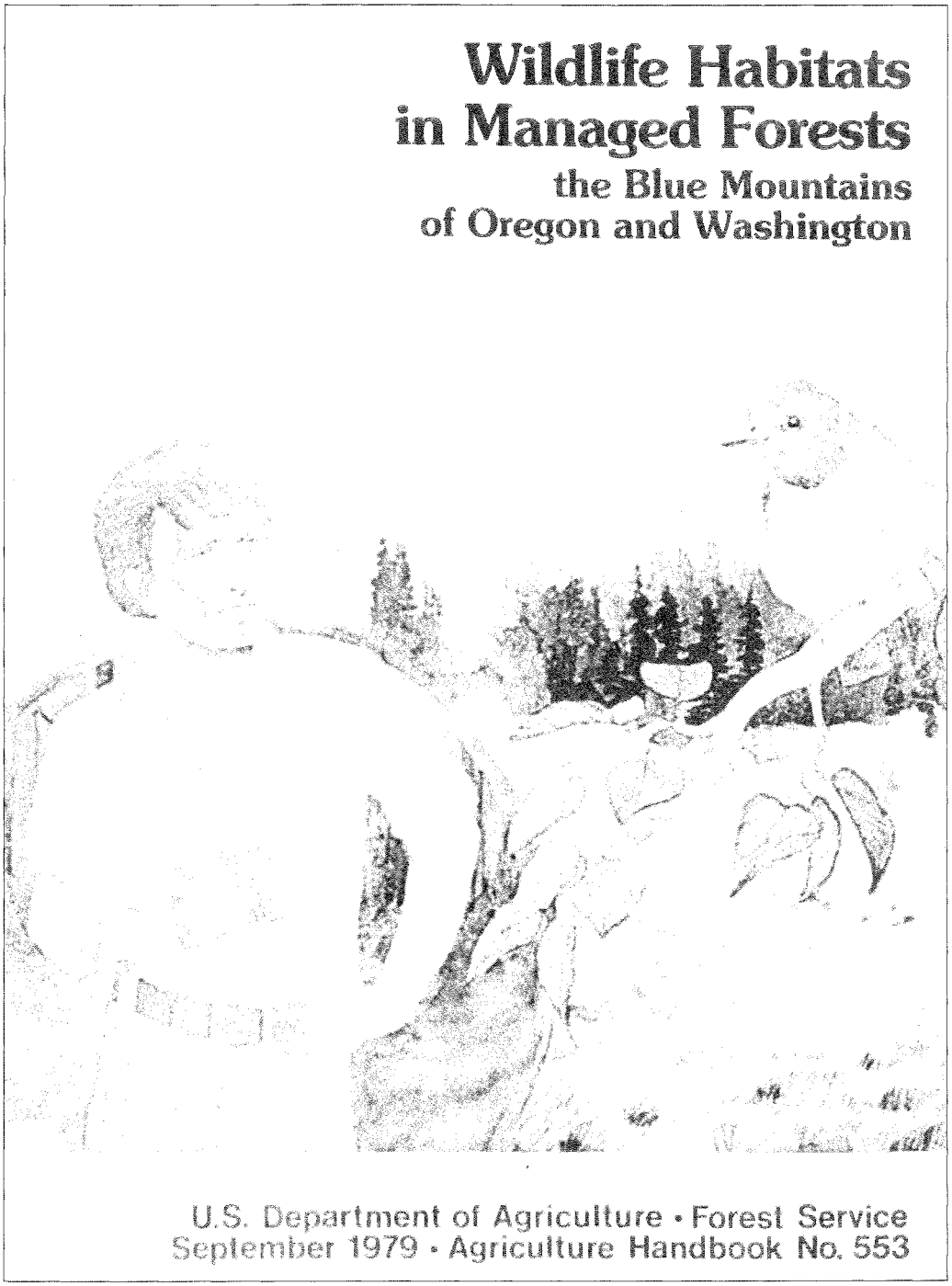
The Blue Mountains Study

The answer was found in an imaginative set of guidelines prepared by the Forest Service's Pacific Northwest Forest and Range Experiment Station in LaGrande, Oregon, for a timber salvage operation in the Blue Mountains. The authors of the guidelines had no intention of producing a seminal work, but the original mimeograph report attracted so much interest that it led to a more comprehensive study.[66] The final result, *Wildlife Habitats in Managed Forests: The Blue Mountains of Oregon and Washington* (1979), was one of the most influential documents in the history of the Forest Service's wildlife program.

The Blue Mountains Study began without fanfare in 1974. The supervisors of the Wallowa-Whitman and Umatilla National Forests of eastern Oregon and Washington requested input from biologists as they prepared to mount a large timber-salvage operation involving standing, green, Douglas-fir forest that had been damaged by the tussock moth. An interagency team composed of foresters and biologists from the Forest Service, the Oregon Department of Fish and Wildlife, and the Washington Department of Game prepared a set of guidelines. For the many Forest Service biologists who had been hired during the past decade and a half, the Blue Mountains Study presented a golden opportunity to influence timber management. Despite the guidelines' specific orientation to the salvage operation, the document broke new ground in the way it integrated silvicultural options and wildlife-habitat relationships.[67]

Impressed with what the team had achieved, the forest supervisors recommended the preparation of a broader set of guidelines that could be used in all types of forest management planning in the Blue Mountains.[68] They wanted a state-of-knowledge review of wildlife-habitat relationships in the Blue Mountains. This large, interdisciplinary effort was to combine forestry and wildlife biology on an unprecedented scale. Jack Ward Thomas, principal wildlife research biologist at the Forest and Range Experiment Station at LaGrande, Oregon, recognized that this was a chance to produce a truly ground-breaking document, and he brought people into the project who were among the best in their fields. Thomas drew on his own experience with game management in Texas, his involvement with nongame issues in the Northeast, and his knowledge of featured species management in the Southeast. The study attracted so much attention that the original mimeograph report on the timber-salvage operation soon spread via photocopy machine throughout the National Forest System.[69]

A major purpose of the book, growing out of the report, was to provide *biologists* with a primer on silvicultural practices as they affected wildlife management. In this respect, it differed from earlier wildlife manuals that aimed at educating *foresters* about principles of wildlife management. Many biologists in the Forest Service lacked basic schooling in silviculture and needed to know how to speak the foresters' language. Where the biologist talked about plant communities, the forester referred to site types. Where the biologist talked about succession, the forester spoke of stands. The Blue Mountains Study laid the foundation for a more sophisticated interdisciplinary approach to management.[70]



The Blue Mountains Study was one of the most influential documents in the history of the Forest Service's wildlife program. It provided foresters and wildlife biologists with a common language for managing habitat. It broke new ground by integrating silvicultural options with wildlife-habitat relationships.

Although it was a collaboration of 16 authors and many more consultants, the study bore the imprint of Thomas's philosophy. He believed that the Government's biologists and scientists had an obligation to use the tools at their disposal. He had little patience for those who insisted on more data before advising one way or another on some action. That attitude had no place in a land management agency. Scientific understanding, like technology and nature itself, was inherently unstable. The only constant was change. In Thomas's view, the Government scientist must be willing to advise the land manager based on the best information available at the time, then move on.[71] Thomas expressed his philosophy succinctly in the introduction to *Wildlife Habitats in Managed Forests*: "Some will say it is too soon to undertake such a task, but there are really only two choices—too soon or too late. Of these, the first is far preferable."[72]

In addition to its activist philosophical premise, the Blue Mountains Study started with another basic assumption. On the national forests in the Blue Mountains—and on national forests generally—timber management was the dominant land management activity. Consequently, silvicultural practices had more significant effects on wildlife habitat than anything the wildlife manager could do directly. Timber management was well financed, affected large acreages, profoundly affected wildlife habitat, and had a great impact on wildlife. By contrast, wildlife habitat improvement had little financing, and affected few acres. The long-standing idea that the wildlife job should piggyback on forestry had never been expressed as boldly. Thomas believed that scientific advances made the coordination of timber and wildlife management more and more feasible.[73]

But the real power of the Blue Mountains Study could be found in its innovative organization of technical information in such a way that biologists and foresters could use it in common. The text consisted of 10 chapters that presented highly readable synopses of the latest research on every kind of habitat from riparian zones to caves. Compared with past wildlife management handbooks, these discussions were less prescriptive than reflective, each one ending fairly benignly with a section on "management considerations" or "management tips." After the text, hundreds of unique wildlife-habitat relationships were charted in 29 appendixes. Wildlife-habitat relationships were depicted in matrixes, with animal species listed along one axis and habitat characteristics along the other. The appendixes were presented in a format that could be readily converted for computer manipulation. The purpose was to enable biologists to model the effects of any silvicultural treatment on nearly all of the 378 wildlife species found in the Blue Mountains. Or to use the information another way, biologists could take nearly any wildlife species in the forest and determine how management affected it. Used in conjunction with requirements under the National Environmental Policy Act and the Endangered Species Act, the data lent a precision to wildlife habitat management that could potentially make biologists much more influential in planning and management.

Wildlife Habitats in Managed Forests provided the Forest Service with a new paradigm for wildlife management on the national forests. Reflecting back on the study nearly 20 years later, Jack Ward Thomas said that the team used only "common sense and science" to prepare the book, yet the book "set off a revolution." In Washington, D.C., the wildlife staff trumpeted the importance of the work for biologists and foresters alike. There was a presentation at the Cosmos Club in the capital city, and copies of the study were sent to more than 30 foreign nations.[74]

Even before its completion, the Blue Mountains Study spawned similar studies of wildlife-habitat relationships in other managed forests using the same general format. One of the first to appear was *California Wildlife and their Habitats: Western Sierra Nevada* by J. Verner and A.S. Boss, in 1980. Another was *Management of Wildlife and Fish Habitats in Forests of Western Oregon and Washington*, compiled by E. Reed Brown and published in 1985. Still another was *New England Wildlife: Management of Forested Habitats*, by Richard M. DeGraaf, Mariko Yamasaki, William B. Leak, and John W. Lanier, published in 1992. A more recent example was *Land Manager's Guide to the Birds of the South*, edited by Paul B. Hamel and produced by The Nature Conservancy in cooperation with the Forest Service. Not only were these handbooks valuable for land managers, but they also tended to focus researchers on gaps and discrepancies in the data. As each study came out, it served as a lightning rod for attracting further information, leading to refinement of the data.[75] The studies circulated inside and outside the Forest Service, generated comment and peer review, and were quickly devoured by wildlife biologists who were tasked to construct new computerized data base systems. As one such biologist noted, "If you do not want your information used, then it better not be written down. Once on paper it will get used even if it is just a WAG (Wild A** Guess)."[76]

The Move Toward Computerized Systems

Rapid advances in computer technology in the early 1980's reinforced the trend toward more complex wildlife management systems based on analysis of wildlife-habitat relationships. A relational data base in the form of a matrix printed in an appendix or wall chart was an unwieldy analytical tool. Once entered into a computer, however, it could be queried using almost any number of combinations of variables. By the end of the decade, there were software packages available that could manage relational data bases with up to 80 relations, or matrixes. Altogether, the matrixes could include as many as 800 attributes, or columns, and tens of thousands of rows for data. Computer technology afforded wildlife managers impressive new opportunities to model the effects of land management actions on wildlife abundance and diversity.[77] Suddenly, wildlife managers and research scientists who had gone to school with slide rules were developing state-of-the-art data base systems for habitat modeling.

David R. Patton, project leader at the Rocky Mountain Forest and Range Experiment Station in Tempe, Arizona, in cooperation with the Southwest Region, introduced one of the first computerized data base systems, called "Run Wild," in the late 1970's. The purpose of Run Wild was to develop a habitat classification system for grouping animal species with similar feeding and breeding requirements. Patton hoped that Run Wild would enable land managers to develop simple habitat models for testing proposed land-use actions.[78] Soon after Run Wild's debut, the Rocky Mountain Region produced a data base system known as

HABCAP. This system was specifically designed for modeling "habitat capabilities" under alternative silvicultural treatments or related land-use actions. HABCAP initially used data from the Colorado Fish and Game Department. The Fish and Wildlife Service and the Bureau of Land Management each produced their own wildlife-habitat data bases in the late 1970's.[79] All of these efforts sought to organize data in a unified system. The power of each system was that relations could be added, deleted, combined, or linked, enabling the system user to model probable outcomes of any number of complex land management actions.[80]

The computerized data bases had limitations, particularly as they were first getting off the ground. The computer could assist but never replace the biologist's professional judgment in each particular land management decision. HABCAP was used to model effects on wildlife habitat of various alternative treatments on a timber sale unit. The user would enter the acreages and age classes of tree species present in the unit together with a selection of early and late successional animal species. HABCAP would calculate habitat values for food and cover for each species. The user would then enter various amounts and distributions of cut. For each scenario, HABCAP would project increases or decreases in the numbers of each wildlife species.[81] A staff member on the Bighorn National Forest in Wyoming tested how much lodgepole pine could be cut before HABCAP would show a decline in elk numbers. In HABCAP's optimum scenario for elk, this skeptical staffer learned, hardly a tree was left standing. Perhaps the fault lay in the fact that the program assumed an even distribution of water and did not distinguish between hiding cover and thermal cover; in the Bighorn Mountains of Wyoming, wet meadows at elevations of around 9,000 feet were known to be highly productive summer range for elk, but cutting down lodgepole pine did not necessarily create wet meadows. Or perhaps the problem lay deeper; one Forest Service researcher claimed that with HABCAP the "underlying assumption is that anything that kills a tree can't be bad for elk."[82] Doubters pointed out that each coefficient entered into a data base system contained a margin of error, and as the calculations became more involved the margin of error accumulated. Some wildlife biologists concluded that problems such as these could be worked out through a process of refinement; others insisted that certain data base systems had to be replaced altogether. HABCAP demonstrated a utility but it also showed the need for continued technical and professional oversight.

The older generation of wildlife and fisheries biologists expressed another concern about the use of computer modeling: it tended to keep the biologist out of the field. Assisted by computer models, a biologist could advise a forester on a timber sale without even making a site visit and exercising his or her intuitive judgment. For some, this was "science without art." With computer technology increasingly circumscribing the biologist's workplace, the biologist was at risk of losing a direct connection to the land. If computers gave wildlife and fish habitat managers an ability to analyze and manipulate data on a much larger scale than before, overdependence on computers could magnify mistakes as well. "As the ratio of computer console time to field time increases," one professor of wildlife ecology cautioned, "the probability that the scientist or manager will make false assumptions also increases."[83] To counteract these tendencies, the biologist had to exercise much judgment in applying

computerized formulations. The biologist's experience and intuition were a vital check on gross errors.

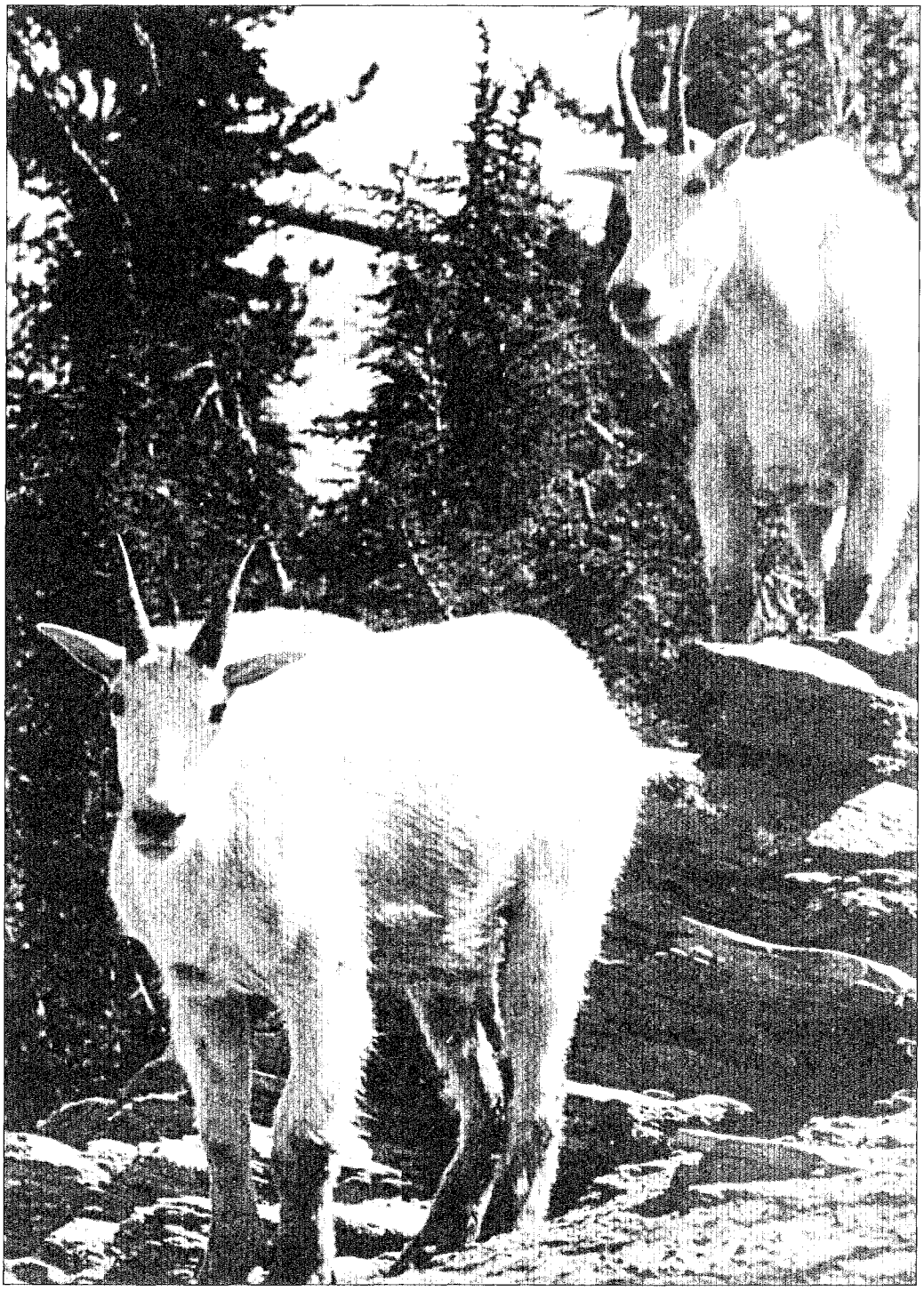
Many wildlife professionals overcame their trepidations, however, and embraced the challenge and opportunity that appeared to accompany this move toward computerized systems. The modeling techniques were continually improving—growing more sophisticated and becoming easier to use. Given the rapid pace of technological advance in the computer industry, their future role could not be predicted. As wildlife managers sought to make land management decisions sensitive to hundreds of animal species in hundreds of different habitat types, however, it was increasingly apparent that computerization was essential.

Coordination Through Planning

The development of computerized systems for storing and manipulating wildlife habitat data could not have been more timely from the Forest Service's point of view. Crucial legislation in the mid-1970's was moving the agency toward a more interdisciplinary and holistic kind of land-use planning. The Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA), as amended by the National Forest Management Act of 1976 (NFMA), raised land-use planning to a new level of complexity. Under these acts, Congress required the Forest Service to develop comprehensive land and resource management plans for each national forest. Moreover, NFMA mandated that a fundamental principle of national forest management was to maintain biological diversity. Indeed, in that regard NFMA gave the Forest Service perhaps the most sweeping charge of any Federal land managing agency up to that time.[84]

Biological diversity was not clearly defined in the law. The NFMA stated that the Forest Service was to "provide for diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives."[85] Given this important new mandate to conserve biological diversity, the Forest Service approached the task of implementing regulations with great deliberation. Congress appointed a Committee of Scientists to assist. Certainly these regulations were the most important yet developed by the agency. In the key section pertaining to management of wildlife and fish, biological diversity was defined as the "distribution and abundance of different plant and animal communities and species within the area covered by a land and resource management plan." The section went on to clarify how the Forest Service was to maintain biological diversity. "Viable populations" were to be the gauge of its compliance:

> Fish and wildlife habitat shall be managed to maintain viable populations of native and desired nonnative vertebrates in the planning area. For planning purposes a viable population shall be considered to have the estimated numbers and distribution of reproductive individuals to insure continued existence is well-distributed throughout the planning area.[86]



COURTESY USDA FOREST SERVICE

Animals with high public interest, such as these mountain goats, were assured specific consideration in national forest management after 1979. Forest Service regulations required that all habitat "shall be managed to maintain viable populations of native and desired nonnative vertebrates in the planning area."

Over the next two decades, this policy statement would prove to be the most significant for wildlife and fish of any ever made by the Forest Service. Significantly, the concept of species *diversity* was written into the law, but the concept of species *viability* appeared only in the regulations.[87]

This landmark regulation, codified as 36 CFR 219, contained two large assumptions. First, the regulation assumed that the maintenance of "viable populations" would tend to protect natural ecological processes. "There is a fundamental assumption," Wildlife Director Robert D. Nelson commented, "that if all the species' populations are viable then all the ecological communities and processes will be free to occur and function in response to prevailing natural forces."[88] The second assumption followed from the first. The NFMA regulation required the Forest Service to select "management indicator species" in each planning unit. The system assumed that the viability of one species—generally a species that was highly susceptible to human activities—would tend to indicate an environment capable of sustaining viable populations of other species with similar habitat needs. Steps taken to protect a management indicator species would form a kind of umbrella over other species as well. Use of the management indicator species greatly reduced the amount of survey and research required to meet the overall goal of maintaining biological diversity. Nelson referred to it as a "simplifying assumption," which was "dictated by technology and logistics."[89]

The regulations for NFMA were promulgated in 1979, capping a decade of important environmental legislation that required more and more input by wildlife biologists in forest management and planning. These included the National Environmental Policy Act of 1969, the Endangered Species Act of 1973, the Forest and Rangeland Renewable Resources Planning Act of 1974, and the Sikes Act of 1974. This spurt of environmental legislation and the planning requirements that it entailed caused the Forest Service to bring many more wildlife biologists into its ranks. In 1973, the agency employed 143 wildlife and fisheries biologists; a decade later it had 662. Flush with biologists in the early 1980's, the Forest Service recognized that it was an auspicious time to integrate wildlife habitat needs more fully into forest management.[90]

Work began on the new generation of forest plans in the late 1970's. The handful of wildlife habitat handbooks, data bases, and computer software programs that began to appear in the late 1970's and early 1980's helped with the planning process mandated by NFMA. Many forests and regions had to work without such resources, however. The complexities involved in coordinated planning on such a large scale were almost insurmountable with the tools at hand. Larry Hedrick was a staff wildlife biologist who worked on the plan for the national forests in Alabama. As Hedrick recalled, the challenge of developing new forest plans to NFMA's specifications was "like building a bridge to the moon without a blueprint."[91]

Wildlife officials decided that there must be a nationally directed effort to provide studies analogous to the Blue Mountains Study for every forest and region in the national forest system. It would be called the Wildlife and Fish Habitat Relationships (WFHR) Program. A program steering committee convened in Portland in March 1982. The committee found an urgent need for the Forest Service to explore the key concepts embodied in the NFMA regulations—viable populations and management indicator species—and to develop the relevant data and models for use by planning teams. Research wildlife biologist Michael Lennartz of the Southeastern Forest Experiment Station described the data currently in use as largely "synthetic and unvalidated, having been developed from a voluminous but deficient literature."[92] To remedy this shortfall, the WFHR Program would organize such pioneering studies as Jack Ward Thomas's *Wildlife Habitats in Managed Forests*, David R. Patton's Run Wild, Herman Holbrook's Featured Species Management, and Robert Radtke's work on forest diversity, and it would integrate wildlife and fish population and habitat inventories with wildlife-habitat relationships models. It would develop uniform habitat evaluation procedures and a nationwide research and monitoring program to test its applications.[93]

COURTESY USDA FOREST SERVICE

The Forest Service's Wildlife and Fish Habitat Relationships Program started with the gathering of baseline data.

After the Portland meeting, it was clear that the Forest Service's wildlife staff was not entirely satisfied with the NFMA regulations. One of the major areas of research would be to test the hypothesis that wildlife species could be aggregated into groups, or "guilds," that had very similar habitat needs, and its corollary that management indicator species could be selected to represent these groupings.[94] The concept of indicator species had been in use for several decades, first by agronomists and later by rangeland managers. But in agronomy and rangeland management, "ecological indicators" were normally plant species that were so closely associated with an environmental factor that the presence of the species would indicate the presence or absence of the factor. The mobility of animals, as opposed to plants, made the concept of a faunal indicator species more problematic. Use of wildlife species as "management indicator species" was an innovation proposed by the Committee of Scientists. The NFMA regulations thrust management out in front of scientific research on this issue.[95]

The Forest Service also needed to develop guidelines for determining viable populations. Managers had to consider population viability on two levels. First, managers needed to conserve an estimated minimum number of separate populations across a whole forest so that the loss of one population or another would not endanger the whole population range throughout the forest. Second, managers needed to ensure a number of breeding individuals in each population in order to preserve its genetic diversity. Both levels of viability had to be approached as problems of probability or risk assessment. It was impossible to have 100 percent probability of long-term success for any animal population, so determining viable populations had to take into account costs of research and monitoring for that species. As Wildlife Director Nelson stated in 1987, the whole issue of viable populations was "one of the hottest questions in conservation biology."[96]

In practice, the Forest Service found that the strategy for maintaining viable populations worked most effectively with endangered and "sensitive" species, or those species whose habitat needs were especially vulnerable to competing forest uses. When these species represented a constraint on other resource uses the phrase "minimum viable population" was often used to permit maximum flexibility for commodity production. Selection of so-called "ecological indicator species" was generally viewed as scientifically suspect. Sometimes the Forest Service selected game species or nongame species of special interest (so-called "demand" species) as management indicator species as well, provided that the variety of other wildlife was assured.[97]

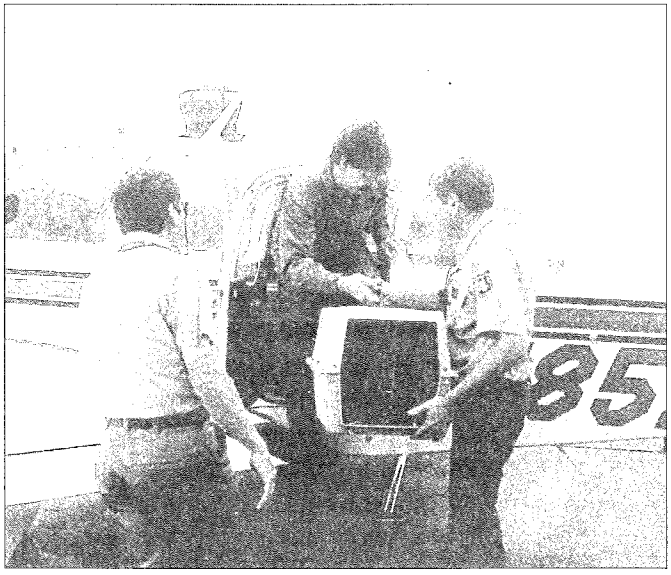
With demand species, the goal of habitat management was not just to maintain viable populations but to increase their numbers so that sportsmen or animal lovers would enjoy a greater abundance of these animals. Whether the Forest Service was concerned with a given species' viability or abundance, however, did not affect the basic technique of habitat management. In either case, the Forest Service now used the Wildlife and Fish Habitat Relationships program as its basic tool for management.[98]

In the forest planning arena, meanwhile, the wildlife habitat regulations and WFHR program did not immediately give biologists the strong voice that they had expected. To the chagrin of many biologists and foresters alike, timber values continued to drive the planning process. Although NFMA was supposed to give nontimber resource professionals and members of the public a greater say in national forest planning, the process ran counter to the centralized planning initiated under RPA. Regional foresters and forest supervisors began to develop one set of expectations while Washington Office administrators and assistants to the Secretary of Agriculture formulated another. On the basic issue that attracted most public attention—how much logging would occur—the two planning efforts began to run afoul. Adding further to the uncertainty, Congress established still another set of timber production targets in the Forest Service's annual budget. Agency officials did not know which of the three timber targets—each one supported by a different congressional mandate—had priority. When the Forest Service began to issue a record of decision (ROD) and final environmental impact statement (FEIS) on various forest plans in the early 1980's, environmentalists promptly attacked them. According to testimony given to Congress by Brock Evans of the National Audubon Society, most of the plans contained "preferred alternatives" calling for at least a doubling of logging and logging roads, and sometimes a tripling. "Lip service was paid to the other values to be sure," Evans said, but close examination of nearly all the plans revealed that "very little of important forest environments would get meaningful protection."[99]

Although the forest plans had already gone through an elaborate public participation process—each accompanied by a Draft and Final Environmental Impact Statement and Record of Decision—environmental, industry, and other non-governmental groups and individuals filed "administrative appeals" on virtually every one. The appeal process on forest plans and projects, made under 36 CFR 219, is unique to the Forest Service.[100] Many of the appeal issues addressed management of wildlife, fish, rare plants, and threatened and endangered species. The hundreds of appeals made during the forest planning process were the forerunner of thousands of appeals made during forest plan implementation. These appeals were to have a profound effect on the management of wildlife, fish, rare plants, and threatened and endangered species.

If the Forest Service's complicated planning process initially gave biological diversity short shrift, a rising tide of administrative appeals, lawsuits, and court decisions would eventually bring this new Forest Service mandate home. The legal challenge would develop slowly, based on NEPA requirements, the Endangered Species Act of 1973, and the NFMA requirements including the species viability rule. Nearly 10 years would pass before the litigation over logging of old-growth forest and conservation of the northern spotted owl in the Pacific Northwest finally drew national attention to the Forest Service's difficulties in managing for timber production and biological diversity. These challenges and the dramatic changes in national forest policy that would ensue in the 1990's are the subject of Chapter 11.

Starting in the 1930's, coordination of timber and wildlife management in the Forest Service grew from an understanding of the relationship between forest succession and wildlife abundance. Because many game animals such as turkey, ruffed grouse, and white-tailed deer preferred habitat in an early stage of forest succession, foresters and biologists found a commonality of interests in managing the land for both timber and wildlife production. As the Forest Service expanded its vision to embrace the conservation of nongame animals, endangered species, and biodiversity, the relationship between forest succession and wildlife abundance became more and more problematic. No matter what the agency tried to do to compensate for logging activity, it could not escape the fact that late-successional species, or animals who depended on old-growth forest, faced a competitive disadvantage in the managed forest. Not even the move toward multispecies systems of wildlife management and computerized data bases could overcome these problems. Rather than firmly establishing timber targets that were consistent with its mission to conserve biological diversity, the Forest Service was too often litigated into defending its forest planning decisions species by sensitive species.



Courtesy USDA Forest Service

Forest Service wildlife biologists studied a variety of wildlife species, including osprey.

Courtesy USDA Forest Service

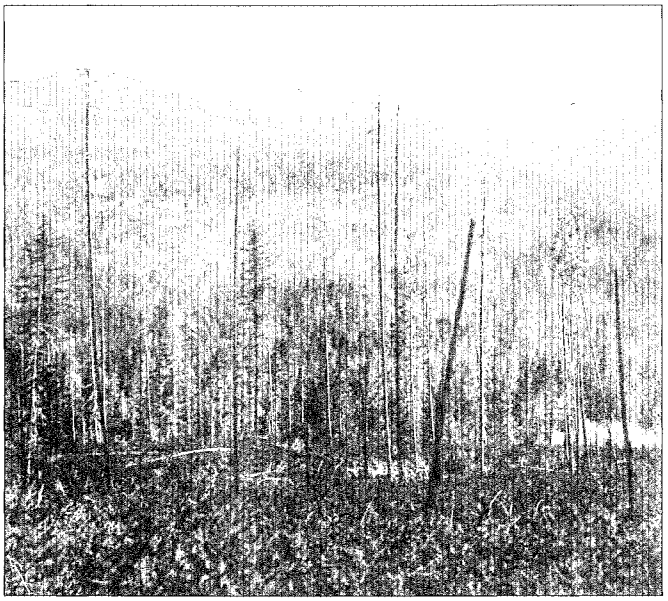
COURTESY USDA FOREST SERVICE

Forest Service biologists studied many species associated with mature and old-growth forests, such as the pine marten, pictured here, and the pileated woodpecker, pictured on the following page.

Courtesy USDA Forest Service

Pileated woodpecker nest cavity.

Section Three
The Environmental Era: 1970's to 1990's



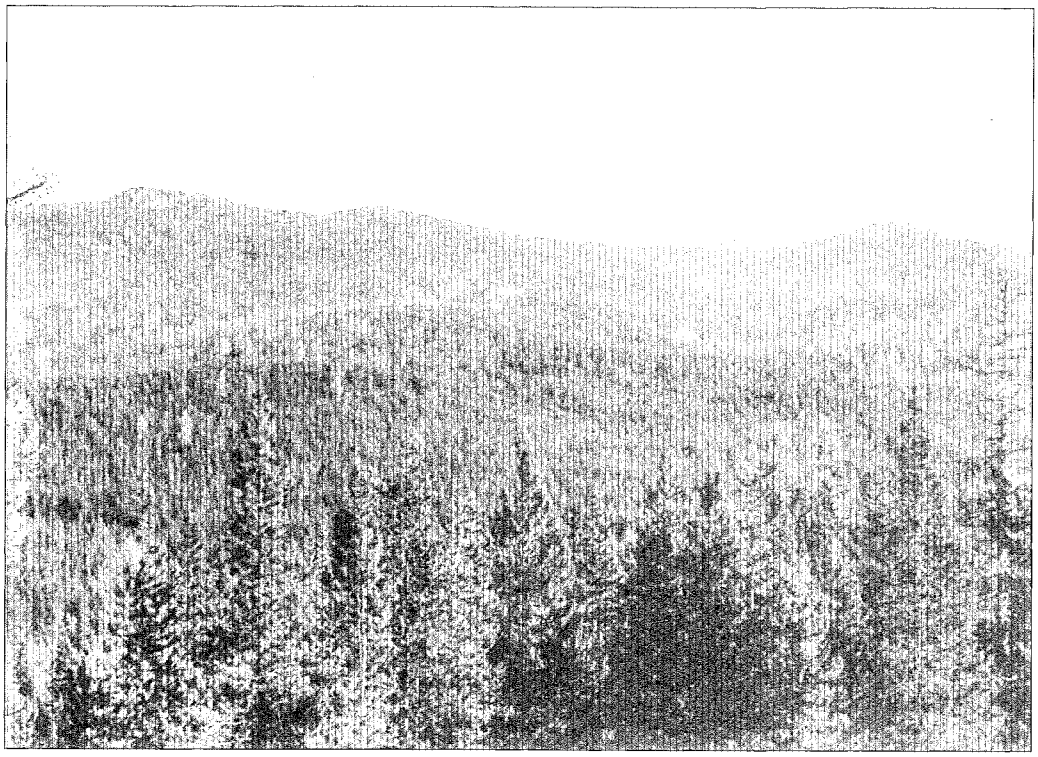
COURTESY USDA FOREST SERVICE

1902
Ravages from a fire in 1889 are evident in the foreground, and the ridge tops in the distance are open and visible.

Blue Mountains Ecosystems Mountain Forests

These photographs were shot from the same vantage point in Grant County, Oregon, 65 years apart.

In an attempt to understand the changes to forest ecosystems of the Blue Mountains in Oregon and Washington, Jon M. Skovlin and Jack Ward Thomas of the Forest Service compared photographs from the early 1900's with shots taken from the same vantage point in the late 20th century. Skovlin and Thomas thus analyzed the long-term trends affecting the forest, including fires, insect, and disease depredation.



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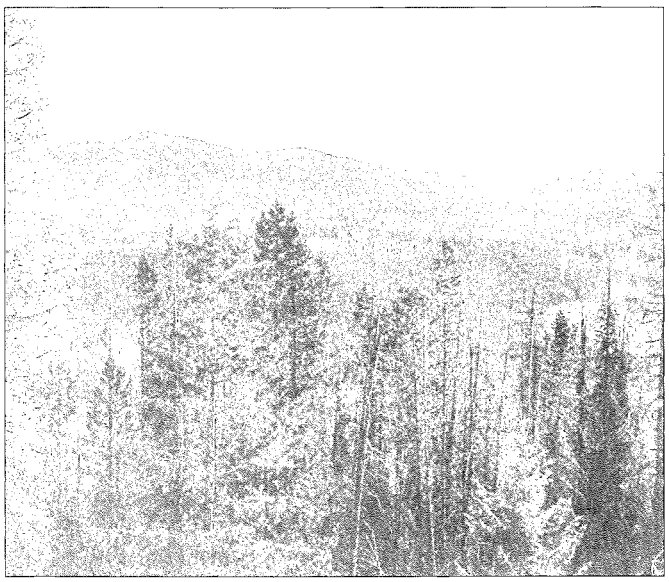
1967
This photograph reveals the new lodgepole stand, and the ridge top openings are now covered with conifers.



COURTESY USDA FOREST SERVICE

Blue Mountains Ecosystems Mountain Forests

These photographs were shot from the same vantage point in Grant County, Oregon, 10 years apart.

1982

Evidence of western and mountain pine beetle infestation of the late 1970's is highlighted in three patch-cut openings created after salvage logging. Old-growth larch is still prominent.

COURTESY USDA FOREST SERVICE

1992

Fires in 1986 and 1989 destroyed much of the remaining timber below the high buttes on the left horizon. The whole of the right horizon, Black Butte, also burned, thereby exposing the cleft rock outcropping. Most of the larch has been taken in the fire salvage operation. The photo point is in the center of a beetle-killed salvage sale of the early 1980's. Sharp-crowned subalpine fire are emerging in the middle ground.

CHAPTER SEVEN

CHAPTER SEVEN
INCORPORATING NEW VALUES

"Quit thinking about decent land-use as solely an economic problem. Examine each question in terms of what is ethically and aesthetically right, as well as what is economically expedient. . . . A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise."

. . . *Aldo Leopold, 1949.*

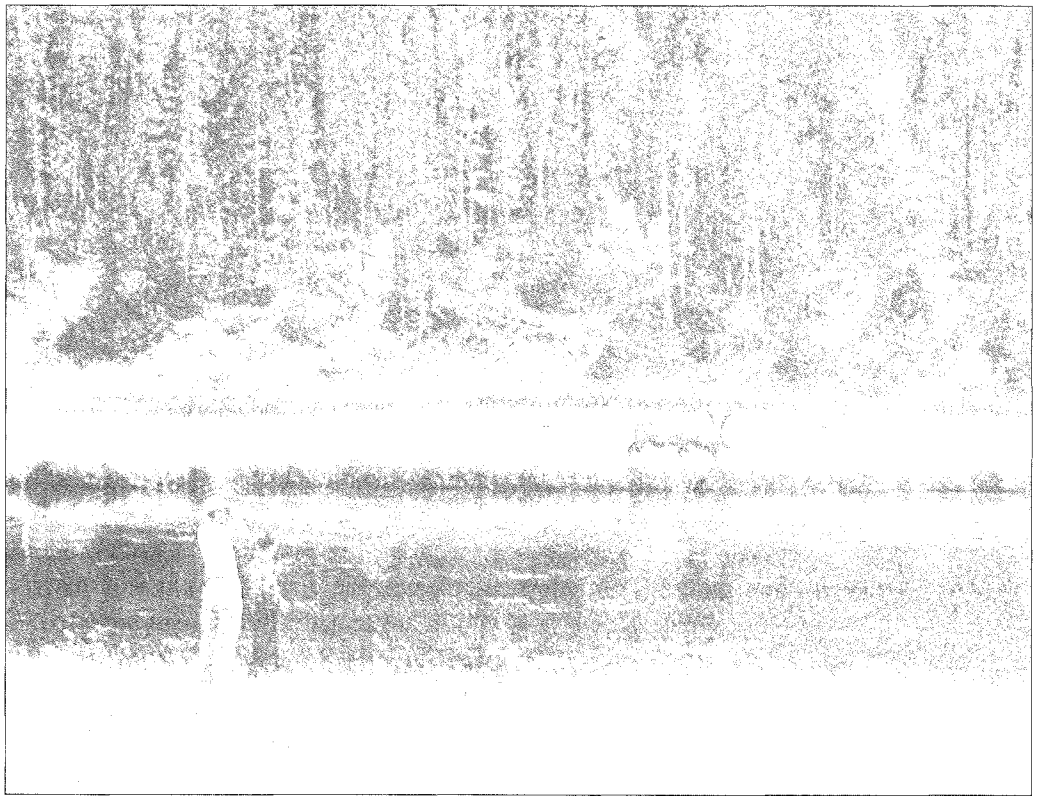
The post-World War II period brought monumental changes to natural resource management. Attitudes toward the natural world developed very rapidly from the late 1940's to the 1970's, prompting an increasing number of Americans to question the precepts of traditional conservation in favor of a broader, more holistic approach to protection. Related to this development was the growing number of Americans looking to the national forests for nonconsumptive uses. Recreational use of the national forests doubled in the decade after World War II, and continued to grow throughout the late 20th century. During that era, wilderness preservationists challenged the Forest Service orthodoxy that timber should be the dominant use of the national forests. Ecologists further questioned whether the agency's sustained-yield timber program was scientifically sound. These forces of change coalesced in the environmental movement of the 1960's and 1970's, resulting in a new framework for wildlife and fisheries management on the national forests.

Recreation

The growth of outdoor recreation in the national forests was truly impressive. In 1924, the Forest Service recorded 4.5 million recreational visits to the national forests. By the end of the 1930's, the number had reached 16 million, and by 1955 it had increased to 40 million. The national forests were particularly popular among sport hunters and anglers. In the mid-1950's, sport hunters accounted for one-fourth of all recreational visits to the national forests.

COURTESY THEODORE CATTON

Backpacker in the Bob Marshall Wilderness Area, Flathead National Forest, Montana.



COURTESY USDA FOREST SERVICE

Forest Service lands provide an opportunity to view wildlife.

Hunting and fishing use of the national forests increased 228 percent from 1946 to 1957—several times the rate of increase in overall hunting and fishing license sales throughout the Nation.[1]

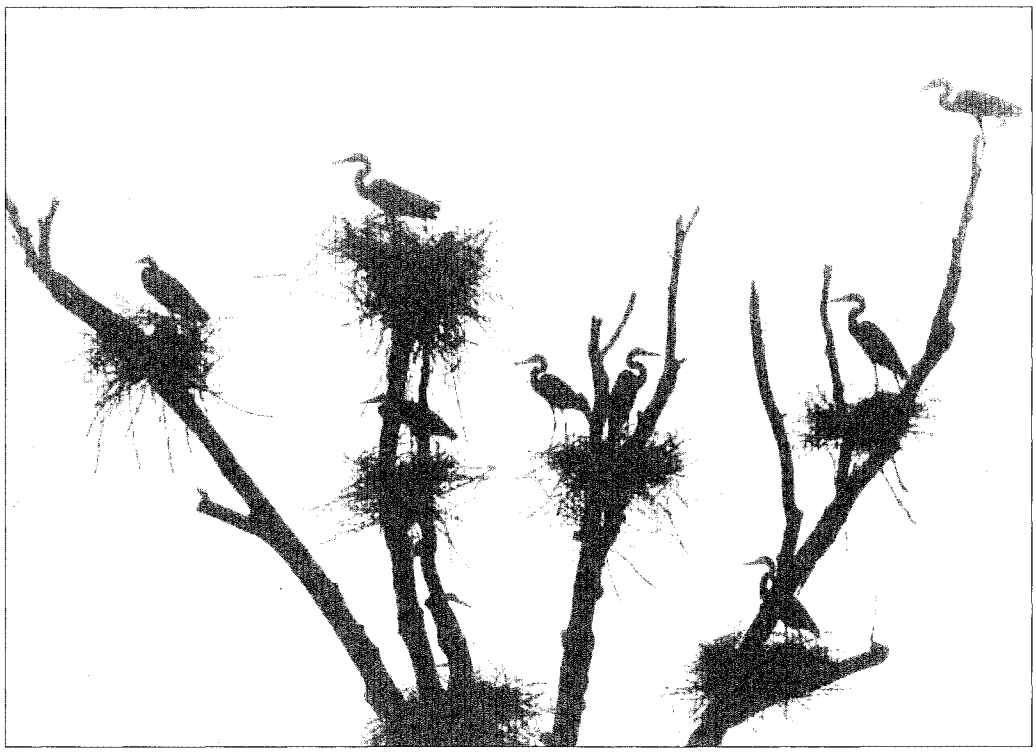
Richard E. McArdle, the new chief of the Forest Service appointed in 1952, recognized this trend. He was concerned about the growing "pressure" on the fish and wildlife resources in the national forests. If the national forests were to meet this growing demand, McArdle informed Congress in his first annual report, more intensive habitat management was essential. "The management work on the ground must be backed by further development of habitat-management techniques." This was especially important where lands held significant timber and grazing values as well as wildlife values. Land managers needed "much more knowledge" about how to coordinate these uses.[2]

Burgeoning use of the national forests by hunters and anglers was not the only reason Chief McArdle felt pressured to broaden the agency's focus in the 1950's. There were other forms of recreational use to consider as well. Wilderness preservationists demanded that portions of the national forest system be preserved in a pristine condition, with restrictions on mechanized access. In general, they defined "wilderness" as an area without signs of

human occupation, especially roads. Reacting to the stepped-up timber harvesting program on the national forests, they no longer trusted "administrative wilderness" set asides by the Forest Service, and sought legislation to establish a national system of legally protected wilderness areas. Congress responded by holding a series of lengthy hearings on the proposal beginning in 1957.[3]

While the wilderness bill was pending, groups such as the Wilderness Society and the Sierra Club worked to prevent road development, dam construction, and logging operations on areas of the national forests that they believed were suitable for wilderness designation. Some Forest Service officials found it difficult to accept that such preserves had any place in the agency's multiple-use management scheme. Other officials believed that wilderness had long been part of multiple-use management, given that Congress designated the first wilderness area in 1924, and the Multiple Use–Sustained Yield Act (described below) included such areas and uses. Many thought that a separate wilderness act was unnecessary. However, some wilderness advocates, even more than wildlife conservationists, were skeptical that the Forest Service's multiple-use approach to land management could really achieve a reasonable balance of forest uses. As Forest Service historian Harold K. Steen has written, multiple-use "steered conservationists and the Forest Service on a collision course." In the 1950's, the Sierra Club eclipsed the sportsmen's associations as the Forest Service's sharpest critic.[4]

McArdle's answer to these developments was "Operation Outdoors." Part 1 of Operation Outdoors, published in January 1957, presented a 5-year program for the development of recreational facilities on the national forests. Part 2, published in February 1961, introduced an analogous plan for wildlife and fish habitat management. The latter program called for rapid expansion in three areas of wildlife habitat management: coordination of wildlife needs with other national forest uses, cooperation with State fish and game departments in all wildlife development programs involving national forest lands, and improvement of wildlife habitat through direct development projects. The Forest Service put forward both plans under the title of "Operation Multiple Use." Like the National Park Service's "Mission 66," which the Department of the Interior sent to Congress in 1956, McArdle's aim in Operation Multiple Use was to establish long-term objectives and cost estimates for the Forest Service in order to win administration and congressional support for significant funding increases.[5]



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Heron rookery.

The Multiple Use–Sustained Yield Act and the Wilderness Act

McArdle also threw his support behind the initiative to enact multiple-use legislation. After 4 years of inquiry and deliberation, Congress passed the Multiple Use–Sustained Yield Act on June 12, 1960. The law specifically listed five resources that would be given equal consideration in national forest management: timber, rangeland, watershed, recreation, and wildlife and fish. In McArdle's view, the Forest Service needed this mandate in order to withstand pressure from the timber industry to give priority to timber and water (the only uses specifically listed in the Forest Management Act of 1897) over recreation and wildlife and fish.

Indeed, lumber manufacturers opposed the bill on the grounds that forest managers would now have to react to public pressure, leaving the lumber industry exposed to the caprice of changing public demand.[6]

Four years after passage of the Multiple Use–Sustained Yield Act, wilderness preservationists achieved their own major objective with the passage of the Wilderness Act of September 3, 1964. This legislation established a national system of wilderness areas, and it provided standards and procedures for expanding the system in the future. The Forest Service was one of four Federal land management agencies charged with managing designated wilderness areas to perpetuate wilderness values. In addition, these agencies

were directed to review roadless areas under their administration and make recommendations to Congress on potential additions to the wilderness system.

Although wildlife and wilderness values were mutually reinforcing in most respects, the parallel legislative campaigns for multiple-use and wilderness preservation brought to light some significant rifts within the conservation movement. Wildlife groups generally supported the multiple-use bill. There was some concern among State wildlife officials that multiple-use would upset the balance in Federal-State cooperation on the national forests, but a provision was included in the bill stating that the Multiple Use–Sustained Yield Act did not abridge the States' authority to regulate the taking of wildlife and fish; the act pertained only to the management of wildlife and fish habitat.[7] This mollified States' rights advocates.

Wilderness preservationists, on the other hand, were suspicious about multiple-use. The National Park Service criticized the concept on the grounds that it would tend to compromise recreational values. Moreover, NPS officials believed that their agency should be preeminent in the field of recreation and they argued that multiple-use was mere window-dressing by the Forest Service to forestall the making of new national parks from national forest lands. The Sierra Club vigorously opposed early versions of the bill because they did not include wilderness among the listed uses. The Wilderness Society took a more conciliatory approach. Howard Zahniser, a leader of this organization and a well-known wilderness advocate, worked with legislative staff to get compromise wording inserted: a statement that the multiple-use mandate would not preclude the establishment of wilderness areas within the national forest system.[8]

As for the wilderness bill, most wildlife conservationists were in favor of it. They could count two of their own—Aldo Leopold and Olaus Murie—among a handful of the most influential wilderness advocates in the 20th century. Wilderness protection would have obvious advantages for many species of wildlife. They were satisfied that the law would not infringe upon hunting and fishing opportunities. Their main concern was that restrictions placed on access and technology in wilderness areas would impede wildlife research and management. But this liability of wilderness was more than offset by the benefits that wilderness protection would afford to wildlife.

The bruising legislative campaigns that led to the Multiple Use–Sustained Yield Act and the Wilderness Act had a polarizing effect among the interest groups concerned with national forest management. As Dennis C. Le Master has explained in *Decade of Change: The Remaking of Forest Service Statutory Authority during the 1970's* (1984), "There were those who believed in the development and use of forest resources wherever feasible—the developers; and there were those who believed in the preservation of certain forest land areas and the plant and animals they contained in a wholly wild and natural state—the environmentalists." These fundamental philosophical differences, Le Master contends, produced lasting political alliances that would influence national forest legislation in the next decade.[9]

The Rise of Environmentalism

Environmentalism sprang from a variety of sources in the 1960's and 1970's. These included the counterculture's challenge to traditional values and its questioning of the assumption that the natural world exists solely for human use. As noted, during the 20th century, environmental disasters of the early 20th century, including the eroded plains of the Dust Bowl, had demonstrated the serious consequences of mismanaging natural resources. In the post-World War II period, pesticides and radiation fallout further posed unprecedented, widespread risks to human health and welfare, prompting a more holistic approach to protecting the natural world than conservationists had envisioned. Although a number of leaders inspired this multifaceted movement, Aldo Leopold became one of its earliest and best known spokesmen.

In the late 1940's, Leopold concluded that conservation, for all its useful policies, had not provided the philosophical foundation necessary for protection of the natural world. In his estimation, efficient use and careful management had proven insufficient; he believed it was also necessary that the natural world "be loved and respected" as more than a commodity. What was missing from conservation thought, Leopold concluded, was a land ethic. No longer could human actions be determined by economic expediency. "Examine each question in terms of what is ethically and aesthetically right," he suggested. "A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise." This eloquently stated premise held implications for wildlife and fisheries. To Leopold, the term "land" meant more than mere soil; it included the complexity of living things that made up an ecosystem. For the most part, conservationists had valued wildlife as game or recreation. Leopold, on the other hand, encouraged his readers to appreciate animals, fish, and plants for their connection to the biotic community.[10]

Conveying scientific concepts through lyrical prose, Leopold reached a large and receptive audience. His expression of the land ethic helped provide the philosophical underpinnings of the environmental movement of the 1960's and 1970's. So influential were his writings that many of his readers came to view him as a "prophet." His book, *A Sand County Almanac With Essays On Conservation From Round River*, published posthumously in 1949, articulated the ideals that would gain prominence in the environmental era—and it became widely read for its discussions of "ecological conscience."[11]

Rachel Carson was another writer who influenced the development of the environmental movement. She alerted the public to the hazards of dichloro-diphenyl-trichloroethane (DDT) in her book, *Silent Spring*, published in 1962. Like Leopold, she conveyed scientific concepts through lyrical prose that reached a wide audience. With an eye for detail and a sense of wonder for the natural world, Carson appealed to a generation of readers. Ostensibly, *Silent Spring* publicized the effect of pesticides on birds. Even more alarming was the book's undercurrent: the possibility that DDT and other pesticides might seriously harm humans. Carson inspired environmentalists to consider the long-term effects of human actions on the land.[12]

Initially, many Forest Service officials were averse to these new ideas. The traditional conservation movement had as its basic aim the efficient, equitable development of resources. While concerned with protecting the health of the land for future generations, its focus was on the production of commodities for human consumption—an emphasis that received clear expression in the multiple-use mission of the Forest Service. The new environmentalism, by contrast, emphasized protection of what Leopold called the "land organism." Moreover, whereas the traditional conservation movement had been based on a coalition of scientists, bureaucrats, and progressive leaders of government and industry, the new environmental movement drew from grassroots organizations and intellectuals who challenged the old conservationist orthodoxy. The new movement carried an anti-technological, anti-managerial strain that many trained foresters found insulting or naive. Environmentalists wanted to drive a wedge between the Forest Service and the timber industry; instead, they alienated most of the old-line foresters from their cause.[13]

Unlike foresters, wildlife and fisheries biologists in the Forest Service tended to gravitate toward the environmentalists' camp. But they were distinctly uncomfortable with the new environmentalism's anti-managerial ethos. Manipulation of the environment to produce a surplus crop of animals for human consumption formed the very basis of wildlife management. For years, agency biologists had been studying and experimenting with the effects of different silvicultural treatments on wildlife habitat. They did not accept the environmentalists' premise that all harvesting of timber was injurious to wildlife values.

Averting Rachel Carson's Prophecy

In 1962, Rachel Carson foretold an environmental catastrophe in her surprise bestseller, *Silent Spring*. Indiscriminate use of pesticides, she warned, was spreading poisons that would concentrate at the upper end of the food chain and wipe out many species of mammals, birds, and fish. Ultimately, these toxins posed a threat to human health. Largely as a result of the public outcry that her book engendered, pesticide use was refined and controlled. In 1972, President Richard Nixon issued an executive order banning the use of certain pesticides on public lands. DDT and other agricultural chemicals were replaced by biodegradable compounds with a much narrower spectrum of toxicity.

Public concern extended to the use of aerial application of herbicides and insecticides on the national forests, where the volume of chemicals was perhaps less disturbing than their reach over a wide area. As a result, the Forest Service's forest experiment stations joined in the search for improved application methods and effective substitutes for these chemical compounds. By the 1980's, research was focused on nonchemical alternatives, namely biological control methods. These include the introduction of exotic parasites, the augmentation of natural enemies of pests, and the development of viruses and bacteria to attack pest populations.

Carson's prophecy focused most sharply on birds; an imagined world without birdsong inspired the book's chilling title. Thanks in part to the consciousness-raising power of her work and the environmental laws that followed, 33 of the 40 species of birds that Carson warned would perish from the earth occur today in equivalent or greater numbers than in 1962.

Wilderness

After the Wilderness Act passed in 1964, the Forest Service was reluctant to develop separate policies for wilderness and non-wilderness area management. Not until 1976, 12 years after its enactment, did the Forest Service develop a systematic approach for managing wildlife in wilderness areas. Then, in the space of 10 months, two important documents emerged. First, Forest Service wildlife officials formulated a set of policies and guidelines in conjunction with officials of the Bureau of Land Management and representatives of the International Association of Fish and Wildlife Agencies. Second, Assistant Secretary of Agriculture M. Rupert Cutler—a new presidential appointee with former ties to the Wilderness Society—issued a general statement of policy on the department's wilderness management objectives.[14] After a trip to Alaska shortly after his appointment, Cutler recognized the importance of wildlife and fish on the national forests there. He directed the Forest Service Chief to assign 50 additional biologists to the Alaska Region.[15]

As a general policy, there was to be no timber harvesting, no manipulation of vegetation for watershed, wildlife, or forage purposes, and no use of mechanized transport or equipment within wilderness areas. Although grazing and predator control were allowed on national forests, the Forest Service would manage wilderness for the most part so as to allow natural ecological successions. Natural wildfire and natural infestations of insects were to be allowed to operate freely insofar as they did not endanger significant resources outside such areas. Management was to be directed toward maintenance of those animals and plants indigenous to the area, with special emphasis on the preservation of endangered or threatened species. A number of research and management activities were permissible under certain guidelines; these included aerial census counts, fish stocking, transplanting of terrestrial wildlife, certain chemical treatments, and population sampling. In some cases, mechanized transport and equipment essential to conducting these activities were permissible too. Sport fishing, hunting, and trapping were defined as legitimate uses of wilderness.[16]

Wilderness advocates had long identified wildlife appreciation with wilderness values. Joseph Grinnell, director of the Museum of Vertebrate Zoology at Berkeley, California, was one of the first to assert that protecting wild animals was central to the purpose of natural preserves. "To the natural charm of the landscape," he wrote in *Science*, "they add the witchery of movement."[17] Olaus Murie, writing in an early issue of the Wilderness Society's *Living Wilderness*, considered the sight and sound of animals at home in the wild to be an essential part of "a living wilderness, in its literal sense."[18] For some people, dangerous predatory animals were part of the allure of wild country. "It ain't wilderness," explained an advocate in Edward Abbey's *Beyond the Wall*, "unless there's a critter out there that can kill you and eat you."[19] For others, animals such as wolves and grizzlies symbolized the spirit of the wilderness: alien, fearsome, and beyond the control of humans.[20]

It remained for Clarence A. Schoenfeld and John C. Hendee to make a systematic analysis of the benefits of wilderness for wildlife. Their study was written primarily for wildlife and wilderness managers. Schoenfeld was a professor of wildlife ecology and journalism at the University of Wisconsin; Hendee, an expert in recreation, was with the Forest Service's division of legislative affairs in Washington, D.C. The Wildlife Management Institute sponsored the study, which was published in 1978 as *Wildlife Management in Wilderness* (1978).

Most importantly, the authors contended, wilderness benefitted a number of species that were particularly vulnerable to human influence. Wildlife that depended on wild country included such species as bison, grizzly bear, moose, mountain sheep, and mountain goat. The concept of wilderness-dependent wildlife was not new. In *Game Management* (1933), Aldo Leopold defined wilderness game as those species that were "harmful to or harmed by economic land uses." Similarly, in *Our Wildlife Legacy* (1966), Durward Allen classified cougar, grizzly bear, and wolf as "true" wilderness animals because they were "wide-ranging" and "at odds with the livestock industry." With the aid of the U.S. Fish and Wildlife Service's listing of threatened and endangered species, it was now more evident than ever that many animal and plant species were confined to wilderness.[21]

Schoenfeld and Hendee also stressed the importance of these preserves for ecological study. The authors described a "wilderness-wildlife web" as an ecological community in which wilderness-dependent species could thrive. The wilderness-wildlife web could provide baseline data for assessing broad-scale human impacts on the natural environment. Sensitive species served as a barometer of environmental health. Moreover, all wildlife that occurred in these areas, including the most common species, was integral to the recreational, economic, and aesthetic values of the land.[22]

Interest in Nongame

Paralleling the public's desire for wilderness preservation—and its desire for the protection of endangered species and the perpetuation of natural ecological processes within those preserves—the public revealed its concern for nongame animals, too. Membership in the National Audubon Society, an organization dedicated to protecting birds and other wildlife, rose from 41,000 in 1963 to 321,000 in 1975. The National Wildlife Federation's magazine for children, *Ranger Rick*, which devoted as much coverage to small animals as it did to the charismatic megafauna featured in hunting magazines, sold 500,000 subscriptions in 1975, its first year. Many State game commissions revamped their monthly magazines to appeal to the nonhunting public, emphasizing wildlife photography and stories on watchable, accessible wildlife. Brian R. Payne and Richard M. DeGraaf, two Forest Service research scientists stationed at the Northeastern Forest Experiment Station in Amherst, Massachusetts, observed these changes in wildlife values. They investigated the economics of nongame birds and concluded that bird watching was a growth industry worth an estimated $500 million annually.[23]

Official data on visitor use of national forests also suggested a dramatic change in modes of wildlife appreciation. In 1972, the Forest Service recorded an estimated 18 million visitor days by nature observers and wildlife photographers, surpassing the 13 million visitor days by sport hunters. As the Northern Region's wildlife staff director Edward R. Schneegas remarked, "We did not foresee the new wave of public awareness for the environment, and greatly broadened concern for all wildlife that has swept the Nation." The time had come to recognize the increasing value of nongame species in the national forests, Schneegas believed.[24]

In May 1975, the Forest Service sponsored a national symposium in Tucson, Arizona, on the Management of Forest and Rangeland Habitats for Nongame Birds.[25] This landmark meeting helped bring nongame wildlife to the attention of agency officials, opening a dialogue between avian ecologists and natural resource managers.[26] Sessions were dedicated to the management of deciduous forest habitat, coniferous forest habitat, and rangeland habitat for nongame birds. Afterward, participants decided that a series of regional workshops should be held with the object of furthering recognition of nongame bird habitat needs in land management practices. Additional workshops on the management of forests for nongame birds were held in Portland, Atlanta, and Boise in the late 1970's.[27]

Wildlife organizations prodded the Forest Service in the same direction. The highly respected Wildlife Management Institute urged land managers to give greater consideration to the habitat requirements of nongame wildlife and fish. Commenting on a 1975 draft EIS prepared by the Gifford Pinchot National Forest in Washington, the institute used the occasion to identify three "serious omissions" in the Forest Service's statement that were endemic in the agency's land planning process throughout the Nation. These included the following: first, a lack of knowledge on nongame birds and small mammals and the effects of land management practices on the diversity and numbers of these species; second, a lack of consideration given to riparian zones and the measures required to protect these critical habitat areas; and third, a lack of emphasis on the values of old-growth forest and snags to certain classes of wildlife. Here was a crisp and remarkably prescient listing of the major challenges that lay ahead for wildlife managers as they shifted their focus to the habitat needs of nongame animals. The Forest Service circulated the institute's comments to all forest supervisors.[28]

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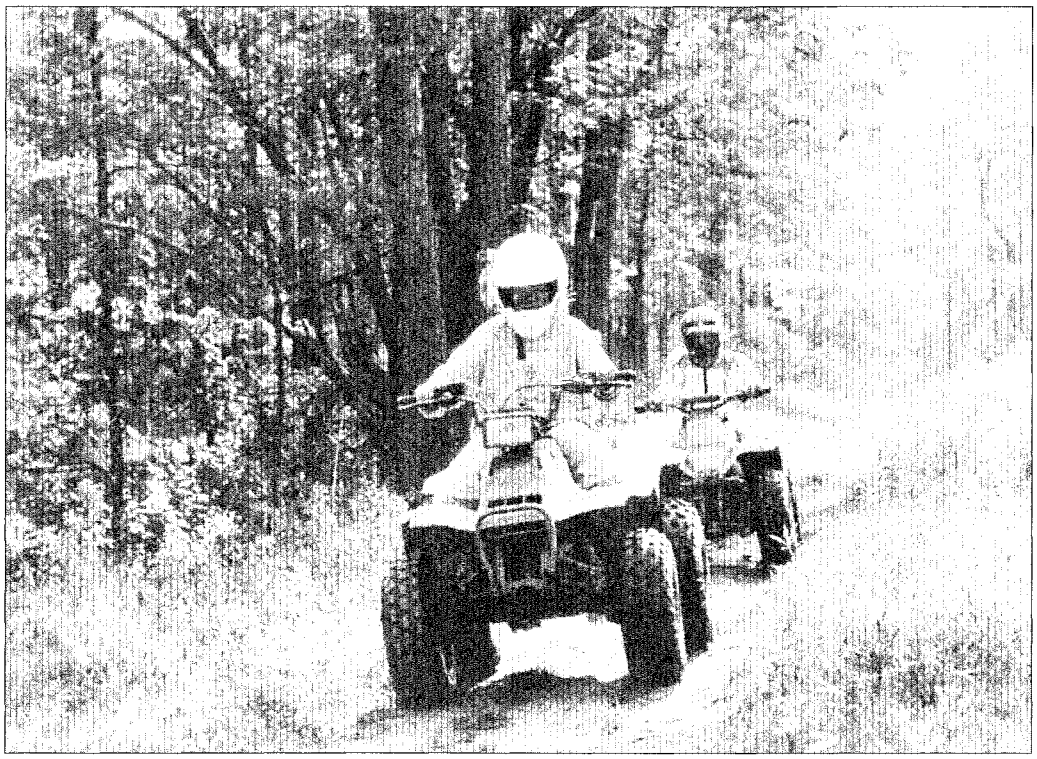
The emergence of new values during the modern era brought some forms of recreation into question.

Wildlife managers noted another trend in public perceptions: anti-hunting sentiment in the mid-1970's was becoming increasingly widespread. The growth of this sentiment appeared to some sport hunters to be linked to such extraneous issues as gun control legislation and violent crime. As Dale Jones, Forest Service Director of Wildlife and Fish observed, it was important to distinguish between anti-hunting sentiment and the philosophical position that all hunting was cruel and inhumane. Much of the ground swell in anti-hunting sentiment was in the nature of personal disdain rather than an organized movement with goals. Some protesters believed hunting to be an immoral act or a violation of "animal rights."[29]

The anti-hunters' proscription against all hunting placed them at odds with most wildlife managers and on the fringes of the wildlife conservation movement. Even so, they were a force to be reckoned with. They insisted, for example, that the wildlife manager had an array of humane alternatives for managing wildlife populations. These included reproductive inhibitors, live trapping, redistribution of surplus animals, and the reintroduction of natural predators.[30] While their specific proposals did not get very far, anti-hunters added fuel to the public's perception that wildlife management was weighted too heavily toward the production of game and fish for sport hunters and anglers.[31]

Not since the 1930's had new public attitudes about wildlife and nature become so intertwined and potent. An increasing number of Americans wanted to feel a stronger sense of permanence in the environment. They wanted wildlands to



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began to embrace the "land ethic" that Aldo Leopold had expressed a quarter-century remain undeveloped, endangered species to survive, ecological processes to continue unimpaired. As noted, Americans earlier. They demanded new laws that would protect the long-term health of the land. Congress responded by enacting a series of strong environmental laws in the 1970's. One of the first of these, the Endangered Species Act, became especially significant, as will be described in the next chapter. Additional legislation that proved vitally important to the wildlife job in the Forest Service included the Forest and Rangeland Renewable Resources Planning Act and the National Forest Management Act.

The Forest and Rangeland Renewable Resources Planning Act

Congress passed the Forest and Rangeland Renewable Resources Planning Act, or RPA, on August 17, 1974. RPA required the Forest Service to prepare a "Renewable Resource Program" every 5 years beginning in 1975. The program would provide a comprehensive picture of what the Forest Service needed for research, national forest management, and cooperation with State and private forestry. It required the Forest Service to specify what it needed to manage each of the major resources listed in the Multiple Use–Sustained Yield Act of 1960. RPA prompted the kind of comprehensive planning that the Forest Service had undertaken 15 years before in its Operation Multiple-Use program, but this time at Congress's request. That assured Forest Service officials of congressional attention and possible action.

Unlike the earlier Wilderness Act and Multiple Use-Sustained Yield Act, RPA was neither glamorous nor controversial. It did not legislate goals for national forest management, and the low-key nature of the law proved to be its strength. It produced a quiet revolution in Forest Service funding priorities. When the Forest Service submitted its first RPA program in 1975, the agency recommended a 13-fold increase in its wildlife and fish habitat management budget (from $16.5 million to $206.4 million), compared with a doubling of its budget for timber management (from $587.2 million to $1.2 billion). Although Congress did not appropriate this amount, that the agency requested an increase of this size for wildlife and fish habitat management revealed a shifting of priorities.[32]

The law was a boon to non-Government organizations who sought to influence wildlife policy through lobbying and public opinion. The law assured these groups of an opportunity to peruse the Forest Service's projections and funding requests and to relay the information to its members. Further, the organizations could track congressional funding of the Forest Service's budget requests. This was crucial, since wildlife organizations had noted in the past that Congress had a penchant for funding the Forest Service's timber management program at or above the level requested by the Forest Service while scrimping on other budget categories, including wildlife. Now this information was readily available for public disclosure. Lonnie Williamson, who later became vice-president of the Wildlife Management Institute, called RPA a "watershed" in the development of the Forest Service's wildlife program.

With the interested public better informed about funding allocations, there was a discernible change in the budget process. In the early 1980's, for example, Forest Service Chief R. Max Peterson effectively blocked an effort by the Office of Management and Budget (OMB) to reallocate funds in the Forest Service budget from wildlife to timber management. Peterson refused to testify to Congress in support of the budget until OMB withdrew its request. Before RPA, the chief did not have that kind of leverage.[33] RPA set the stage for the rapid growth of the Forest Service's wildlife program during the mid-to-late 1970's.

The National Forest Management Act

As important as RPA proved to be, the most significant legislation of the decade pertaining to wildlife habitat on the national forests was the National Forest Management Act (NFMA), which Congress passed on October 22, 1976. Although the law encompassed all aspects of national forest administration, it was important for the wildlife resource that Congress fashioned NFMA at a time when the public demanded greater consideration of endangered species and nongame.

NFMA amended RPA by increasing the scope and complexity of land use planning required by law. The agency was now required to prepare a comprehensive land use plan for each national forest. Like RPA, NFMA emphasized the need for an interdisciplinary approach to planning, but it went much further than the RPA in prescribing management guidelines. Regulations for this law were 3 years in the making. A Committee of Scientists, composed entirely of non-Forest Service personnel, was appointed to help develop the regulations for all phases of land use planning. In keeping with the

interdisciplinary intent of NFMA, the Committee of Scientists integrated wildlife and fish habitat concerns into the forest planning process, ensuring that wildlife and fisheries biologists would be integral to national forest management in the future. The Forest Service invited public input on the regulations, prepared an EIS on the regulations, and then ran the EIS through the public review process as well.[34]

When the regulations were finally adopted in 1979, they constituted the single most important set of guidelines for Forest Service wildlife policy to date. "It was the most wonderful thing that happened to the Forest Service," recalled Larry Hedrick, an agency biologist.[35] Robert Nelson, who retired as director of the Forest Service's Wildlife and Fish program in 1997, agreed. He remembered that "what the NFMA regs did is tell us if we are going to maintain all species of wildlife and fish in a managed forest we must lay a much lighter hand on the land and use much more science in doing so. The viable population strategy has worked and is working well."[36]

NFMA expanded the Forest Service's traditional concept of developing the wildlife resource for the use and enjoyment of sport hunters and nonhunters. Under NFMA, the agency was to manage habitat in such a way as to conserve the full diversity of tree species and plant and animal communities found in the national forests. Moreover, it was clear from the legislative history of NFMA that Congress expected the Forest Service to consider biodiversity at every level of forest management—from the national forest plan to the smallest timber sale. It remained for the Committee of Scientists to decide whether the NFMA regulations should prescribe a method for maintaining diversity or whether this should be left to the discretion of planning teams and land managers. The Committee decided to include two key concepts, or imperatives, in the regulations.[37]

The first key concept was the "management indicator species." For any given planning unit, the Forest Service would select appropriate management indicator species as part of the planning process. Management indicator species were normally those species whose preferred habitat matched the forest type in the planning unit. Species could also be selected as indicators because they were endangered or had special habitat needs that were likely to be adversely affected by a specific management action. In some cases species could be selected because they were in demand—either for their consumptive or nonconsumptive value. Each forest plan would specify goals for the future condition of the management indicator species, and as the plan was implemented, Forest Service officials would compare increases or decreases in population levels against the plan's goals. In most cases, a decline in the numbers of an indicator species would indicate a decline of habitat quality for other species associated with the forest type in that unit. When a management indicator species did not respond to changes in habitat according to plan, the management action would have to be modified.

The second key concept was the "viable population." The Forest Service would attempt to maintain viable populations of all vertebrate species found in each national forest. If land use practices such as logging threatened to eliminate any vertebrate species in a national forest, then remedial action would be required. In other words, the agency would allow a reduction of animal numbers but it would not allow a decline in their distribution. Three Forest Service biologists—Robert Nelson, Hal Salwasser, and Stephen Mealey—helped develop the viability rule in consultation with the Committee of Scientists. A "viable population," they decided, was the minimum number and distribution of reproductive individuals of each species needed to ensure its continued existence throughout suitable habitats on a national forest.[38] To maintain viable populations, the Forest Service developed a sensitive species program to identify those animals, fish, and plants with potentially declining populations, that could become listed as threatened or endangered, due to agency management practices. This program provided for inventory and evaluation of habitats that supported sensitive species—and by the early 1990's, Forest Service officials had regarded it as a "valuable, proactive tool."[39]

In NFMA, Congress endorsed the Forest Service's move to intensive forest management. The law was intended to satisfy both the environmentalists and the timber industry. Clearcutting was the land management practice that had come to symbolize environmentalists' disillusionment with the Forest Service in the 1960's and early 1970's. It received the Government's approval as an essential tool of intensive forest management, when it could be proved to "be the optimal method" and carried out in a manner consistent with the protection of soil, watershed, fish and wildlife, recreation, and aesthetic resources and the regeneration of the timber resource.[40] At the same time that Congress legislated a new purpose for national forests as reservoirs of the continent's biodiversity, it also reinforced the old conception of national forests as producers of renewable resources. Forest Service biologists would have to manage habitat, as they always had, in coordination with other forest uses.

The decade of the 1970's was a turning point for wildlife management in the Forest Service. The agency moved beyond its traditional emphasis on the production of game and fish to assume a major role in the conservation of sensitive, threatened, and endangered species; nongame; and finally, biodiversity. But if the Endangered Species Act, RPA, and NFMA pleased the wildlife interests, and if the new laws helped to empower the biologists within the agency, no one had any illusions that the wildlife job would now be easier. If anything, the laws pointed to an era of increasing resource competition and contentiousness.

Diversification in the Forest Service

During the 1970's, the Forest Service hired an increasing number of wildlife and fisheries biologists and botanists. The Pacific Southwest Region, under the leadership of Bob Nelson, added 100 biologists—many of whom were women, minorities, and veterans. This hiring trend predated mandates during the 1980's to provide equal opportunity in Federally funded programs, and diversity in the Wildlife and Fisheries Group remained unparalled in the agency. The influx of new personnel helped broaden perspectives in the Forest Service, which hastened the incorporation of new values.

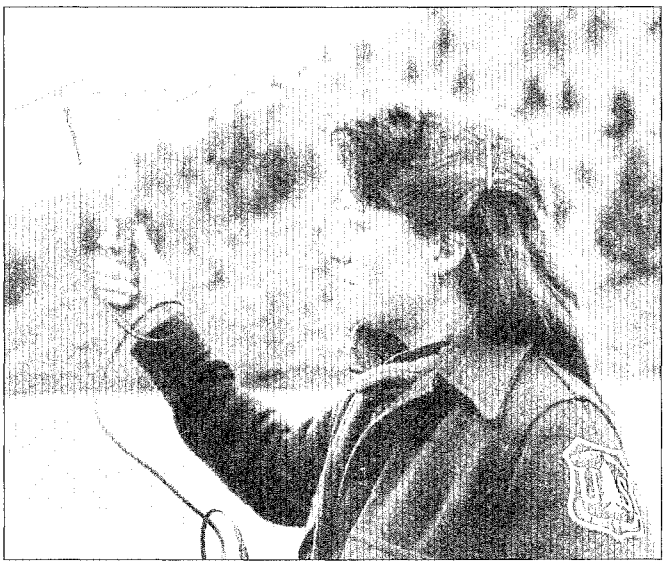
Continuing Education in the Forest Service

One indication of increasing professionalism in the Forest Service was the program promoting continuing education. Bob Nelson, Director of Wildlife and Fisheries, initiated this program to advance the technical and program management expertise of his workforce. From 1987 to 1997, more than 1,600 wildlife and fisheries biologists and botanists—nearly half of whom were women—received training through courses and workshops sponsored by the Forest Service, sometimes in partnership with organizations such as The Nature Conservancy.

The Continuing Education Program offered these courses and workshops at universities throughout the Nation, and most of them covered a term of 3 days to 2 weeks. Topics ranged from advanced concepts in aquatic systems to GIS remote sensing. Not all courses focused on technical subjects; some were devoted to fostering leadership skills. The agency also offered a course in managing forested ecosystems, bringing silviculturalists and biologists together and providing them the opportunity to share their perspectives.

Conservation Education in the Forest Service

The Forest Service has provided educational programs for the public for nearly a century. Generations of school children learned about fire prevention and pollution control through the characters of Smokey Bear and Woodsy Owl. By the 1990's, the agency's conservation education programs had become extensive and wide-ranging, reaching children and adults from diverse backgrounds. Programs highlighting fish, animals, and plants included NatureWatch, Eyes on Wildlife, Fish Watch, Partners in Flight, Celebrating Wildflowers, and Noxious Weed Awareness. The agency also sponsored National Fishing Week and a Kids Fishing Derby, designed to educate children and adults about streams and lakes. This program encouraged forest managers and the public to cultivate a sense of shared ownership and responsibility for public lands and aquatic resources.



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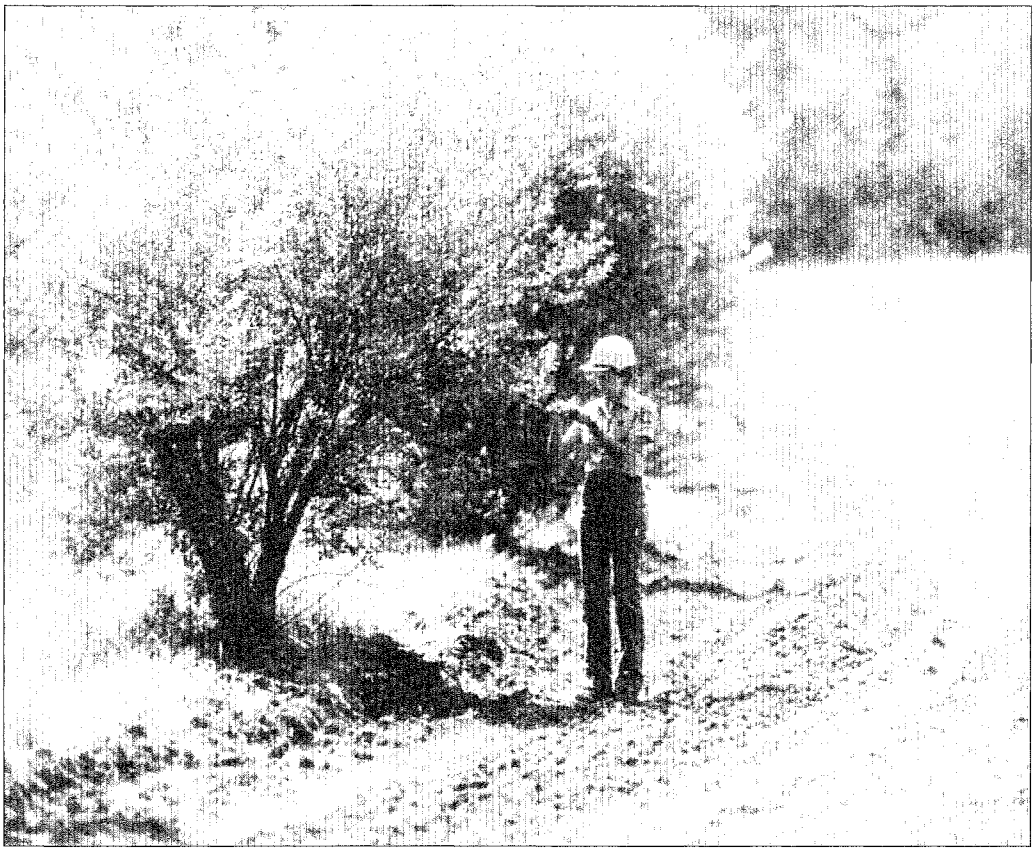
During the modern era, the Forest Service employed an increasing number of women as wildlife and fisheries biologists.



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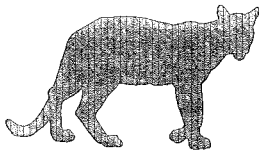


CHAPTER EIGHT

CHAPTER EIGHT
SAVING ENDANGERED SPECIES

"To allow a species to slip to the point of being threatened [by extinction] is a terrible error; it is a terrible economic, social, biological error."

. . . *Jack Ward Thomas, 1992.*

The environmental movement thrust endangered species into the forefront of Federal natural resource policy, culminating in passage of the Endangered Species Act of 1973. Although Congress passed endangered species legislation in 1966 and 1969, the amended statute of 1973 proved to be one of the strongest environmental statutes of the era—and it brought major changes in the management of national forests and other Federal lands. Its passage signalled that preventing extinctions and protecting biodiversity had became major goals of U.S. environmental policy.

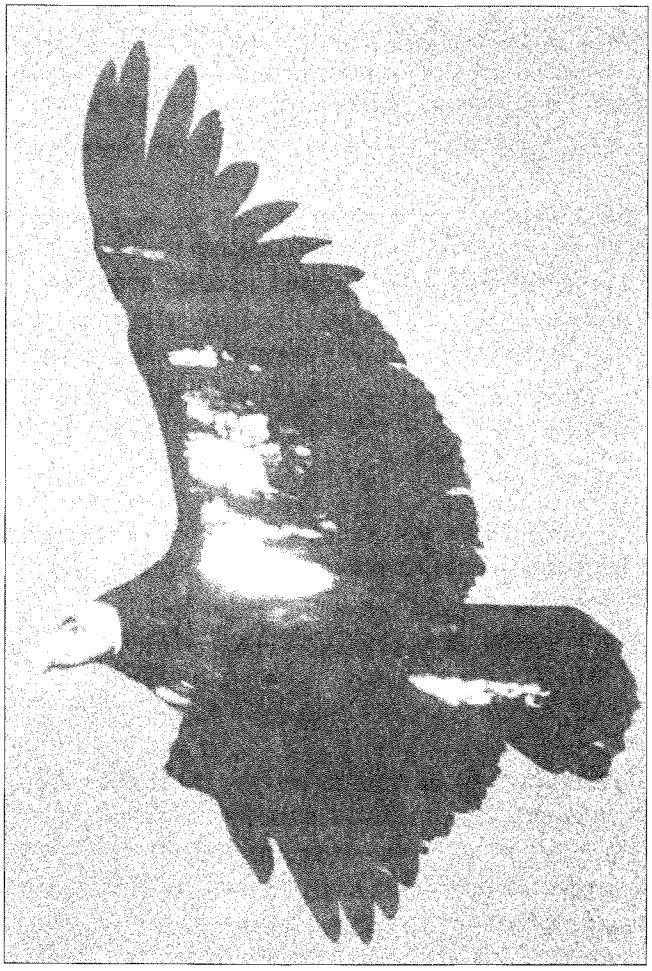
This effort to save endangered species represents a phenomenal development in wildlife conservation. Early interest in preventing extinction had focused on large, appealing animals or game species—wildlife that was of immediate use to humans. Conservationists of a century ago might be surprised by the level of recent effort devoted to species such as the Kirtland's warbler or the Mount Graham red squirrel. The work of the Forest Service and other agencies to save these animals indicates how much attitudes and values have changed.

Early Concern for Endangered Species

No issue in wildlife conservation aroused more passion than that of species extinction. The destruction of habitat and the depletion of wildlife populations were regrettable enough, but these could be rectified. The extinction of species, on the other hand, differed fundamentally in its stark irreversibility. Nothing that wildlife managers could do would ever restore an extinct species. The conservation biologist Michael Soule defined extinction as "the death of birth."[1]

Humans became aware of their ability to cause extinctions as early as the 19th century. In the United States, it was the near extermination of the bison in the late 1800's and the extinction of the passenger pigeon in 1914—two abundant, widespread, and highly visible species—that most impressed Americans with the human capacity for wildlife destruction. Human population growth, burgeoning resource consumption, and the spread of environmental toxins added to the sense of peril. In the second half of the 20th century, Americans increasingly came to identify extinction with humanity's own tenuous place on Planet Earth. By the end of the 20th century, biologists had warned that the level of human-caused extinctions could soon rival the mass extinction that had eliminated the dinosaurs at the end of the Cretaceous period 65 million years ago.

The gravity of the problem, along with its geographical extent, encouraged Americans to look to the Federal Government for solutions. Congress made an early effort in 1874, passing a bill providing for the protection of the bison, but President Grant did not sign it.[2] In 1903, President Roosevelt established the first Federal wildlife refuge to protect a brown pelican nesting rookery on Pelican Island, Florida. In 1916, the United States and Canada signed a treaty protecting migratory birds from large-scale destruction, and 2 years later, Congress passed the Migratory Bird Treaty Act to implement the agreement.[3] For decades, wildlife refuges remained the centerpiece of Federal efforts to save declining species.[4]



COURTESY S. LAFRANCE, THE ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA

One of the earliest instances of Forest Service action to protect an endangered species involved the California condor. A vulture of impressive size, this bird can have a wingspan of 9 feet. California condors once ranged along the Rocky Mountain cordillera from British Columbia to northern Mexico. An easy target for poachers and vandals and the unintended victim of poisoned carcasses, the condor also suffered from loss of habitat—problems that began in the 19th century. As a result, the bird was exterminated throughout most of this region by 1900. The last sightings of condors outside of California occurred in Arizona in the early 1930's and in Mexico in 1934 or 1935. By that time, the condor's only remaining breeding area was located on the Los Padres National Forest in southern California.[5]

In the fall of 1935, the National Audubon Society protested a Forest Service proposal to construct a new road through Sisquoc Canyon, a probable nesting area for the condor. The Forest Service wanted to build the Sisquoc road because it would provide access to an undeveloped area that was vulnerable to forest fire. Chief Forester Ferdinand A. Silcox speculated that more effective fire suppression might help the condor; recent fires had destroyed condor nests—and possibly the birds—near Reyes Peak and in the Topotopa Mountains. Silcox invited the National Audubon Society to initiate a study of the condor focusing on its range and nesting requirements, which would outline the "steps necessary to ensure the preservation of the species."[6]

In the spring of 1936, the National Audubon Society contributed $270 for expenses, while the Forest Service assigned two forest guards to make field studies of the condor during the summer. Associate Forester Cyril S. Robinson directed the men's inquiry. In October, Robinson reported to the National Audubon Society that the Forest Service had decided not to build the Sisquoc road, but rather to preserve the area in a primitive condition for the protection of the condors.[7]

COURTESY USDA FOREST SERVICE

Condors, Los Padres National Forest.

It remained for the Forest Service to determine the proper administrative procedure for protecting these birds. Aldo Leopold, formerly with the agency and now in charge of game research at the University of Wisconsin, urged the Forest Service to address condor protection specifically in its administrative plans. For example, use of poison bait for predator control should be eliminated from the area. Assistant Forester Christopher E. Rachford proposed that the Forest Service invoke the controversial Regulation G-20A to assure protection of the condor. Regional Forester S.B. Show disagreed on the grounds that State game laws already afforded the condor protection from hunting; the real need was for more stringent controls on access.[8] Eventually it was decided that the situation called for a new regulation. In 1937, the Forest Service promulgated Regulation T-9-I for the protection of habitat critical to the condor. Under this regulation, 1,200 acres in Sisquoc Canyon were set aside and posted against all use and travel. At the time, it was believed that the sanctuary would provide nesting, roosting, and bathing places for about 60 percent of the condor population on the Los Padres National Forest.[9]

Although this was a step in the right direction, it was nearly too late. During the next two decades, Forest Service officials believed the condor population had stabilized when in fact it was larger than previously estimated, yet still declining. Even the creation of another, larger sanctuary of 35,000 acres in 1947 failed to arrest the condor's decline. By the 1960's, the National Audubon Society concluded that the condor required closer study and more intensive management if it were to survive. The California condor was listed as an endangered species in 1967.[10]

STILL ON THE BRINK

Despite 50 years of conservation efforts, the California condor continued to slip toward extinction. By the early 1980's, there were only a few dozen condors left in the wild and in captivity, and biologists resorted to a captive breeding program to save this endangered species. The last known condors in the wild were caught in 1987, bringing the captive population to 27. Starting from this perilously small gene pool, the captive breeding program had increased the population to 103 individuals by 1995.

Although condor chicks have thrived in the San Diego and Los Angeles zoos, it remains to be seen whether the captive-bred birds can acquire the necessary behaviors to survive in nature. Beginning in January 1992, recovery program biologists began to release young captive-bred condors at remote locations in southern California. The biologists assist the freed birds by placing stillborn calves at different points near the release sites in the hope that the condors will learn to forage in the mountainous terrain where their chances of survival are greater.

The recovery program is now focused on a site in Arizona 30 miles north of Grand Canyon National Park. The Peregrine Fund, a nonprofit conservation organization and Forest Service partner based in Boise, Idaho, was selected by the Department of the Interior to lead this effort. The Grand Canyon area contains an appropriate combination of quality habitat and viewing opportunities that will build public support for the condor.

While the fate of the California condor continued to hang in the balance, the Kaibab white-tailed squirrel also attracted the attention of the Forest Service. This rare species is found only in one small area of northern Arizona. In 1967, William Hurst, Regional Forester for the Southwestern Region, expressed concern that its numbers were declining. "The Forest Service has a moral, as well as a legal, obligation to protect this animal," he informed the Forest Supervisor. "We should give leadership to a research program to learn more about the squirrel." The animal's significance, as Hurst pointed out, was "without question." During the next 2 years, D.I. Rasmussen, who had investigated exploding deer populations on the North Kaibab in the 1920's, studied this unique squirrel and its habitat. The Arizona Game and Fish Department continued to allow hunting of these animals, however, and in the late 1990's they remained "in serious trouble."[11]

The Kirtland's Warbler

One of the Forest Service's most noteworthy efforts to save an endangered species and its habitat involved a diminutive songbird known as the Kirtland's warbler. This rare, yellow-breasted warbler was unknown to science before 1851. It has unusually restrictive habitat requirements, nesting only on the ground or under young jack pine stands of about 8 to 20 years of age. Such stands were probably common in the conifer zone on the sandy outwash plains near the edge of the ice sheet at the end of the last ice age. Jack pine stands also develop in areas cleared by forest fires or logging. The amount of jack pine forest increased in the wake of 19th-century logging operations, and Kirtland's warblers probably reached maximum abundance between 1890 and 1910. With the advent of effective fire suppression in the 20th century, the amount of nesting habitat for the Kirtland's warbler declined drastically. By 1961, the bird's summer range was confined to a handful of counties in Michigan's lower peninsula and its population numbered about 500 nesting pairs.[12]

Courtesy D. Roby & K. Brink, The Academy of Natural Sciences of Philadelphia

Kirtland's Warbler.

Officials in the Forest Service's Eastern Region proposed that the agency establish a vanishing species area for the Kirtland's warbler on the Huron National Forest in Michigan, similar to the two that had been established for the condor on Los Padres National Forest in California. (The condor reserves remained the only vanishing species areas under Forest Service administration.) Assistant Chief Edward P. Cliff rejected the idea, reasoning that the Kirtland's warbler needed "proper habitat management rather than protection from public disturbance." With well-coordinated timber management and wildlife management plans, Cliff noted, the Forest Service could maintain an adequate amount of young jack pine to preserve the Kirtland's warbler. Indeed, cutting practices would need relatively little modification to improve the habitat for the Kirtland's warbler. The jack pine forests would continue to be managed as even-aged stands; only the size and distribution of the cuts would need adjustment.[13]

A key difference between managing the forest for Kirtland's warbler habitat and managing it for timber production was the need for extensive controlled burning, or prescribed fire. Jack pine depends on fire to regenerate; the seed cones of this tree species stay closed until released by high temperatures produced by a fire. This allows the jack pine seedlings to

develop after a burn in full sunlight and with minimum competition from other tree species. Because the Kirtland's warbler nests only in young jack pine, it is a fire-dependent species like the jack pine itself. Managing the forest strictly for timber production did not produce the right habitat conditions for the Kirtland's warbler because cutting units were normally too small (40 to 80 acres) and many residual non-merchantable trees were left standing after most logging operations were completed, and jack pine seedlings were planted too far apart to create the dense stands that the birds needed. The only practical way to make clearings on a larger scale was through burning.[14]

Anticipating the need to reintroduce fire in Michigan's forests before all the young stands of jack pine matured to the point where the warbler would no longer nest in them, the Forest Service established a 4,010-acre Kirtland's Warbler Management Area on the Huron National Forest in 1962. The reserve augmented three Kirtland's warbler management areas totaling 7,680 acres which the Michigan Conservation Commission had established on State lands 5 years earlier. Each of the four management areas was supposed to contain enough jack pine forest to maintain even-aged stands of various ages and sizes on a 60-year rotation. This would permit a sustained yield of young jack pine in the critical age class required by the Kirtland's warbler for nesting.[15] Over the next 15 years, the Forest Service and the Michigan Department of Natural Resources would conduct more than 50 controlled burns ranging up to 500 acres in size in their efforts to save the Kirtland's warbler from extinction.[16]

After the devastating Mack Lake fire in 1980, Forest Service managers and researchers directed new efforts toward modifying timber harvest in an attempt to provide habitat for the bird without the use of prescribed fire. By increasing the size of the harvest units, removing all trees, and by increasing the density of plant seedlings, suitable nesting habitat could be created. By the 1990's, this modified intensive silviculture had become the primary means by which the Forest Service attempted to maintain Kirtland warbler habitat and populations.[17]

The Forest Service touted the story of the Kirtland's warbler as evidence that the agency's multiple-use mission embraced the conservation of wildlife species large and small. Agency officials formally dedicated the Kirtland's Warbler Management Area in 1963, and Dr. Ira N. Gabrielson, long-time director of the U.S. Fish and Wildlife Service and the dean of American wildlife professionals, was invited to speak at the ceremony. Gabrielson observed that it was the first time a public agency had dedicated an area of land to the preservation of a little songbird—an indication of how responsive the Forest Service was to changing wildlife values.[18] Moreover, the unique habitat requirements of the Kirtland's warbler demonstrated how timber management and wildlife management could sometimes dovetail with one another. Most importantly, the Kirtland's Warbler Management Area contrasted with the sanctuaries established on the Los Padres National Forest for the California condor, where the Forest Service had allowed itself little flexibility.

THE MACK LAKE FIRE

By the 1980's, the Forest Service and the Michigan Department of Natural Resources had conducted more than 50 prescribed burns, in an effort to save the Kirtland's warbler. This small songbird prefers the young growth of jack pine, which produces low-hanging branches that protect nests embedded in sandy soil. In 1980, an incident at Mack Lake on the Huron National Forest demonstrated the drawbacks of this practice, while revealing the complexities of providing habitat for the future. On the evening of May 5, a prescribed fire burned out of control, torching 25,000 acres of jack pine. The blaze also killed Jim Swiderski, a Forest Service fire technician, prompting public questioning of the practice of prescribed burning.

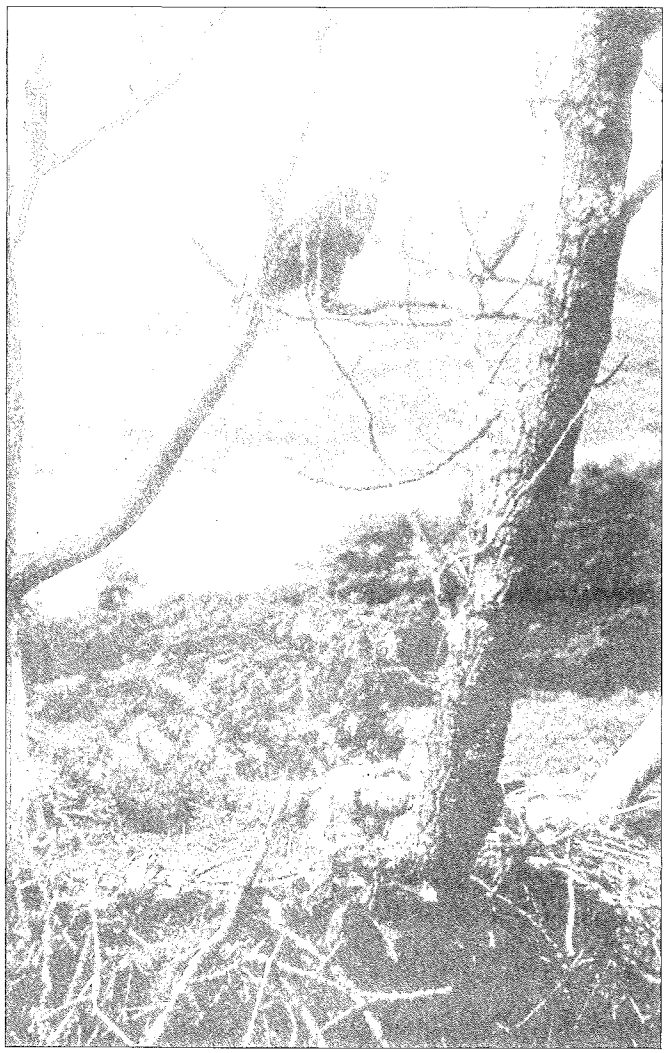
The disaster at Mack Lake resulted in a change in Forest Service policy. Soon after the fire, the agency required district rangers to attend a series of training workshops on prescribed burning, and the rangers in turn held training sessions for fire technicians. Another new requirement called for public involvement before any prescribed burning took place within the National Forest System. Although disastrous, the burn did produce future nesting habitat for the Kirtland's warbler.

The Bald Eagle

Probably the most renowned American endangered species in the 1960's was the bald eagle, the national symbol of the United States. For more than a century and a half, Americans had celebrated the bird's regal image on everything from the Great Seal of the United States to military regalia, poster art, furniture, and trademark designs, while giving the actual species no more respect than they gave to other undesirable birds of prey. Hunted, trapped, and extirpated from many areas by destruction of habitat, the bald eagle steadily declined in numbers throughout the United States.

Although symbol and species were joined in the Bald Eagle Protection Act of 1944, it was not until the 1960's that Americans became widely concerned that their national bird was in danger of extinction. By then it had become clear that the most serious threat to the bald eagle came from the pesticide DDT. As noted, Rachel Carson alerted the public to the disastrous effects of DDT on birds, including eagles, in her book, *Silent Spring*. Published in 1962, this beautifully written account of the hazards of pesticides reached a large audience.[19] Sprayed on crops and forests all over the United States, DDT ran off into rivers where it concentrated in fish. The bald eagle ate the fish and the DDT impaired the bird's ability to reproduce. No one knew how fast and far the bald eagle population had fallen since the introduction of DDT following World War II.[20]

Public interest in the plight of bald eagles encouraged the Forest Service to initiate a survey of nesting pairs of these birds on national forest lands in 1963. John E. Mathisen, a wildlife biologist on the Chippewa National Forest in northern Minnesota, conducted one of the



COURTESY USDA FOREST SERVICE

Bald eagle.

longest and most intensive studies of bald eagle nesting sites and reproductive rates anywhere in the United States. Mathisen checked the eagle nests from the air each April and July to determine the rate of occupancy and the number of young produced. Reproductive success among the Chippewa's eagles ran less than 50 percent—compared to 80 percent for thriving populations in Alaska and British Columbia. Laboratory tests of unhatched eggs verified that DDT was an important factor in nesting failure.[21]

During the early 1970's, after DDT was banned, the Forest Service's effort to save the bald eagle focused on protection of key habitat, often nesting or roosting sites. The agency's Eastern Region established a policy of protecting all bald eagle and osprey nest sites with buffer zones. The approach was later expanded to include eagle territories, and they now are included in a larger landscape level analysis. Mathisen's research during the late 1960's had revealed the complex relationship between human disturbance and nest abandonment.[22] For the next three decades, the population of bald eagles had increased substantially, and in 1995 the bird was reclassified from endangered to threatened in most of the lower 48 states.[23]

The Endangered Species Act

Although many wildlife biologists in the Forest Service wanted to do more for endangered species, they faced several obstacles. Internally, biologists had to overcome the traditional emphasis by the Forest Service and State agencies on big game management. Another key issue for the agency was the need to adjust timber and grazing activities to benefit threatened and endangered species. Wildlife Director Lloyd Swift constantly reminded his superiors of the need to broaden the Forest Service's focus to include habitat improvement for fish, upland game birds, furbearers, and vanishing species.[24] One of the most significant problems the agency faced was a lack of funds. Managing habitat for declining species usually had to begin with basic research on the ecology of the animal, and wide-ranging and elusive species such as the California condor and bald eagle were difficult and costly creatures to study. Third, the Forest Service received limited help from the states. Since

State wildlife programs were largely funded by revenues from hunting and fishing licenses, most States accorded rare and nongame species low priority. Indeed, the states' emphasis on big game and sport fish reinforced the Forest Service's emphasis on these species, since most of the direct habitat improvement on national forests in the 1940's, 1950's, and 1960's was accomplished with State funds.[25]

Gradually it became evident that the Federal Government must take the lead in saving endangered species. In 1962, the U.S. Fish and Wildlife Service formed a Committee on Endangered Species in the Division of Wildlife Research. About the same time, the U.S. National Committee of the International Biological Program (IBP) also formed a section on endangered species. In 1966, Congress passed the first of three endangered species acts. While Congress assigned the U.S. Fish and Wildlife Service responsibility for coordinating the national program, it gave all land managing agencies responsibility for protecting threatened and endangered species on lands under their jurisdiction. For the first time, the Forest Service had a direct legislative mandate to give endangered species high priority.[26]

To fulfill that responsibility, the Forest Service recognized the need for more biologists. By 1966, these specialists were sprinkled throughout the agency. Each region had a handful of wildlife biologists and most had at least one fisheries biologist. Some were in the regional offices and some were on the forests. The research arm of the Forest Service had another contingent of wildlife and fish scientists. Growing public interest in endangered species and ecology brought biologists into vogue. They became a kind of status symbol within the Forest Service: every station director and forest supervisor wanted to get one on the staff.[27]

For all the pronounced increase in the numbers of wildlife biologists between 1960 and 1966, the Forest Service's wildlife program was still more than a decade away from maturation. The wildlife division remained much smaller than other divisions. D.I. Rasmussen, director of the wildlife division from 1964 to 1967, had just one assistant in the Washington Office. Walt Hanson, the division's director from 1967 to 1970, added fisheries biologist Phillip B. Summers to this tiny staff group. These wildlife staff positions were salaried at a lower GS-level than their equivalents in other divisions. Many Forest Service officials continued to insist that the wildlife function deserved a low profile in the organization because it involved more coordination than management.[28] [See threatened and endangered species chart.]

If the Forest Service continued to demonstrate a minimal commitment to saving declining species in the 1960's, this was true of other Federal agencies as well. Congress passed the Endangered Species Protection Act in 1966, and the slightly stronger Endangered Species Conservation Act in 1969, but these laws lacked teeth. Nevertheless, the Federal legislation pushed the endangered species issue into the limelight and prompted Federal wildlife officials to begin exploring ways in which their agencies could cooperate with each other. The Forest Service's Director of Wildlife Management Walt Hanson, for example, canvassed forest officers in the Northern Region about the possibility of reintroducing wolves in the Northern Rockies and raised this issue with his colleagues in the National Park Service and the U.S. Fish and Wildlife Service.[29] A concept was emerging that

national forests—and other Federal lands—bore a special burden to conserve not only the Nation's renewable resources but the Earth's biological diversity as well.

Public concern for endangered species continued to mount. Americans showed a keen desire to secure a cleaner, healthier, and more stable environment, as epitomized by the massive Earth Day celebration on April 22, 1970. Congress enacted a series of strong environmental laws, beginning with the National Environmental Policy Act, continuing with the Clean Water Act and Clean Air Act, and concluding with the Endangered Species Act of 1973 (ESA). This statute, the third to address endangered species in seven years, was passed by a large majority and contained much stronger provisions than the two preceding endangered species acts. A provision allowing for citizen suits brought teeth into this legislation, making it a benchmark in the Federal Government's commitment to conserve biological diversity.

SENSITIVE SPECIES

A plant or animal species identified by a Regional Forester for which population viability is a concern, as evidenced by the following: significant current or predicted downward trends in population numbers or density as well as significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution.

THREATENED SPECIES

A plant or animal species listed under the Endangered Species Act that is likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

ENDANGERED SPECIES

A plant or animal species listed under the Endangered Species Act that is in danger of extinction throughout all or a significant portion of its range.

Congress explicitly stated that the ESA was to conserve the ecosystems upon which threatened and endangered species depended. Section 2 of the act announced that all Federal departments and agencies would seek to conserve endangered and threatened species as a matter of policy. Section 7 of the act required agencies to take "such action necessary to ensure that the actions authorized, funded or carried out by them do not jeopardize the continued existence of an endangered species." The language was unequivocating: protection of all species assumed a high priority in U.S. environmental policy.

The ESA assigned responsibility for listing endangered species to the Fish and Wildlife Service in the Department of the Interior and to the National Marine Fisheries Service in the Department of Commerce. Any citizen could petition for listing of a species, but the final decision would rest with one of these two agencies and would be made "solely on the basis of the best scientific and commercial data available." When a species was listed, the listing agency was required to prepare a plan for its recovery of the species, taking funding and priority into account.

This legislation provided for how the Forest Service and other land management agencies would coordinate with the two agencies responsible for listing endangered species. The procedure was described in Section 7 of the act and became known as a Section 7 consultation. In theory, the consultation process was supposed to ensure that wildlife professionals would have input on all proposed actions, and that potentially harmful actions would be modified or in rare instances prevented in order to protect habitat. In practice, environmental organizations often insisted on the rigorous application of Section 7 consultation procedures to forestall or prevent actions that they did not like. This led to charges that the law was being abused. As one of the law's authors, Senator Mark Hatfield of Oregon remarked, the provision was meant to serve as a shield, not a sword.[30]

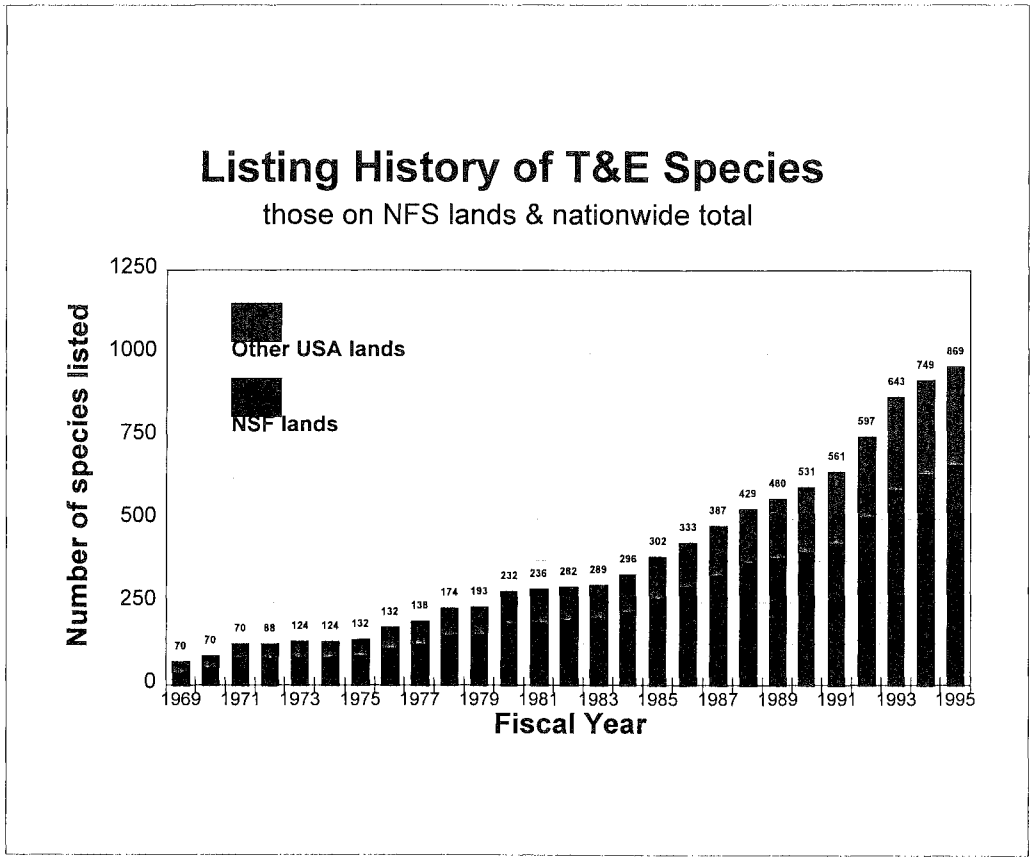
The ESA of 1973 had a more pronounced effect on the Forest Service's wildlife program than the earlier legislation of 1966 and 1969. This legislation, along with the National Environmental Policy Act (NEPA), which was signed into law in 1970, made the need for more wildlife and fisheries biologists apparent. The Forest Service hired these specialists to provide assessments of land management actions and to keep the agency in compliance with the new regulations. More than ever before, it needed to separate the wildlife staff from the range and timber staffs in order to ensure the impartiality of its biologists' decisions. No one saw this more clearly than Tom Nelson, Deputy Chief of the National Forest System. Having a strong orientation to timber himself, Nelson wanted the agency to have credible wildlife experts so it would be less reliant on the U.S. Fish and Wildlife Service for advice. Nelson initiated a reorganization of national forest administration in the mid-1970's, officially separating wildlife from range in all of the Forest Service's western regions.[31]

During the mid-1970's, Deputy Chief Nelson persuaded the head of Michigan's Department of Natural Resources, Pete Petoskey, to come to Washington for a 2-year stint with the Forest Service as the new director of wildlife management. This proved to be a bold stroke. Petoskey's aggressive management style was precisely what the program needed to flourish. Petoskey disregarded the usual protocols and took his requests straight to the chief of the Forest Service. He consulted directly with congressional staffers. Under Petoskey's capable hand, the Forest Service's fish and wildlife management budget grew from approximately $4 million to $10 million in 2 years.[32]

While the ESA led the Forest Service to change the emphasis of its wildlife program, it also created a more contentious atmosphere within the agency. Backed by the authority of the ESA, biologists in the Forest Service now had the ability to provide assessments for the agency's land management actions. At the same time, every biologists in the Forest Service had to function in an agency culture that was steeped in the tradition of managing the forest for timber production. Timber targets were still driving agency action, due to its dominant role in funding. Likewise, achieving each forest's assigned timber allocation remained the first order of business, and all employees were encouraged to work in a team spirit toward that end. Depending on the national forest and the personalities involved, conflicts could be sharp. Whether a biologist worked constructively with the line officer in his or her area or raised a red flag was often a matter of conscience. Some elected to "lie down in front of

the bulldozer." Taking note of what was happening between foresters and biologists within the agency, one fisheries biologist on the Clearwater National Forest in Idaho coined the term "combat biologist." Before long, everyone in the agency recognized the term—even though it could be used admiringly by one person and pejoratively by the next.[33]

The ESA enjoyed wide popularity when Congress enacted the National Forest Management Act of 1976 (NFMA). The logic of the earlier act was imprinted on the latter. NFMA required the Forest Service to work actively for the recovery and delisting of any listed species occurring on national forest lands. In addition to ESA requirements, it was Forest Service direction that the agency would not do anything in its management programs to cause a species to be listed.[34] Thus, NFMA brought the Forest Service's wildlife program even closer to the ESA's goal of saving all species from extinction.



SOURCE: USDA FOREST SERVICE AND FISH AND WILDLIFE SERVICE UPDATES

The linkage between public interest in saving endangered species and preparing forest plans was crucial, because NFMA established an administrative appeals process by which interested citizens could become involved. One result was a growing volume of administrative appeals work for Forest Service personnel. The number of appeals, often based on NEPA and NFMA requirements, first became pronounced in the early 1980's as the Forest Service began to release records of decision for forest plans. It grew to cumbersome proportions in the 1990's as more species were listed under the ESA and as environmental, industry and special-interest groups and professional lobbyists gained experience with ESA, NEPA, and NFMA. Forest Service wildlife and fisheries biologists devoted increasing amounts of time to administrative appeals and litigation. In some regions and on some forests the changing workload had a demoralizing, even paralyzing, effect, as more wildlife and fisheries biologists spent less time in the field and more time at their desks responding to law suits, and defending agency decisions.

The Mount Graham Red Squirrel

An example of how litigious the NFMA planning and ESA Section 7 consultation process had become involved the Mount Graham red squirrel, an endangered species found only on the Coronado National Forest in southern Arizona. Mount Graham is one of several isolated mountains in southern Arizona known as "sky islands" for the way they rise out of the desert low country. The relatively cool temperatures found near the summits of the peaks make them biotic as well as visual islands in the desert. The plant and animal communities atop these sky islands have been isolated geographically, ecologically, and genetically for thousands of years, at least since the last glaciation in the Pleistocene era.

On the summit of Mount Graham is found the southernmost subspecies of red squirrel in North America. The Mount Graham red squirrel, first described in 1894, occurs nowhere else but on this mountain in the Coronado National Forest. Subsequent studies of the Mount Graham red squirrel suggested that the subspecies had declined in numbers and might be in danger of extinction.[35] In 1984 and 1985, the Forest Service cooperated with the U.S. Fish and Wildlife Service and the Arizona Department of Game and Fish in conducting field studies of the Mount Graham red squirrel. The subspecies was estimated to number less than 500 individuals, perhaps less than 300. After these studies, the U.S. Fish and Wildlife Service proposed to list the species as endangered and to classify three different peaks on the summit of Mount Graham as critical habitat. One year later, in June 1987, the subspecies was officially listed.[36]

This process might have attracted little attention except for the fact that a wealthy consortium of research institutions had already determined that the summit of Mount Graham constituted the most favorable site in the continental United States for a world-class, $200 million astronomical observatory. The University of Arizona was the principal sponsor of the project, but it had the support of both the Smithsonian Institution and the Vatican (whose own Vatican Observatory had relocated most of its field operations from Castel Sandolfo, Italy, to southern Arizona in 1980 to get away from light pollution).[37] In 1982, the consortium proposed a 3,500-acre site covering the top 1,000 feet elevation of the

COURTESY MARICOPA AUDUBON SOCIETY

mountain, and requested that the Forest Service include the proposed development in its forest plans.[38]

At first the Forest Service obliged, but rising public concern about the development caused the Forest Service to reconsider. Opponents of the university's development proposal were many. Wilderness advocates wanted the area designated as wilderness and did not like the fact that the summit of Mount Graham was omitted from the Arizona wilderness study area which Congress delineated in 1984. Other recreationists were suspicious of the restricted access that might accompany such development. Wildlife biologists both in the Forest Service and the Arizona Department of Game and Fish began to draw attention to the mountain's importance as a biological island.[39]

The political discord surrounding the observatory site and the Mount Graham red squirrel became heated. After the issuance of a draft environmental impact statement as required under the National Environmental Policy Act, the Forest Service launched a biological assessment and Section 7 consultation with the U.S. Fish and Wildlife Service as required under the ESA. Preliminary findings from these studies indicated that the university would get nothing close to its 3,500-acre site; at best, it would get two small sites on two separate peaks on the broad summit of Mount Graham able to accommodate up to seven telescopes. Eventually the proposed initial request for development was whittled down to three telescopes.

University of Arizona officials, meanwhile, perceived that the procedures under NEPA and ESA could delay the project for years—too long to hold the consortium together. What they needed was a special legislative dispensation. The university hired lobbyists, taking the matter directly to Arizona's congressional delegation. Senators Dennis DeConcini and John McCain and Representative James Kolbe were supportive of the project; Representative Morris Udall was philosophically opposed but politically noncommittal. In 1988, after the U.S. Fish and Wildlife Service's Biological Opinion, Arizona Senator DeConcini added a rider to the Arizona-Idaho Conservation Act (AICA) authorizing the observatory development to proceed in accordance with the reasonable and prudent alternative of the

Biological Opinion. In the interest of getting the land bill passed, Representative Udall let the rider slip through the House. The U.S. Fish and Wildlife Service and the Forest Service, having issued their assessments, refrained from further comment.[40]

Environmental groups cried foul and sued, demanding that Federal agencies reinitiate a Section 7 consultation. The AICA, however, indicated the requirements of the ESA were "satisfied," and the agencies were affirmed. When the university proposed a modification—a relocation of one of the three telescopes—Forest Service and FWS officials agreed the move was covered in the original Biological Opinion. Environmental groups then sued again, and won. Congress quickly passed another rider, indicating the move was consistent with the AICA. Eight years after the 1988 law was passed the project was still being litigated. But construction had begun on the three telescopes, and it was widely assumed that this telescope group would lead to more.[41]

In the meantime the Mount Graham red squirrel has endured. Low numbers in the population in the late 1980's and early 1990's were thought to be a consequence of drought conditions, which caused the tree species on the summit of Mount Graham to produce fewer seed cones, a principal source of food for squirrels. In the early 1990's, the drought ended and the population appeared to have stabilized for the short term at about 250-300 animals.[42]

COURTESY THE OREGONIAN

The Red-Cockaded Woodpecker

Forest Service biologists found the litigation over the Mount Graham red squirrel intensely frustrating, because much of the interpretation of the science and politics of the case were beyond the agency's immediate control. Very different in that respect was the case of the red-cockaded woodpecker, where Forest Service research and management decisions appeared to be saving the species. Like the Kirtland's warbler, the red-cockaded woodpecker has been one of the Forest Service's success stories. The story is worth telling because the recovery of this species is firmly tied in an interesting way to the privately managed pine forest and the agency's limited land base in the South. Forest Service efforts to save this bird proved an effective model of successful application of research to management for the future.

COURTESY USDA FOREST SERVICE

Red-cockaded woodpecker.

The red-cockaded woodpecker, named for the small group of crimson feathers behind the adult male's ear, was once common in southern pine forests. Populations were spread across the Southeast, from Texas to North Carolina and as far inland as Oklahoma and Kentucky. Longleaf, shortleaf, loblolly, and slash pines comprised the predominant tree species across the areas. As the forests were logged and subsequently managed for a short rotation of 25 to 40 years, the bird's habitat diminished to a few remnants of older aged pine located primarily on national forests, Federal wildlife refuges, and military reservations. The red-cockaded woodpecker depends on older aged pine because it excavates its nesting and roosting cavities in the fungus-weakened heartwood of live pine trees. The most recent research suggests that the softened heartwood that the bird prefers takes around 90 years to develop. The bird will forage in 30-year-old stands.

Fire is an important part of the southern pine ecosystem. Under natural conditions, low-intensity fires burn the forest floor every few years, eliminating shade-tolerant hardwoods. Fire suppression, however, leads to the development of a midstory forest layer which will cause the red-cockaded woodpecker to abandon its nest site. This was an additional cause of the red-cockaded woodpecker's decline. Conservation of the species depends upon the use of prescribed fire to prevent the encroachment of this midstory.[43]

The red-cockaded woodpecker was one of the first species listed under the ESA of 1973. The Forest Service began a systematic investigation of the bird's status on the southern national forests in 1975, with an emphasis on identifying and protecting cavity trees. A 200-foot buffer was placed around each cavity tree and 40 acres of foraging habitat was provided for each group of cavity trees, or cluster. Four years later, the Forest Service revised its forest management practices to require a 200-foot buffer around each cavity tree. The agency provided 100 to 250 acres of foraging habitat per cluster, and recommended a rotation of 80 years for longleaf pines and 70 years for other yellow pines. As significant new research on the red-cockaded woodpecker became available, the Forest Service and U.S. Fish and Wildlife Service agencies cooperated in the development of more stringent measures to conserve and recover the species. These were incorporated into the recovery plan and released in 1985.[44]

COURTESY USDA FOREST SERVICE

Red-cockaded woodpecker.

Biologists from the two agencies believed that relocating juveniles from one forest to another to form new clans would aid recovery of the species. It is a peculiar characteristic of the red-cockaded woodpecker that one or more of the male juveniles from each year's brood will stay around to help the breeding pair, while all female juveniles disperse from the territory. These groups or "clans" consist of up to nine individuals. Biologists' understanding of the social grouping and breeding behavior of the red-cockaded woodpecker formed the basis for their judgment of what was required to recover the species. In order to provide the genetic diversity of the species, the 1985 recovery plan called for the establishment of 15 recovery populations of 250 breeding groups each. In addition, other existing populations were managed to aid red-cockaded woodpecker conservation.[45]

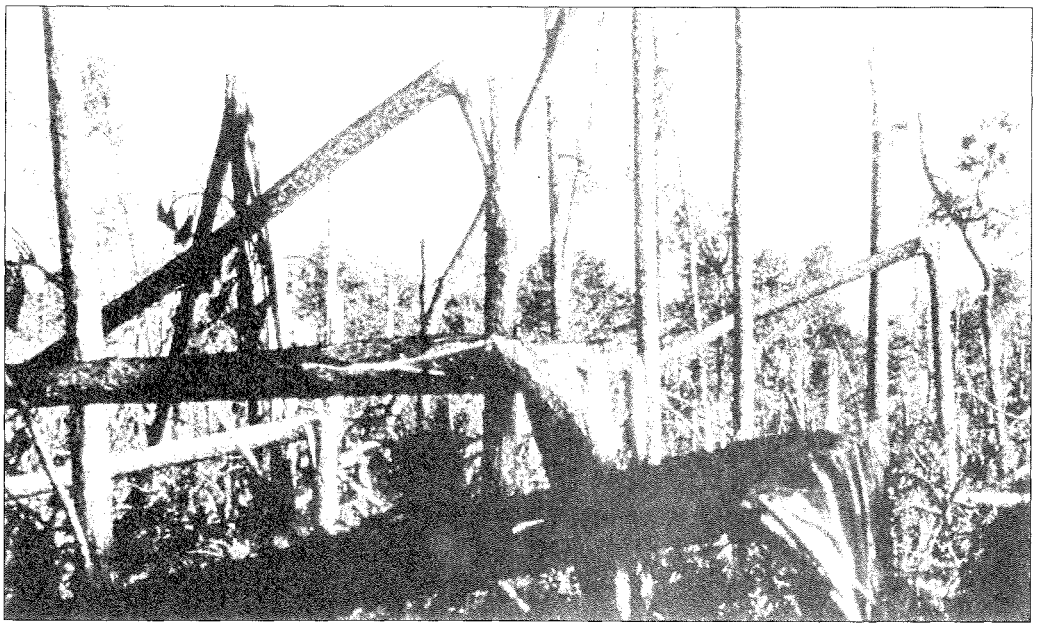
Environmental groups contended that the Forest Service's forest management plans for the southern national forests, which appeared in the mid-1980's, did not provide adequate protection for the red-cockaded woodpecker. Most criticism focused on the Forest Service's cluster-to-cluster approach for conserving nesting habitat. Essentially, each nest was to be surrounded by a 200-foot buffer and a 10-acre stand of older pine was to be preserved within three-quarters of a mile of it as a "recruitment" stand for population

expansion. The rest of the area surrounding the nest site was to be managed on a 70- or 80-year rotation, depending on pine species.[46]

Forest Service biologists analyzed population surveys in 1989 and found that 67 percent of the populations on national forests were in fact declining. Populations on four national forests appeared to have vanished. On March 27, 1989, pending the development of new management guidelines, Regional Forester John E. Alcock halted all timber sales within three-quarters of a mile of red-cockaded woodpecker clusters until the effects of the sales could be evaluated. The following May, Alcock issued interim management guidelines that essentially continued the moratorium on standard even-aged management near cluster sites.

In addition to the disappointing survey results on national forest lands, the recovery effort experienced another setback in 1989. Of the 15 populations, only 2 numbered more than the target level of 250 breeding groups; these were on the Apalachicola National Forest in Florida and the Francis Marion National Forest in South Carolina. In September of 1989, Hurricane Hugo devastated the latter, destroying 83 percent of the nests and reducing the population by about 65 percent.[47]

Despite Hurricane Hugo and the disappointing population trends, Forest Service wildlife biologists saw many reasons for long-term optimism when they looked at the long term. In the first place, scientific understanding of the species had improved. Serious research on the red-cockaded woodpecker had now been underway for 20 years. A number of research scientists and biologists had been studying the species throughout their professional lives,



COURTESY USDA FOREST SERVICE

Devastation from Hurricane Hugo.

and they developed an increasingly precise picture of what its habitat requirements were. Extensive research on snags and snag management for other cavity nesters also benefitted from the red-cockaded woodpecker recovery effort.[48]

COURTESY USDA FOREST SERVICE

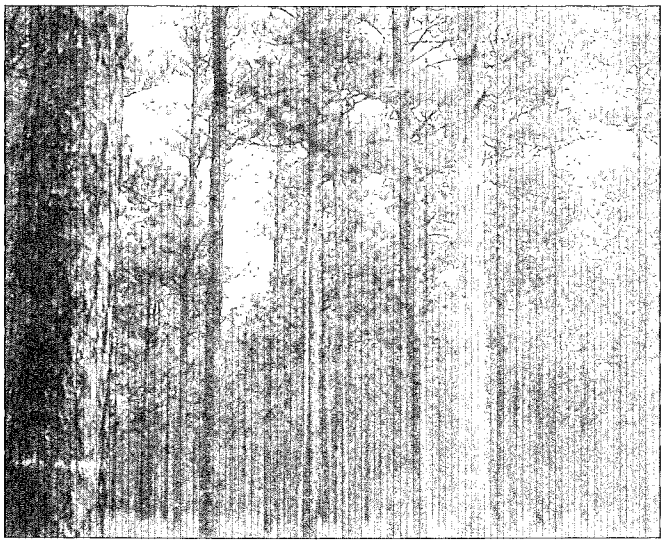
Forest Service worker creating cavity for the red-cockaded woodpecker.

Another cause for optimism was the success that research scientists and wildlife managers were having with artificial cavities. Wildlife biologists experimented with various techniques, the two most promising of which were drilled cavities and cavity inserts. Drilled cavities were developed by boring out a nesting or roosting cavity in the heartwood of the desired tree. A cavity insert resembles a typical bird box in appearance. However, a chain saw is used to cut a hole in the tree that is slightly larger than the insert. The insert is then placed in the hole and the excess area filled with wood putty. Both artificial cavity types are readily used by red-cockaded woodpeckers, providing suitable nest sites. Most pines in the Southeast are not old enough to be suitable for cavity excavation. In the judgment of Forest Service wildlife biologist Dennis L. Krusac, artificial cavities are critical to red-cockaded woodpecker recovery, because the current age of the forest does not provide suitable trees for natural cavity excavation.[49] In the years after Hurricane Hugo, Krusac believed, the Forest Service turned the corner in its effort to recover the species, through the agency's use of artificial cavities, translocation of young woodpeckers, aggressive midstory vegetation control, and a landscape-level approach to management.[50]

If the red-cockaded woodpecker is preserved over the long run, it will survive as a member of the managed forest on lands that are also used for the production of wood fiber. Recovery of the species will most likely be accomplished by coordinating timber management with the bird's specialized habitat needs, through a landscape-level approach to management.

COURTESY USDA FOREST SERVICE

The Forest Service worked to improve habitat for the red-cockaded woodpecker.



COURTESY USDA FOREST SERVICE

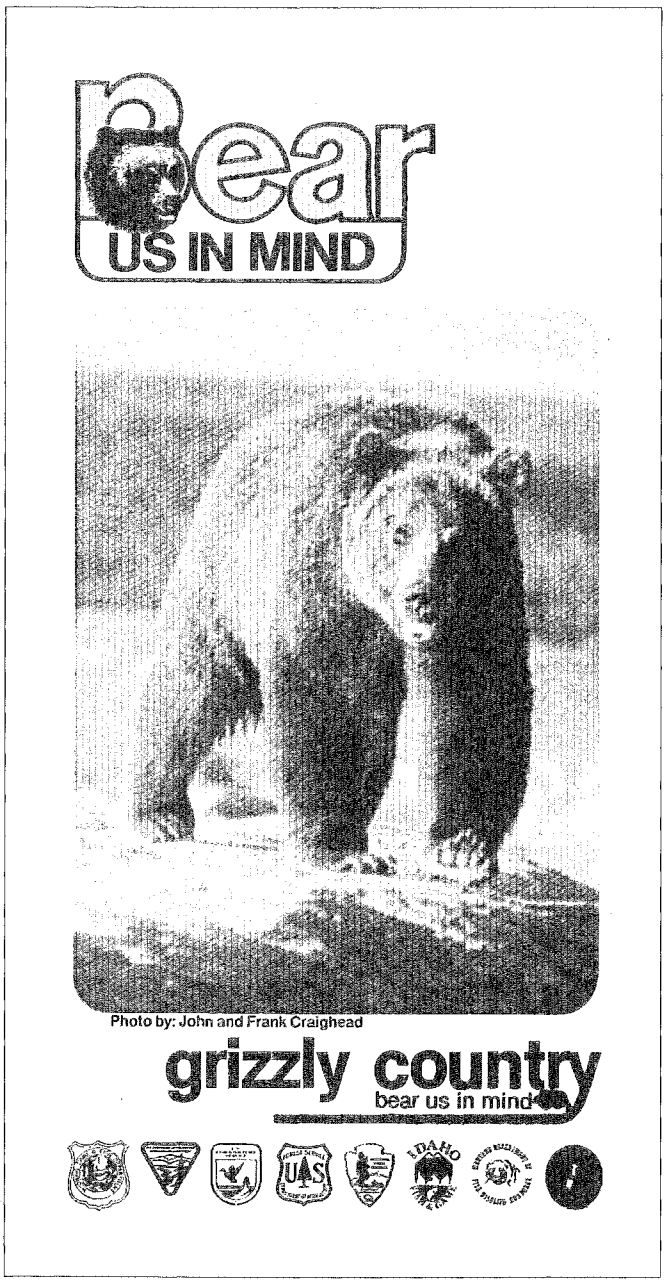
Marking a colony for the red-cockaded woodpecker.

The Grizzly Bear

Wildlife biologists once referred to species that require a lot of space apart from human development as "wilderness-dependent" species. "Wilderness" in this context represented something besides a game refuge or sanctuary where animals were protected from hunting; it referred to the animals' inability to thrive in proximity to various human land uses. The wildlife biologist Raymond Dasmann defined "wilderness species" as species that depend on "a climax community or wilderness area." Characteristically, these species were formerly abundant and now scarce, Dasmann noted. "The basic problem for their conservation," he wrote, "is that of maintaining undisturbed conditions."[51] After Congress designated certain lands as wilderness areas under the Wilderness Act of 1964, the term "wilderness-dependent" became freighted with new meaning. It was clear that efforts to recover a threatened or endangered "wilderness-dependent" species dovetailed with wilderness preservation. Wilderness advocates and wildlife conservationists alike pushed for more wilderness areas to protect these animals.[52]

Perhaps no other animal is more strongly associated with wilderness than the grizzly bear. This animal's present range within the contiguous United States is limited to certain areas in the Northern Rockies from Yellowstone through western Montana to the Idaho panhandle, plus a small population in the North Cascades of Washington. All but one of these areas centers on either a national park or wilderness area, and in all cases grizzlies range beyond the park or wilderness boundaries onto lands that are used for grazing, mining, and timber production as well as hunting and other recreational activities. Efforts to recover this wide-ranging species have involved an unusual level of interagency and Federal-State cooperation. The grizzly's association with wilderness— both in the abstract and with a capital "W"—has excited passions in the environmental community and among groups with a direct economic stake in the land.

Ironically, the grizzly bear is "wilderness-dependent" only in the broad sense that the species has been eliminated from most of its former range by the spread of human settlement. The grizzly bear is not a "wilderness species" in Dasmann's sense of the term; it is not dependent on "climax" or late-successional communities. Nor is it restricted to designated wilderness; indeed, grizzlies range onto nonwilderness and private land in many areas. Research over the past 30 years has shown that human-bear conflicts, which often lead to the destruction of the bear, pose the greatest threat to the species. Human modifications to grizzly habitat tend to be adverse primarily because this development tends to bring a greater level of human activity closer to the bears. The great bears cannot coexist with large numbers of humans, because conflicts often result in a bear being killed , or trapped and removed from populated areas.



COURTESY USDA FOREST SERVICE

This pamphlet urged visitors to national forests to take precautions when entering grizzly country.

The grizzly was once a plains animal. Mammalogists suggest that the grizzly's powerful build and aggressiveness are adaptations to its former plains environment, where the absence of cover required that it fight rather than flee its foes.[53] These evolutionary traits made the animal much more threatening to humans than its smaller cousin, the woodland-dwelling American black bear, and probably explain the grizzly's disappearance from lightly settled areas where black bears were able to persist. There may have been as many as 50,000 grizzlies in what is now the contiguous United States at the time of the Lewis and Clark expedition; by the 20th century their numbers had declined to less than 1,000.[54]

By the 1930's, the last two remaining North American strongholds of the grizzly outside of Alaska and Canada were already evident. Yellowstone National Park and the surrounding national forests in Montana, Idaho, and Wyoming composed one stronghold; Glacier National Park and the national forests to the west and south formed the second. Additional populations in Grand Teton National Park and national forests in Utah, Colorado, Arizona, and New Mexico appeared to be too small to survive. Although grizzly populations were protected in national parks, the parks were too small to ensure the survival of the species. Grizzlies had to be afforded greater protection on the national forests where their numbers continued to decline.[55]

Forest Service officials expressed hope in the 1930's that small populations of grizzlies might survive in several locations throughout the Rocky Mountains. There were insufficient funds, however, to research and manage the animal. A wildlife management handbook published by the Forest Service's Northern Region in 1957 contained not a single reference to the grizzly bear or its habitat.[56]

Modern research on the grizzly bear began in 1959 with the work of two brothers, John and Frank Craighead. What distinguished their work in Yellowstone from earlier field studies was the use of ear tags, and then radio-collar transmitters, to identify and track individual grizzlies. These techniques, together with the long-term nature of the study, provided a fuller picture of the biological and environmental factors that influence grizzly bear numbers. Ultimately the Craigheads' research pointed to the precariousness of the Yellowstone grizzly population and generated public interest in protecting that population from extinction.[57] Despite disagreements between the Craigheads and the National Park Service that resulted in termination of the Craigheads' study in Yellowstone National Park, grizzly bear research continued under the direction of the Interagency Grizzly Bear Study Team, established in 1974 and led by Dr. Dick Knight of the National Park Service. On September 1, 1975, 2 years after Congress passed the Endangered Species Act (ESA), the grizzly bear was listed as a threatened species in the lower 48 States.

The ESA directed all Federal agencies to develop conservation programs for threatened and endangered species and to ensure that land uses would not jeopardize the continued existence of such species or adversely modify or destroy critical habitat. Defining "critical habitat" had potentially far-reaching implications for the grizzly since it was found in widely distributed and variable habitats. Depending on the extent of area designated, as well as the restrictions on land uses that the critical habitat would require, the grizzly bear recovery effort could impact recreation, ranching, mining, and lumbering operations across a wide area. At three public hearings held in Cody and Jackson, Wyoming and Rexburg, Idaho, biologists with the Fish and Wildlife Service encountered bitter opposition to their plans. Many locals voiced concern that the economy of the region would be adversely affected.[58] As one student of the Endangered Species Act explains, "The designation of critical habitat moves the administrative process more clearly into the political arena because for the first time endangered species become spatial."[59] Nowhere was this more apparent than in the case of the grizzly bear.

The Fish and Wildlife Service moved cautiously to designate critical habitat for the grizzly bear. It had already published its general definition of critical habitat in the *Federal Register* in April 1975. Grizzly bear specialists and population biologists now debated how much space was required for each separate population of grizzlies. The debate turned on a related issue of some importance: how many individuals were required to constitute a "minimum viable population" (MVP).[60] The debate drew upon a growing body of work on island biogeography, which pointed to the importance of re-establishing links between separate populations—or corridors, in spatial terms—to maintain genetic diversity and to reduce the chances of any one population dying out.[61] It was hard to reconcile this spatial model with the FWS's definition of critical habitat, which stipulated that all critical habitat areas had to contain at least one habitat element that was critical to the survival of the species.

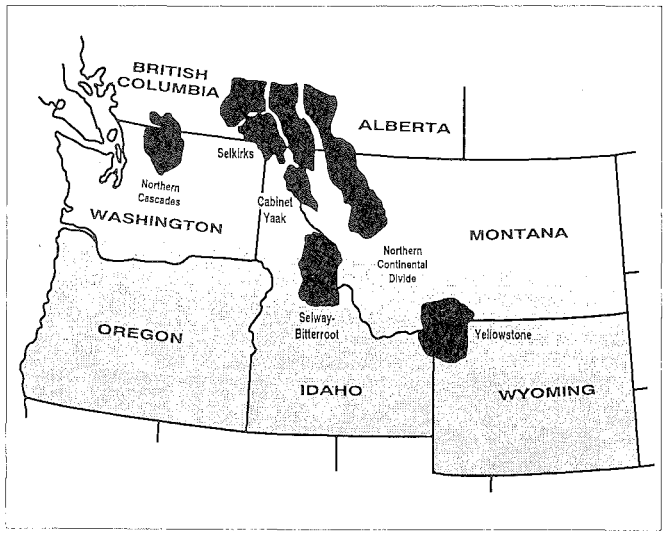
After several years of scientific debate, public hearings, and delicate negotiations between Federal, State, and tribal officials, it became obvious that all parties were interested in finding a workable alternative to critical habitat designation for the grizzly bear. The Shoshone National Forest in Wyoming, in cooperation with Yellowstone National Park, other national forests, and the Fish and Wildlife Service, devised an alternative known as the Interagency Grizzly Bear Guidelines. The guidelines recognized five levels of grizzly habitat. These levels were called "Management Situations" (MS) 1 to 5. Areas containing the best or most important grizzly habitat, where existing populations were centered, were classified as MS-1. Areas that were considered devoid of grizzly habitat components were classified as MS-5. The plan focused efforts on those areas classified as MS-1, MS-2, or MS-3. With the implementation of these guidelines in the early 1980's, the grizzly population in the Yellowstone area began a slow recovery.[62]

Meanwhile, the FWS finally issued a grizzly bear recovery plan in 1982. Six areas were designated as grizzly bear "recovery zones" comprised of area classifications MS-1 through MS-3. Four of these areas were contiguous with areas inhabited by grizzlies in the Canadian Rockies, two contained isolated populations, and one contained no known grizzlies but was suitable for grizzly reintroduction. The six areas totaled 20,000 square miles.[63] The recovery plan established a set of goals for each separate population. These included minimum numbers of females observed with cubs annually, limits on human-caused mortality both for the total population and specifically for females, and a spatial requirement that each population achieve distribution throughout the recovery zone. This last requirement was included to meet the Forest Service's NFMA Planning Regulation 219.19, which required that a population be well distributed throughout a planning area. Once all goals had been met for a given grizzly population, it could be proposed for delisting.[64] Inasmuch as some biologists believed that the separate populations ultimately had to be linked to preserve the species in the contiguous United States, this was another compromise between science and politics.

With the final approval of a recovery plan in 1982, the politics surrounding the grizzly changed. Now the focus shifted from recovery planning to management, from theory to practice. Questions about population viability and linkage corridors faded into the background while specific cases of human-related conflict, bear mortality, and habitat degradation came to the fore. Land managers took a lead role in resolving these issues, assisted by their staff biologists. To coordinate the recovery effort, the FWS appointed a National Grizzly Bear Recovery Coordinator in 1982, and the Forest Service followed in 1985 with the appointment of a National Grizzly Bear Habitat Coordinator to facilitate grizzly bear management on 18 national forests in four regions. Meanwhile, the Secretaries of Agriculture and the Interior and the governors of Montana, Idaho, Washington, and Wyoming chartered the Interagency Grizzly Bear Committee (IGBC) in 1983.[65]

The IGBC won praise as a successful instrument for implementing the ESA. Because of the complex administrative responsibilities and the amount of land involved in the recovery of the grizzly, interagency coordination and cooperation were vital. The Northern Continental Divide Ecosystem, for example, involved no fewer than eight agencies in the United States—three in the Department of the Interior, the Forest Service in the Department of Agriculture, two tribal governments, and two Montana departments—and others in Canada. Given the complexity of coordinating research and management across so many jurisdictional boundaries, the IGBC established a subcommittee for each of the six grizzly bear ecosystems. The subcommittees worked toward attaining the recovery goals specific to each area, while the IGBC itself concentrated on public involvement, research, and keeping the entire effort funded. The National Grizzly Bear Recovery Coordinators for the FWS and the Forest Service served as primary advisors to the IGBC and the subcommittees.[66]

The IGBC also strove from the beginning to protect the public credibility of the recovery plan and all the agencies that were involved with its implementation. Using the latest computer simulation models, the architects of the recovery plan had developed MVP's and recovery zones that gave the grizzly bear a reasonably high chance of survival over the long run. To their way of thinking, this represented the maximum protection for the grizzly that the political environment in 1975-1982 would allow. Environmentalists might continue to press for more protection while local ranchers and timber companies might continue to press for less, but government managers and biologists had to maintain their commitment to the 1982 recovery plan until such time as it was revised. If they battled each other then the whole recovery effort would likely collapse of its own weight. It was nothing new for biologists of different agencies to refrain from public criticism of each other, but the charged political and emotional atmosphere surrounding the conservation of the grizzly bear made this kind of interagency coordination all the more important.



COURTESY U.S. FISH & WILDLIFE SERVICE

Grizzly bear range in the Lower 48 and southern Canada, early 1990's.

Toward that end the IGBC updated the Interagency Grizzly Bear Guidelines, with its five levels of "Management Situations," and recommended them for use throughout all recovery areas. The guidelines were published in the *Federal Register* in 1986. This was a major step forward in ensuring that the fragmented land ownerships in each grizzly bear ecosystem did not defeat the recovery effort.[67]

COURTESY USDA FOREST SERVICE

Interagency Grizzly Bear Committee and support staff, 1986.

The management guidelines reflected the Forest Service's interest in coordinating grizzly conservation with other land uses. With approximately two-thirds of the recovery area being within the national forests, this was a matter of vital concern to the Forest Service and to the whole recovery effort. The Forest Service had initiated research on this problem in 1981.[68] By the mid-1980's, some bear researchers expressed optimism that carefully planned and regulated timber harvesting, livestock grazing, and mineral development could take place inside the recovery zones without undermining the recovery effort. Most importantly, roads and trails would be closed to motorized access most of the time in order to minimize human-bear conflicts and to provide more secure habitat for grizzlies.[69]

Environmental groups were skeptical. The Greater Yellowstone Coalition, an organization founded in 1983 to promote an ecosystem approach to resource management in the Yellowstone region, insisted that timber, grazing, and mineral values had no place in land use plans within the Greater Yellowstone Ecosystem.[70] The coalition wanted to use the grizzly bear's status under the ESA as a legal weapon for protecting the biological and aesthetic values in the region. The IGBC's management guidelines were not as prohibitive as environmentalists thought they should be.

The IGBC faced a tricky political problem in 1989. Montana's Director of Fish, Wildlife and Parks, Jim Flynn, wanted to have the relatively large grizzly population in the Northern Continental Divide Ecosystem delisted. He believed that the State would follow the IGBC's management guidelines, with the exception that it would allow a limited grizzly bear hunt. Governor Ted Schwinden obtained congressional support for this initiative. The IGBC proposed to transfer responsibility for the biological consultation process (under Section 7 of the ESA) to the Montana Department of Fish, Wildlife and Parks. Forest Service officials warned that the interagency cooperative effort would unravel if the IGBC did not accommodate the State of Montana. The IGBC was at an impasse when there was a change in the State governorship and the directorship of the Department of Fish, Wildlife and Parks. Montana's new governor, Stan Stephens, balked at the cost of taking over grizzly bear management from the Federal Government—an estimated half million dollars—and withdrew the State's request when the FWS could not guarantee that this level of funding would pass through to Montana.[71]

The grizzly bear recovery plan was revised in 1993. The plan included new population targets based on research and management since 1982. No populations had been delisted, although the grizzly population in the Northern Continental Divide Ecosystem was close to the target level. In addition, the plan recognized the importance of "linkage zones" between recovery zones. In the long term, biologists wanted to see grizzlies expand into these linkage zones and traverse the whole distance so that populations would no longer be genetically isolated from one another. Although the linkage zones had biological significance, they had no legal protection under the ESA. The recognition of unprotected linkage zones represented a delicate compromise between science and politics. Reintroduction of the grizzly to the Bitterroot Ecosystem promised to be the next important phase in the recovery effort—and the controversy was certain to persist into the next century.[72]

Interagency grizzly bear recovery efforts were showing positive results by the early 1990's. Human and livestock food sources were cleaned up or made more resistant to foraging bears, management actions that led directly to fewer dead bears. Mortality of grizzlies in most recovery zones was reduced and female bears were living longer. Female longevity was key—not only because the females lived to produce more cubs, but because these survivors were savvy individuals and good mothers who reared their young to avoid fatal encounters with humans. As a result, grizzly populations were expanding and individuals were dispersing many miles outside of some recovery areas. In the Northern Continental Divide Ecosystem, grizzlies were commonly found many miles east of the recovery area boundary on the Montana plains. In the Greater Yellowstone Ecosystem, bears were seen 40 to 50 miles south of the recovery area boundary. After 25 years of interagency cooperation, the future of the grizzly bear in the Lower 48 appeared to be much brighter.

Saving Endangered Species

Saving endangered species became one of the pillars of U.S. wildlife policy. This emphasis, however, is a relatively recent development. Although the Forest Service took steps to protect an endangered species as early as the 1930's by setting aside areas for the California condor, the agency devoted little effort to endangered species during the next 40 years. Other land management agencies similarly showed little enthusiasm for this issue.

Beginning with the ESA of 1973, the Forest Service took steps to improve its ability to coordinate traditional forest resource uses with the habitat requirements of endangered species.

As the bald eagle, red-cockaded woodpecker, and grizzly bear examples demonstrate, the Forest Service became an important player in the national policy of saving species from extinction. The agency also proved instrumental in saving the peregrine falcon and American alligator. Through the combined efforts of many Federal and State agencies, numerous species such as the Kirtland's warbler and the Mount Graham red squirrel also were saved, at least for the time being, from probable extinction. Even so, candidate species continued to be added to the list of endangered species faster than endangered species could be recovered or delisted. Judged by that standard, the overall conservation effort was falling short of its mark.

With the listing in 1990 of the northern spotted owl and later anadromous stocks of Pacific salmon—species whose habitat cover wide areas in the Pacific Northwest—it became evident that a new, more comprehensive approach was needed to save endangered species. Despite considerable controversy surrounding the Forest Service's record in managing the habitat of the northern spotted owl, the agency was strongly positioned to lead the recovery effort. That story is discussed in Chapter 11.

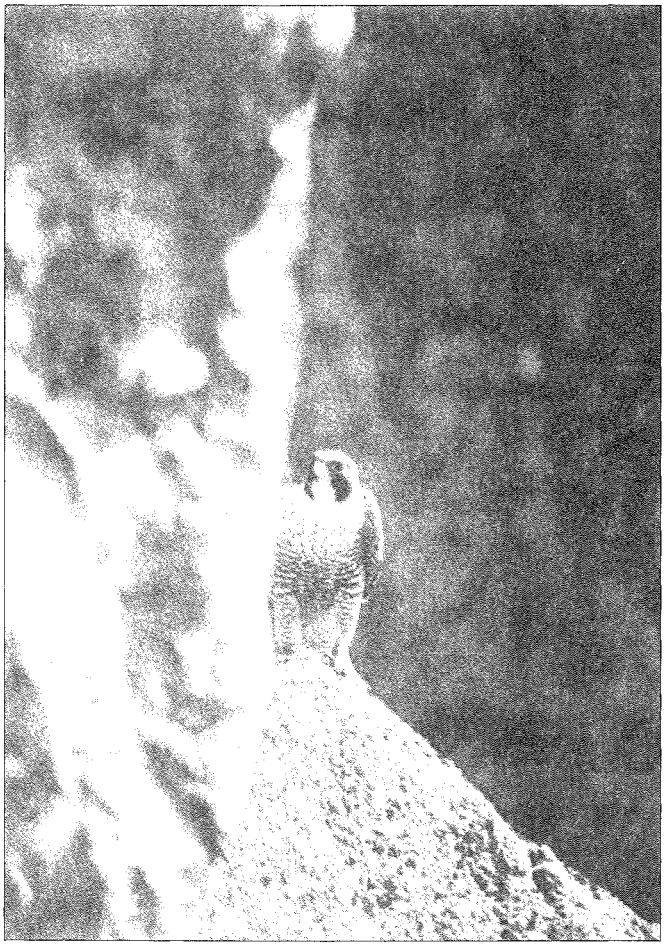
COURTESY T. HAMER, THE ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA

THE MARBLED MURRELET

During the 1990's, the marbled murrelet has rivaled the spotted owl as a bird of controversy in the Pacific Northwest. Although it feeds in marine waters, this elusive, dove-sized seabird flies inland up to 50 miles to breed in solitary nests in old-growth forests. Each year the female lays a single egg in a natural depression in a moss-covered limb. Dependent on older forests, the marbled murrelet has declined in population.

The bird's status has delayed timber harvesting activities throughout much of its range along the Pacific Coast. Due to the loss of forests, the State of California listed the species as endangered in 1991. That year, the U.S. Fish and Wildlife Service published a rule in the Federal Register to designate the marbled murrelet as a threatened species in Washington, Oregon, and California, due to loss of older forest nesting habitat as well as to threats posed by net fisheries and oil spills. In 1992, however, the Service announced a 6-month extension for determining the status of the species. After being taken to court for failing to meet the legal time frames provided in the Endangered Species Act, the Service listed the marbled murrelet as threatened.

In 1992, the Forest Service began a "Marbled Murrelet Conservation Assessment" to evaluate current habitat conditions to assist recovery efforts. Forest Service representatives joined a variety of wildlife managers and scientists to gather available data on the small seabird. They also evaluated current habitat conditions, and reviewed research and current investigations, outlining actions considered necessary to maintain viable populations.



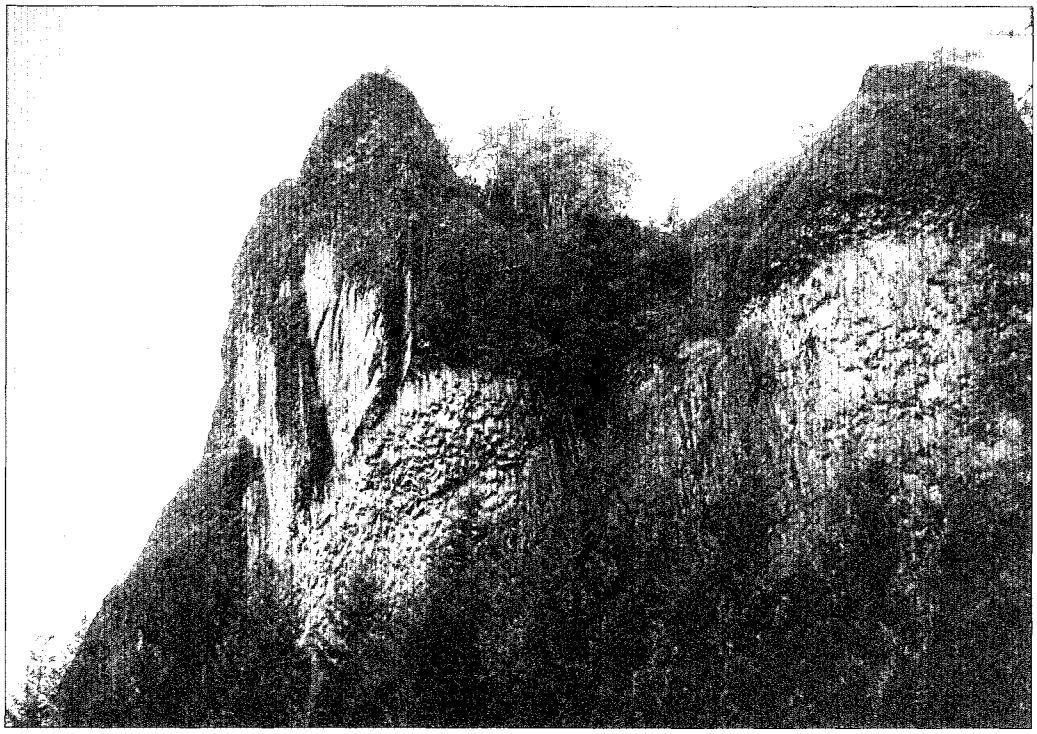
COURTESY JOEL E. "JEEP" PAGEL, USDA FOREST SERVICE

Adult peregrine falcon.

BACK FROM THE BRINK
POPULATION INCREASE OF THE PEREGRINE FALCON

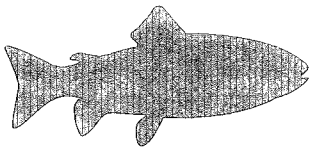
Peregrine falcons have been known throughout the world for their beauty and grace for thousands of years. Their name derives from the Latin word peregrinus, meaning "wanderer." These birds of prey are characterized by compact bodies and long pointed wings that allow them to fly—and dive—at great speeds. Peregrines nest on cliffs, feeding mostly on other birds, which they strike in flight.

Like bald eagles, brown pelicans, and ospreys, peregrine falcons suffered from the widespread use of the pesticide DDT after World War II. DDT consumed with prey species produced thinned eggshells that could not withstand the weight of incubating adults, resulting in accidental breakage of eggs. From the 1950's to the 1970's, the population of the peregrine falcon in the western United States dropped to only 20-40 known pairs. The population east of the Mississippi River was completely extirpated. Since the late 1970's, peregrine falcons have resurged into their historical habitat. To assist in this recovery, the Forest Service and other Federal and State agencies worked with organizations such as The Peregrine Fund and the California-based Santa Cruz Predatory Bird Research Group to release thousands of captive bred or raised birds. By the 1990's, the population of peregrine falcons had risen to at least 400-500 known pairs, located throughout the West. Approximately one-third of these birds can be found on national forests, while in Oregon, nearly 70 percent of the 56 known nest sites are found on national forests.



COURTESY JOEL E. "JEEP" PAGEL, USDA FOREST SERVICE

Single peregrine falcon site, Klamath National Forest.



CHAPTER NINE

CHAPTER NINE
MANAGING AQUATIC HABITATS

"Whether we are referring to the bass fisheries in Florida, the walleye fisheries in the Great Lakes States, or the trout and salmon fisheries in the Pacific Northwest and Alaska, the National Forests and Grasslands support world-class fisheries."

. . . F. Dale Robertson, Forest Service Chief.

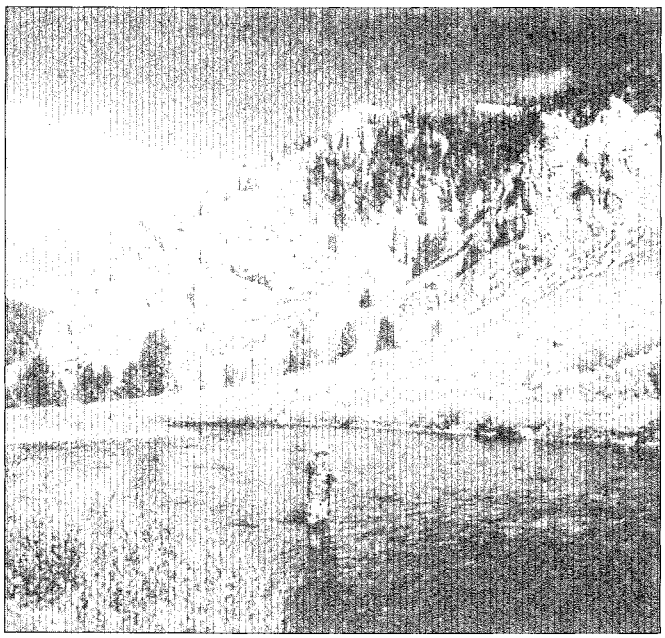
"Fish your national forests," the Forest Service urges the public under its new fisheries program, "Rise to the Future."[1] With an estimated 128,000 miles of streams and 2 million acres of lakes, the Forest Service boasts of being the largest fish habitat management agency in the world. Yet fisheries biologists were rare in the organization before the 1980's. At that time, it was not unusual for fisheries biologists to be assigned to multiple forests. As recently as 1979, the Forest Service's Southern Region employed only 4 fisheries biologists to manage aquatic habitat on more than 12 million acres of national forest—a ratio of 3 million acres per biologist.[2]

The national forests contain a large percentage of the Nation's blue-ribbon trout streams, and these waters were traditionally stocked with sport fish since the early 1900's. Other fisheries and aquatic habitats on the national forests—anadromous and warm water fisheries, wetlands, riparian zones—were largely neglected by the Forest Service until the advent of various environmental laws in the 1970's. The Forest Service significantly increased its emphasis of these resources only in the last two decades of the 20th century.

Managing Sport Fisheries Habitat in the 1940's and 1950's

The Civilian Conservation Corps (CCC) did much for the inland sport fishery in the 1930's (see Chapter 2). After the CCC was terminated in 1942 as a result of World War II, the Government had fewer people available for stocking streams and lakes and improving stream habitat. Fishery efforts nearly vanished from the Forest Service, as rangers and their limited staff assumed the task of overseeing stream habitat improvement. Sometimes working from specifications found in old water-stained handbooks from the CCC, more often proceeding by trial and error, the rangers generally made improvements on their own initiative. To help guide their efforts, Merle A. Gee, assistant director in the Division of Wildlife Management, Northern Region, collected what had been learned about construction and maintenance of these structures in a new Fish Stream Improvement Handbook, published in 1952 for systemwide distribution.[3]

These modest efforts were insufficient to keep up with the growing pressure on the resource from anglers. Recreational use of the national forests rose sharply in the first postwar decade, and the number of anglers who fished the streams and lakes increased by several fold. Sportsmen and conservationists demanded that more be done to improve aquatic environments. Congress passed the Dingell-Johnson Act in 1950, mandating Federal aid to



COURTESY USDA FOREST SERVICE

Population growth, prosperity, and restricted access to private lands led to a jump in recreational fishing on national forests in the 1950's.

the States for fish habitat restoration. This companion legislation to the Pittman-Robertson Act of 1937 established an excise tax on fishing tackle and earmarked the revenue for sport fishery conservation efforts. Like the Pittman-Robertson Act, the Federal law sought to foster State efforts. Money was provided for stream surveys, stream improvement, construction of water impoundments, and fishing access sites. Much of this early work, initiated and directed by State fish and game departments, took place on national forest lands in cooperation with the Forest Service.[4]

The Dingell-Johnson Act's emphasis on habitat *restoration* reflected an important change in thinking about fisheries and aquatic habitats. In the CCC era, fisheries biologists had focused efforts on habitat *improvement*. The CCC's construction of various small structures for the benefit of fish—check dams, fish dams, fish ladders, and the like—reflected in miniature the New Deal's enthusiasm for constructing grand hydroelectric dams. Rivers were regarded as latent resources awaiting development for power production, irrigation projects, and recreational use. Similarly, mountain lakes and streams were examined for their potential to support more fish. As fisheries biologists gained more experience managing fish streams in the 1930's, however, it became increasingly apparent that they were dealing with degraded systems. By the time Congress passed the Dingell-Johnson Act of 1950, restoration, not improvement, was the watchword for fisheries habitat management.

Forest Service research scientists and staff biologists on the forests contributed to the growing body of knowledge about how aquatic systems functioned. Biologists continued to enlarge the concept of aquatic habitats to include not only the physical and chemical properties of the water course itself but also the condition of the stream banks and the composition and the structure of plant communities of the entire watershed. Fish habitat improvement, it now seemed, required the restoration of larger ecosystems.

Streamside vegetation, streambank stability, and stream sedimentation were closely interrelated. Combined, they had a powerful influence on the quality of aquatic habitat. Streamside vegetation, for example, provided cover for aquatic life and protection from seasonal extremes of water temperature. Trees were important in riparian systems because their foliage provided shade and cover and their massive root systems provided streambank stability. When trees toppled into the stream and decayed, they fed organic material into

COURTESY USDA FOREST SERVICE

A Forest Service researcher takes a sample of the lake water to determine the oxygen content. Superior National Forest, 1940.

the system. Fallen trees also formed pools and riffles and affected the gradient and stability of the stream channel.[5] As biologists investigated the spreading ramifications of these many ecological factors, it became increasingly clear that good stewardship of fish habitats involved more than the construction of water impoundments and channel structures and the artificial planting of streambanks with willow cuttings. Rather, it involved a wider ecological perspective. Many of these inland fisheries were badly degraded after more than a century of adverse land use practices such as livestock grazing, timber harvest, and road building.

Despite the change in thinking, however, protective measures were slow to follow. Protection of fisheries habitats often conflicted with other long-standing uses of the national forests. Many western streams continued to suffer degradation by livestock grazing. Cattle tended to gather along streams where they could slake their thirst, graze on more succulent grasses, and rest under shade trees. The effects on fish habitat could be devastating.[6] When

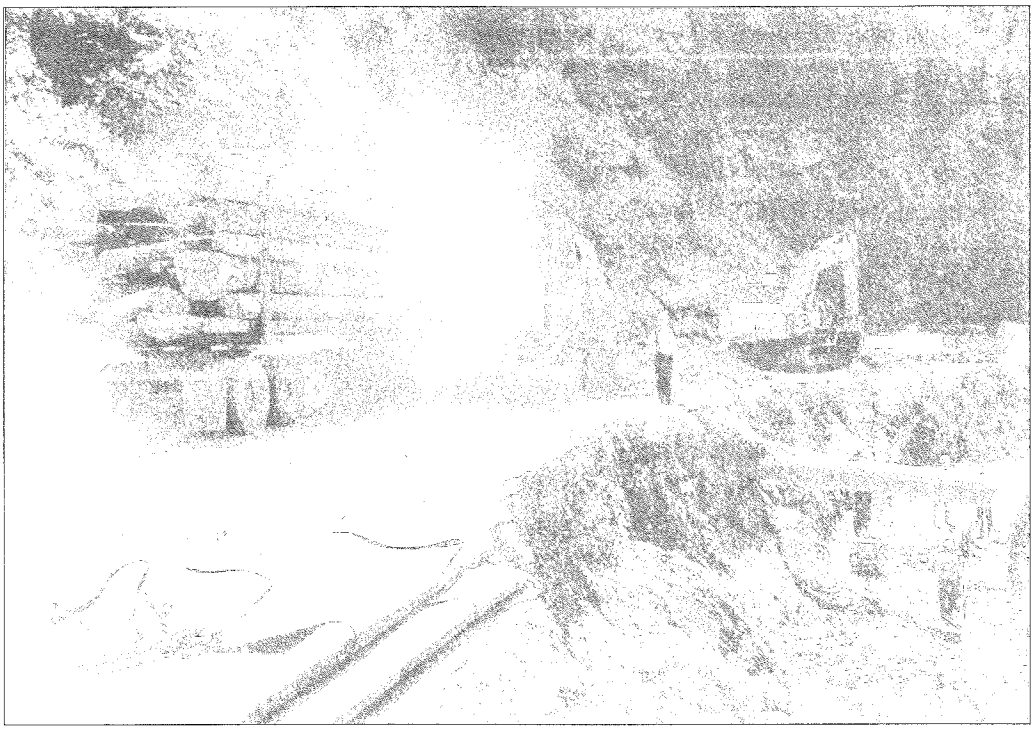
Forest Service officials tried to protect these areas, however, western stockgrowers usually complained about the interference with their grazing operations—and western politicians rallied to their side. Livestock grazing on the Bighorn National Forest in Wyoming was a case in point. In the 1950's, the forest supervisor encouraged his rangers to fence off 1-acre plots to check the effects of livestock grazing along stream courses. As soon as Rocky Mountain Regional Forester Ed Cliff tried to use that data to justify livestock reductions on those grazing districts, however, Wyoming's two senators persuaded Cliff to desist.[7] Although Forest Service officials were increasingly aware of the vulnerability of riparian areas to livestock use, the agency's multiple-use mission sometimes hamstrung their efforts to give these areas greater protection.

Concerns about Clearcuts

Fisheries experts had long been aware of the damaging effects of logging and associated road building on fish habitat. From Maine to California, streams on some national forests still showed the ravaging effects of 19th- and early-20th-century logging practices 50 to 100 years later. In particular, many streams had been devastated by the practice of piling logs into a streambed above and below a temporary "splash dam," removing the dam at the opportune time, and "booming" the logs downstream on a flood of water. The scouring effect of these log drives left streambanks denuded of woody debris and spawning beds choked with silt. Great log drives of the turn of the century had virtually sterilized some rivers in the Upper Midwest, turning them into "rivers of sand."[8]

As logging activity intensified on the national forests in the 1950's and 1960's, fish habitat was exposed to a new generation of clearcutting. The Forest Service's move to even-aged management, especially by clearcutting, raised new concerns for fish habitat. In many areas of the West, timber operations now advanced into remote mountain areas that had never before been logged. The proliferation of logging roads began to concern fisheries biologists outside the Forest Service as early as the 1950's. In this steep terrain, logging roads significantly increased soil erosion. An increase in soil erosion from logging roads and timber harvest increased turbidity in mountain streams and rivers. Fisheries biologists knew that greater turbidity affects the ability of fish to find food. High turbidity also inhibits light penetration so that photosynthesis by phytoplankton occurs only in the top layer of the water column, limiting the amount of nutrients in the water and the productivity of potential food sources for fish.[9]

Logging roads also combined with timber harvests to increase sedimentation. Stream sedimentation could harm fish habitat by settling in the gravel beds used by many species of fish for spawning. The deposition of sediment on spawning beds, biologists learned, could suffocate eggs and embryos by inhibiting the percolation of water through the gravels, thereby reducing the oxygen supply around the eggs and embryos. Sediment could also limit rearing habitat by filling in pools and spaces within gravel or cobble beds used by wintering fish.[10]



COURTESY USDA FOREST SERVICE

Logging roads can be a major source of fish habitat degradation.

Growing concern about the effects of logging roads on fish populations and habitat led the Forest Service to recruit a handful of new fisheries biologists in the 1960's. Their primary task was to improve coordination between timber management and protection of fish habitat. Leon Murphy was the first fisheries biologist appointed in the Forest Service's Pacific Northwest Region and one of the first in the Nation. He was a graduate of the University of Washington's School of Fisheries and a biologist with Idaho's Department of Fish and Game since 1949. When Murphy joined the Forest Service in 1966, the region had no written guidelines for mitigating logging effects on fish habitat. Murphy had to start from scratch. Yet he found his superiors responsive. On his first trip to the field, Murphy inspected a "very bad logging road" built along a stream. The road embankment wasted directly into the stream channel. He wrote a report to the regional forester, who promptly made the report a policy directive for future roadbuilding. By such small but significant increments, the Forest Service acted to mitigate the effects of logging on fish habitat.[11]

Logging roads were not the only threat that timber operations posed to this resource. Clearcutting itself was another concern. Although some environmentalists regarded the advent of clearcutting on the national forests as an abomination, this forest management practice differed in important ways from the uncontrolled logging that had occurred over much of the continent in the past. Clearcutting on a sustained yield basis usually involved cutting in patches of up to 200 acres. These clearcuts paralleled some natural occurrences such as burns, insect infestations, and blowdowns. As a substitute for these forest

rejuvenating events, they had some beneficial effects. Unfortunately, research findings on clearcutting in one stream drainage or forest type were not always applicable to other stream drainages and forest types. Moreover, the effects of clearcutting on wildlife habitat could be measured in a span of months, but the effects of those same habitat changes on fish populations were more complicated and long lasting and needed to be studied both in the short and long term. It was relatively easy for fisheries biologists to recognize impacts and damage occurring but it took much longer to gather the background data to support changes in management practices.[12]

Like logging roads, clearcuts were found to produce a number of changes in fish habitat. Clearcuts caused greater rates of soil erosion, thereby causing an increase in both turbidity and sedimentation in streams downslope. The removal of the tree canopy allowed more direct sunlight to enter the stream. More light penetration produced more photosynthesis as well as higher water temperatures. These effects were offset to one degree or another by increased turbidity, which blocked light penetration. In some cases, clearcuts were found to reduce the amount of organic detritus that entered the stream, which would in turn lower the level of dissolved nutrients in the water. Thus, they could affect the amount of food available for invertebrates, a vital link in the food chain between plants and fish. Finally, the removal of streamside vegetation reduced the amount of cover for some aquatic species, making them more vulnerable to predators.[13]

One of the first major studies of these impacts occurred on the Deerlodge National Forest in Montana. Gordon Haugen, fisheries biologist for the Lolo and Deerlodge National Forests, led a 7-year study of fish habitat and water quality in the Rock Creek watershed from 1969 to 1976. Rock Creek was designated as a blue-ribbon fishery by the Montana Department of Fish, Wildlife and Parks. A number of conservation groups in western Montana expressed concern about the impacts of logging and road construction in the watershed. The study involved sampling and analysis of water quality, measurement of water quantity, surveillance of the gravel bed environment, stream habitat surveys, and evaluation of salmonid populations in three sections of Rock Creek.[14]

As a result of this study, the Forest Service divided the watershed into four major management areas according to their principal resource values. Rock Creek's outstanding values for fishing were recognized in the designation of a 43,500-acre "canyon area." Timber values were to take precedence in a "forested uplands area." Wildlife habitat would receive first consideration in "high areas." Finally, a 40,000-acre area at the upper end of the drainage was within the Anaconda-Pintlar Wilderness Area and was managed according to the provisions of the Wilderness Act of 1964. The plan stipulated "coordinating requirements" for each of the nonwilderness areas, looking to the protection or utilization of soil, water, vegetative, and aesthetic and recreational resources.[15] In short, the Forest Service made many positive modifications to its timber program in the Rock Creek drainage to protect fish habitat.

At the time of the Rock Creek study, several other studies of logging effects on fish habitat were underway by the Forest Service's research scientists. In the 1960's, research stations began to add fisheries biologists to their staff of plant ecologists, hydrologists, and soil scientists. Research station staff also organized interdisciplinary teams of scientists that included fisheries biologists in universities and other agencies. On the Tongass National Forest in Alaska, for example, Forest Service researchers collaborated with University of Washington biologists on a long-term study of logging effects on pink salmon populations in four different streams.[16] On various experimental forests, meanwhile, researchers examined the effects of clearcutting on water temperatures, sedimentation, nutrient cycling, and other features of fish habitat.

One of the most controversial studies occurred on the Hubbard Brook Experimental Forest in New Hampshire. Researchers determined that the clearcutting of hardwood forest in this watershed led to a precipitous decline in soil fertility and thus to a loss of dissolved nutrients in the stream.[17] Further, the maximum recorded stream temperature of Hubbard Brook rose to 71 degrees after clearcutting, compared with a maximum temperature of 59 degrees in the control stream in an adjacent forested watershed.[18] The Hubbard Brook study appeared to be a harbinger of ecological disaster, and was cited in congressional testimony and in *The Report of the President's Advisory Panel on Timber and the Environment* (1973). Critics claimed the study results were misused. The experiment was directed at watershed research. After the hardwoods were cut, they had been left on the ground and the 40-acre site had been sprayed with herbicides over the next 3 years to prevent regrowth of vegetation. This was an extreme scenario and was not designed to simulate an actual forest treatment option. Other streams in the White Mountains of New Hampshire did not show such drastic effects after clearcutting. Moreover, research findings from experimental forests in West Virginia, Pennsylvania, and North Carolina suggested that nutrient loss varied greatly depending on soil types.[19] Nevertheless, ongoing research on Hubbard Brook continued to disclose broad patterns in nutrient cycling that appeared to be symptomatic of clearcutting elsewhere.[20]

Through the gradual accumulation of studies similar to the one on Hubbard Brook Experimental Forest, it became evident that the beneficial effects of clearcutting on streams seldom, if ever, outweighed the damaging effects in the long term. Still, some Forest Service biologists cited other complicating factors that supported the use of clearcuts. Monte Seehorn, the senior fisheries biologist in the Forest Service's Southern Region, came to champion even-aged forest management as the best way to achieve congressionally assigned timber targets—or "to get out the cut"—for the least amount of impact on the rivers and streams. Despite the soil erosion that occurred in clearcuts, Seehorn maintained, even-aged forest management was preferable to other silvicultural systems because when forests were harvested by clearcutting, harvest units were relatively compact and orderly, requiring less road construction and road use to access them. Minimizing road development reduced the amount of sedimentation. As much as 90 percent of the sediment in Southern Appalachian streams could be traced to logging roads, Seehorn maintained. There were numerous ways to mitigate these effects, Seehorn stressed, from modification of the way

the roads were located, built, and surfaced, to restrictions on the kinds of vehicles and tires that were allowed on them.[21]

Although he favored even-aged forest management, Seehorn remained concerned about the effects of clearcuts on stream temperatures. Several studies in the early 1970's documented temperature increases of 4 to 10 degrees centigrade in southeastern streams after removal of shade trees by logging. The temperatures of most Southern Appalachian streams were already at the upper limit in the thermal range preferred by brown and rainbow trout; consequently, such increases were apt to stress, if not eliminate, these coldwater fish populations.[22]

Forest Service biologists recognized that the surest way to mitigate the effects of clearcuts was to maintain "leave" or "buffer" strips. Instead of clearcutting to the edge of a stream, the timber harvester left a strip of forest between the clearcut and the water course. Buffer strips shaded the stream and held soil in place. Fisheries biologists considered buffer strips to be the single most important action the Forest Service could take to protect fish habitat. The Pacific Northwest and Pacific Southwest (California) Regions began to include a provision for buffer strips in timber sales as early as the 1960's.[23] The Southern Region soon followed. But without consistent standards and guidelines the practice did not become universal. Even when the Forest Service did write buffer strips into a timber sale, the lumber companies often violated the terms. Fisheries biologists were too few in number to review each timber sale contract, much less inspect the operation on the ground. It was obvious that these practices needed to be incorporated into timber sale design and contract enforcement.[24]

New fisheries biologists were recruited into the Forest Service following passage of the National Forest Management Act of 1976, strengthening management efforts. By 1982, the number of fisheries biologists in the Forest Service had reached 136; there were 22 in the Intermountain Region alone.[25] Most national forests in the West maintained at least one fisheries biologist on staff. Strong emphasis was placed on coordinating timber and range management with fish habitat protection.[26]

"Rise to the Future"

Trout Unlimited, a national conservation organization dedicated to the protection and improvement of recreational fishing opportunities, became one of the Forest Service's most important partners in the drive to restore inland fisheries. When the Forest Service began to release numerous national forest plans in the early-to-mid-1980's, Trout Unlimited publicized what it perceived as insufficient emphasis on the forests' cold water fisheries. Concerns raised by many of Trout Unlimited's members, chapters, and councils led the organization to pass a resolution at the March 1985 Board of Directors meeting in San Francisco.[27]

Willis Evans, a former Forest Service regional fisheries biologist from California, made a study of the agency's fisheries program on behalf of the American Fisheries Society in 1986. Evans found that the fisheries program had not been able to break out of its traditional mold as an accessory to the timber program. Evans also found that staffing

A Constituency Group At Work

Whereas, Trout Unlimited's primary goal is to protect and enhance the coldwater fishery of North America;

Whereas, significant coldwater fisheries occur on National forest lands; and

Whereas, the Forest Service is mandated to manage our forests for public benefit, including our char, trout and salmon renewable resources; and

Whereas, we are concerned about the fisheries and coldwater habitat plans in the emerging National Forest plans that will establish the management of each forest for the next fifty years as directed by Congress in the 1976 National Forest Management Act; and

Whereas, high quality coldwater habitat is decreasing nationwide and there is a large portion of this desirable habitat remaining on our National Forests; and

Whereas, there is increasing angler demand for a high quality fishery; and

Whereas, many of the draft plans do not appear to adequately address the effects of road construction and other activities; and

Whereas, production of large trees in the riparian zone is important to produce woody debris for instream cover and to provide shade to reduce water temperatures; and

Whereas, overgrazing compacts soils and reduces stream bank stability; therefore be it Resolved, that Trout Unlimited, represented by its National Board of Directors assembled in San Francisco, California, on March 9, 1985, requests that all draft Forest Service plans be reevaluated to assure that they protect and enhance the valuable coldwater fisheries of our forests and to assure that investments and adequate staffing are made to increase wild trout angling opportunities.

of fish biologists did not represent the size or complexity of the fishery resource. The Forest Service had been unable to appeal to fisheries constituency groups such as Trout Unlimited. For these reasons, Congress had not felt any pressure to increase appropriations for fish habitat enhancement. In 1986, the Forest Service's budget for fish habitat management stood at $12.4 million with all but $2 million of that committed to anadromous fish.[28]

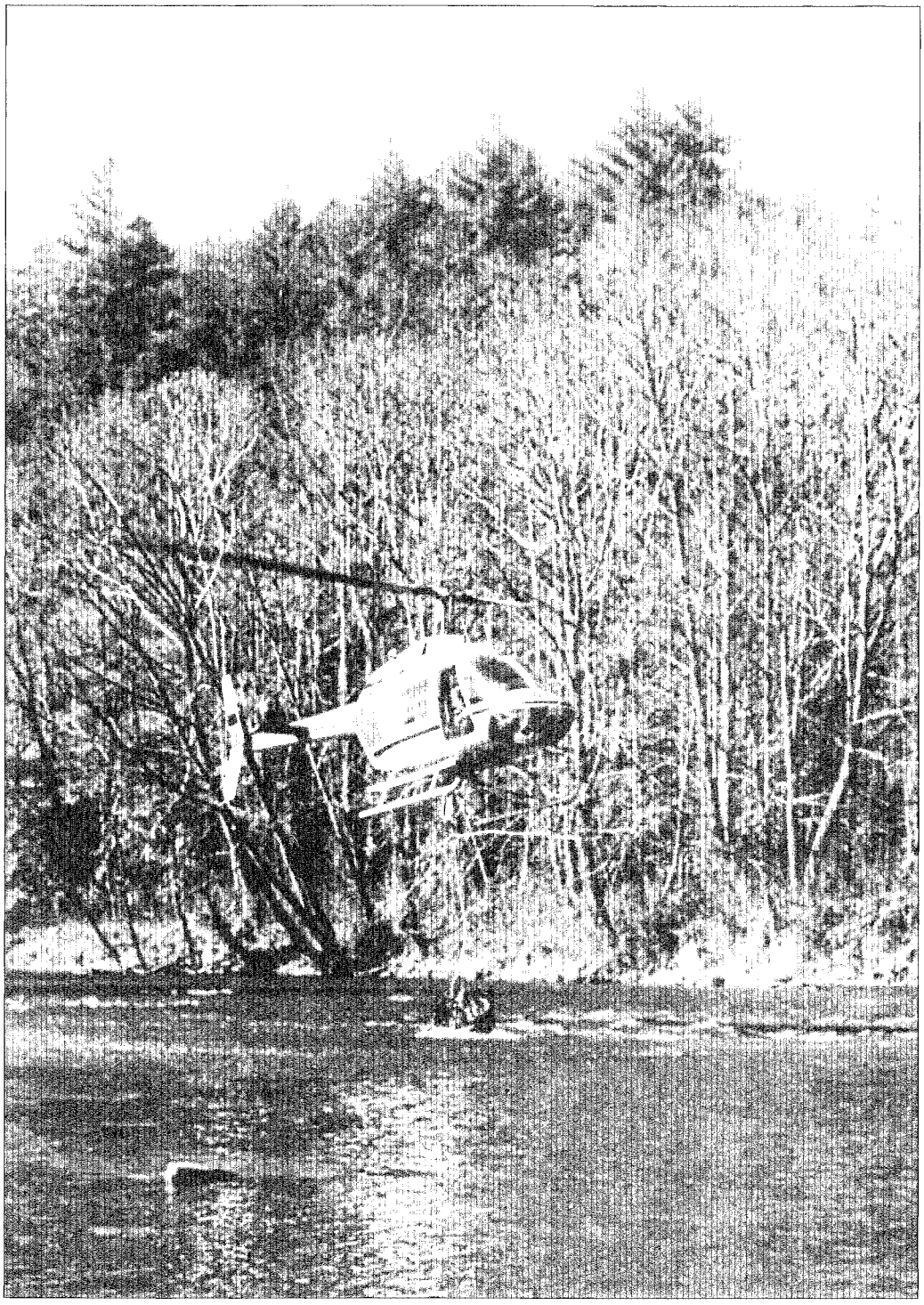
Robert D. Nelson, Director of the Wildlife, Fish, and Rare Plants Staff in the Washington Office, took the assessment by Willis Evans and information from other special interest groups and used it to develop a program aimed specifically at garnering public support for fish habitat enhancement. Nelson was assisted by a number of people, including Paul Brouha, who became executive vice president of the American Fisheries Society, Phil Janik, who became Deputy Chief of State and Private Forestry, and Michael Dombeck, who became Chief of the Forest Service. From this effort a Task Force produced a program titled "Rise to the Future." It was the first in a wave of new "partnership programs" (Chapter 10), initiated and approved by the Chief in March of 1987. Like other partnership programs, it sought to capitalize on the growing recreational use of national forests—to turn a resource demand into a source of strength for forest habitat restoration and improvement. The program aimed at raising funds and volunteers for cooperative habitat improvement and research projects with "partners" outside the Forest Service. Partners included constituency groups such as Trout Unlimited in addition to the Forest Service's traditional Federal and State partners. Nelson unveiled Rise to the Future at a regional foresters meeting, drawing the agency's top officials into the program's promotional spirit with party hats, smoked fish, and a slide presentation. Chief F. Dale Robertson declared himself 110 percent behind it. After this opener, the program rapidly got off the ground with help from "Fishnet," a group of conservation organizations based in the Washington, D.C. area.[29]

Rise to the Future stimulated a new wave of fish habitat improvement that surpassed the activity of the CCC era. Working with a variety of partners, Forest Service personnel completed improvements and restoration projects involving fish stocking, habitat enhancement, biological surveys, inventories, monitoring, and development of recreational fishing opportunities. Nelson secured bigger and bigger appropriations for fish habitat improvement, doubling the budget approximately every 2 years. The number of fishery biologists, meanwhile, climbed from 110 in 1986 to 290 in 1993.[30]

COURTESY USDA FOREST SERVICE

Beginning in the later 1980's, Forest Service efforts to promote the national forest sport fishery led to significant increases to program funding and fish habitat improvements.

Rise to the Future reaffirmed the Forest Service's traditional emphasis on stream habitat improvement and the propagation of sport fish for recreational use. Trout Unlimited was a major partner in the program, and projects involving trout dominated the program's early agenda. But the variety of projects under Rise to the Future also displayed the Forest Service's growing breadth of interest in nongame fish and other aquatic habitats including wetlands and riparian zones. Two years after launching Rise to the Future, the Forest Service joined 65 other administrative authorities in signing the National Recreational Fisheries Policy. The policy committed the Forest Service to work closely with the Bureau of Land Management (BLM) and to develop and implement partnerships with non-Government organizations, individual anglers, the recreational fishing industry, and others to improve the quality and quantity of fisheries. It provided a framework intended to guide and encourage Federal agencies with fisheries resource responsibilities. The policy also recognized agency stewardship responsibilities—now broadly defined as conserving healthy ecosystems—in addition to the growth in demand for recreational opportunities. In 1991, the Forest Service added another partnership program, "Bring Back the Natives," to its overall fisheries effort. In partnership with the BLM and National Fish and Wildlife Foundation, Bring Back the Natives focused on restoring the health of inland cold water fisheries and their native species.[31]

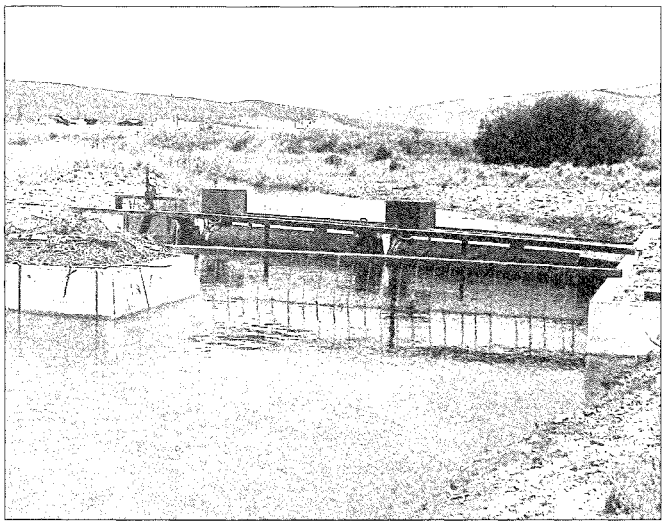


COURTESY USDA FOREST SERVICE

Forest Service helicopter releases trout into the Chattooga River, Chattahooche-Oconee National Forest.

COURTESY GLEN CONTRERAS, USDA FOREST SERVICE

Forest Service and Alaska Department of Fish and Game biologists trapping anadromous fish fry in river areas with large, woody debris, Misty Fjords National Monument, Tongass National Forest.



COURTESY GLEN CONTRERAS, USDA FOREST SERVICE

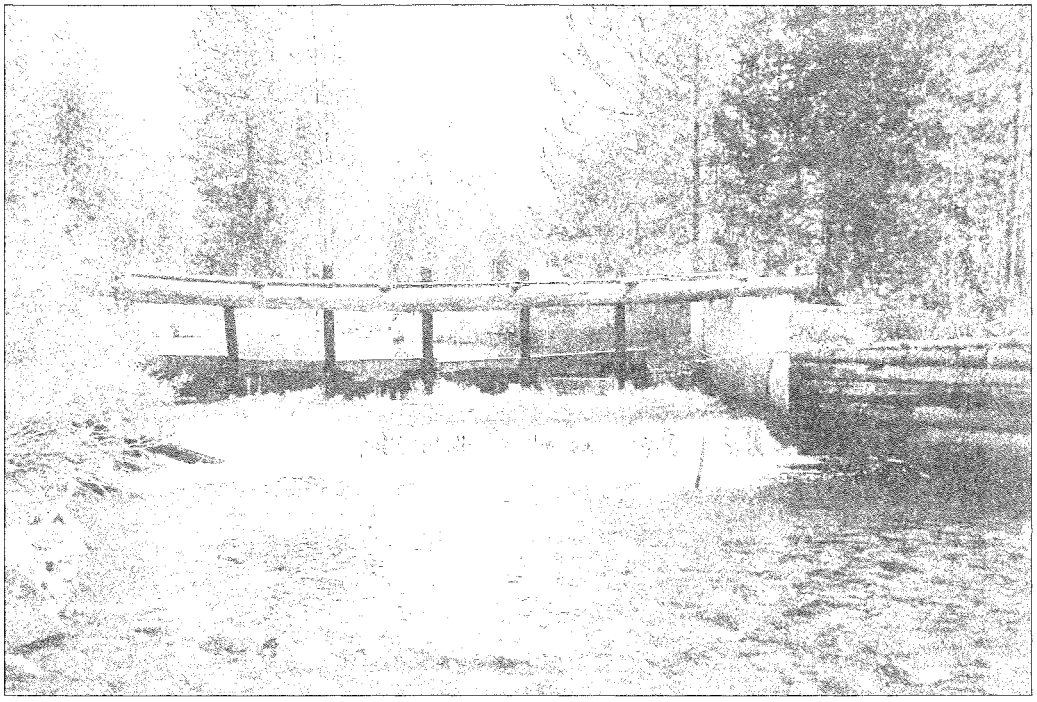
The Forest Service joined the Idaho Department of Fish and Game and National Marine Fisheries Service in a basinwide effort to improve conditions for anadromous fish in the upper Salmon River. Constructed in the mid 1970's, rotary fish screens kept fry and other small fish from becoming diverted into pastures via the diversion ditch. The drum mesh is small enough to keep fish in the pool area, where they are "bypassed" through a pipe and back into the parent stream.

COURTESY GLEN CONTRERAS, USDA FOREST SERVICE

Pictured here are chinook salmon fry trapped in an irrigation diversion ditch on the Sawtooth National Recreation Area, Sawtooth National Forest, before screens were in place. Thousands of fry were lost this way every year.

COURTESY RON MEDEL, USDA FOREST SERVICE

Forest Service fisheries biologist rescuing a chinook salmon in Alturas Lake Creek from dewatered stream channel, below an irrigation diversion, Sawtooth National Recreation Area, Sawtooth National Forest.



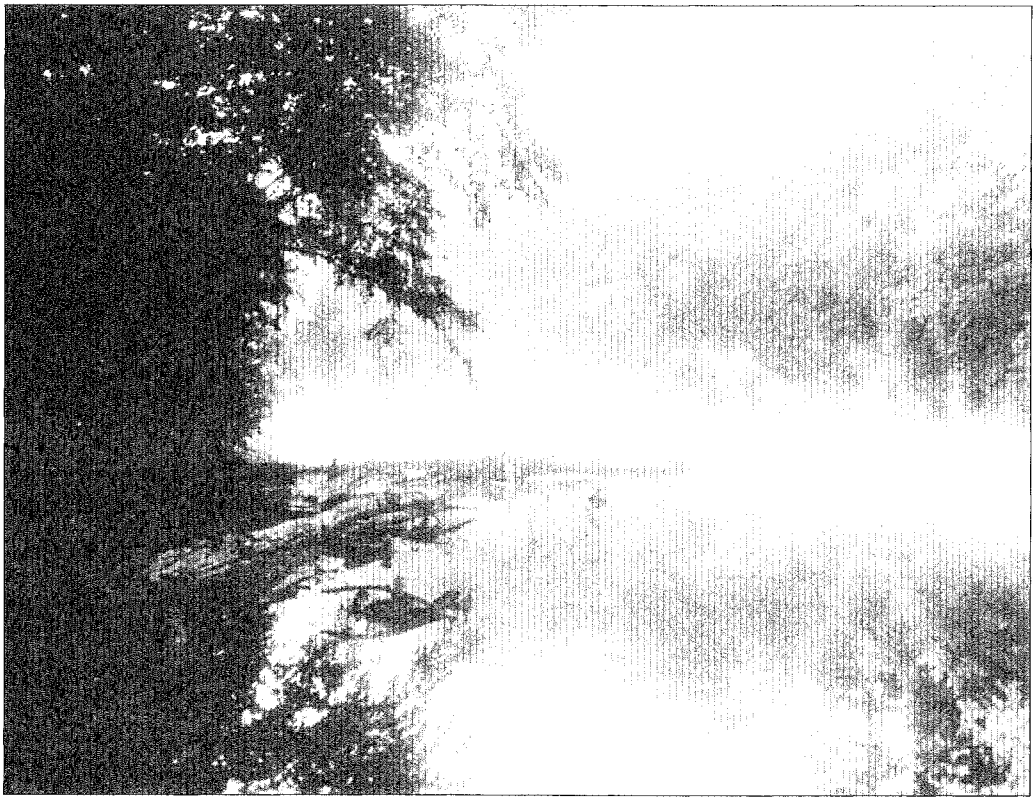
COURTESY SAWTOOTH NATIONAL RECREATION AREA, SAWTOOTH NATIONAL FOREST

Irrigation diversion in place (top) and diversion removed (bottom), restoring fish passage in Alturas Lake Creek, Sawtooth National Recreation Area, Sawtooth National Forest.

COURTESY SAWTOOTH NATIONAL RECREATION AREA, SAWTOOTH NATIONAL FOREST

Wetlands Management

The environmental movement awakened the public's interest in wetlands. Formerly regarded as worthless by most people, wetlands acquired new significance as more people embraced ecological perspectives in the 1960's and 1970's. Wetlands were now recognized to comprise numerous public resources and benefits, including wildlife and wildlife habitat, preservation of rare species and species diversity, ground and surface water quality, flood water retention, and recreation. Although wetlands were not conspicuous in the national forests nationwide, they were an important feature in some regions. National forests in Alaska, Minnesota, North Carolina, and Florida all contained extensive wetlands.[32]

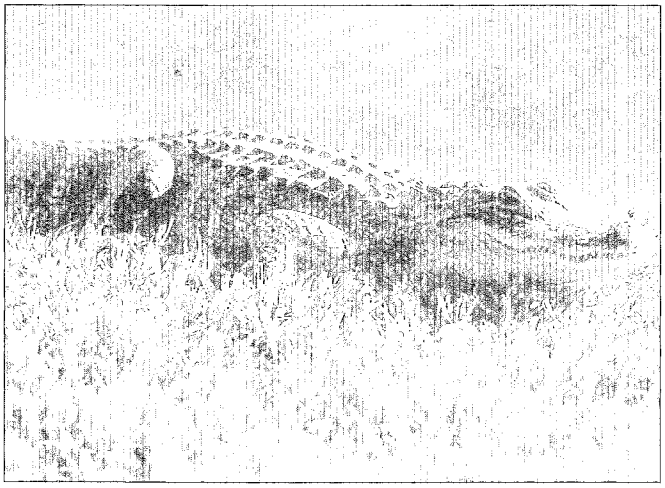


COURTESY USDA FOREST SERVICE

Croatan National Forest, North Carolina.

The environmental movement highlighted the fragmented, contradictory status of Federal wetlands policy. Prior to the 1960's, Federal leadership in wetlands conservation was vested in the Fish and Wildlife Service, with sister agencies such as the Forest Service and Bureau of Land Management offering minimal support. Other Federal agencies such as the U.S. Army Corps of Engineers, the Bureau of Reclamation, and the Soil Conservation Service pursued actions that often led to destruction of wetlands. Interagency cooperation in wetlands conservation began to improve under various environmental laws enacted in the late 1960's and early 1970's, including the Land and Water Conservation Fund Act of 1968 and the Clean Water Act of 1972. Finally, a pair of executive orders issued by President Jimmy Carter in 1977 marked a turning point in Federal wetlands policy. The two

executive orders required all Federal agencies to review their policies and provide leadership in the conservation of wetlands, riparian systems, and floodplains. This led to a concerted effort by Federal agencies to classify and inventory all wetlands during the 1980's, culminating in the pronouncement of "no net loss" as the cornerstone of national wetlands policy in the 1990's. In the long course of development of Federal wetlands policy, the Forest Service gradually assumed a significant role in research and management.[33]

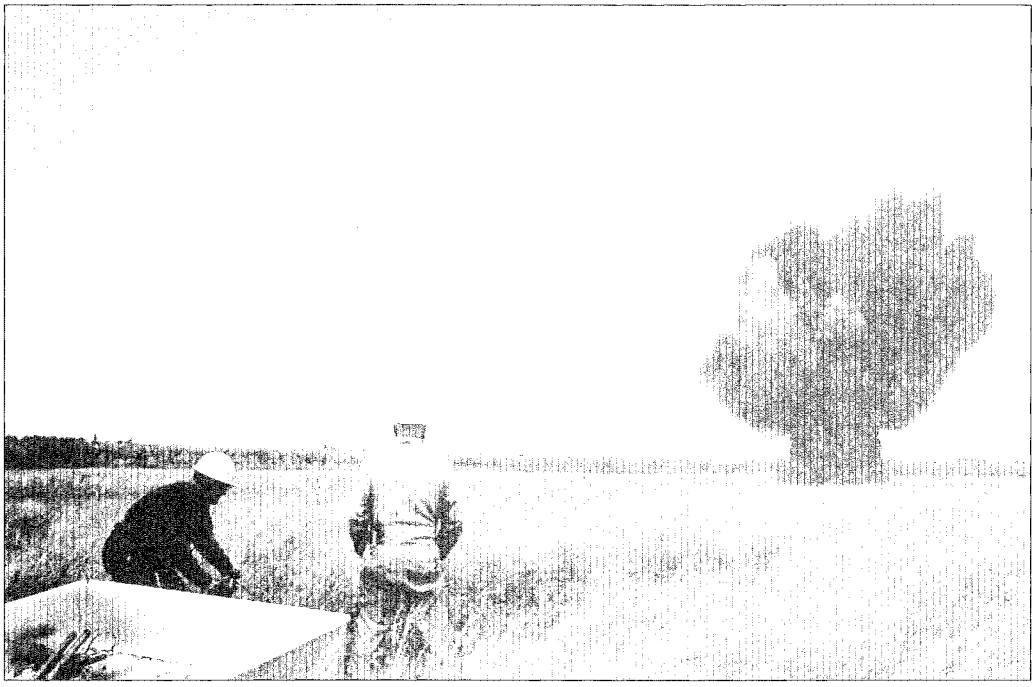


COURTESY USDA FOREST SERVICE

Aquatic habitat is home to the alligator.

Early efforts to conserve wetlands on the national forests varied enormously from region to region. One of the first systematic efforts to inventory lakes and ponds and classify all wetland areas occurred on Minnesota's Chippewa National Forest in 1965. The national forest staff classified nearly one-fourth of the forest's land base as wetland and prepared a model wetlands management plan.[34] More typical of this period were the pioneering efforts of ranger-biologists Ben Sanders and Mickey Beland, who poured their entire $200 budget for wildlife into gas money and drove the backroads of Florida's Ocala National Forest in a mud-caked jeep, inventorying the area's waterfowl and alligator habitat. In another instance, wildlife biologist Leon Fisher championed wetland acquisition for waterfowl on the Modoc National Forest in northeast California in the early 1970's. Modest though these individual efforts were, they helped to establish wetlands management as a part of national forest administration.[35]

Most national forests did not allocate funds for classification and inventory of wetlands until the late 1970's. Nevertheless, the new wave of planning for wildlife and fish habitat management that was initiated under the Sikes Act of 1974 pointed toward greater protection of wetlands. The Sikes Act sought to promote closer cooperation between the Forest Service and State fish and game departments. By 1976, the Forest Service had completed 18 new fish and wildlife management plans in cooperation with the States, each one giving specific attention to wetlands management. These plans outlined procedures and provided cost estimates for a variety of wetland habitat improvements, including the development of potholes, food plantings, nesting cover, and nest structures.[36] Most improvements were aimed at increasing populations of waterfowl and furbearers. Characteristically, the Forest Service preferred to modify these areas rather than leave them alone. On some national forests, biologists claimed to observe immediate and dramatic results for wildlife after such improvements were completed.[37]



COURTESY USDA FOREST SERVICE

A crew uses explosives to create pot holes for waterfowl on Leech Lake, Chippewa National Forest, 1967.

At the same time that Sikes Act plans were being developed, biologists began to appreciate the significance of riparian areas in the semi-arid and arid regions of the West. These areas were easily overlooked. Small in total acreage, they did not amount to very much in the various national surveys of wetlands that had been conducted since the 1950's. Biologists had long recognized that riparian areas, like forest edges, held unusual concentrations of species diversity; now they learned that these areas were extraordinarily productive as well. It was in the conservation of riparian zones that the Forest Service emerged as a significant partner in the conservation of wetlands.

Riparian Zones

In 1973, officials of the Salt River Water Project in central Arizona began leveling the vegetation along the banks of the Verde River, in the belief that the cottonwood trees and other riparian trees and plants soaked up water better used by the city of Phoenix. Appalled by this short-sightedness, ranger Doug Morrison stopped the bulldozers at the boundary of the Coconino National Forest until a study could be made. He then enlisted the help of two biologists, Steve Carothers of the Museum of Northern Arizona and Roy Johnson of the National Park Service, to inventory the breeding bird population in this riparian habitat. The biologists discovered that the Verde River bottomlands contained the highest density of breeding birds on the entire continent. This dramatic discovery sparked interest in the Southwest's riparian zones and soon positioned the Forest Service to lead other land managing agencies in the effort to conserve riparian habitat.[38]

The first task was to define what riparian zones were. Wetlands and riparian zones had much in common, but biologists generally came to associate wetlands with standing waters and riparian zones with flowing waters. Wetlands were usually classified in terms of acreage, riparian zones as linear systems bordering rivers and streams.[39] In the East, riparian zones occurred over broad areas of bottomlands where they were hardly distinguishable from wetlands. In the semi-arid West, however, riparian zones tended to be well defined, with very different characteristics than the surrounding uplands. Biologists pointed to three characteristics of riparian zones in western rangelands in addition to their linear shape: they were small in total area, they were generally more productive in terms of biomass than the remainder of the area, and they were a critical source of biodiversity within the larger area.

Riparian zones were vulnerable. As Jack Ward Thomas, then a research biologist at the Pacific Northwest Forest and Range Experiment Station pointed out, both wildlife and people used these areas disproportionately more than the surrounding lands. Wildlife sought riparian zones for food, shelter, water, and migration corridors; people exploited them for grazing and watering livestock, recreational pursuits, and as convenient routes for roads and highways. His study of riparian zones in southeastern Oregon, co-authored with Chris Maser of the Bureau of Land Management and Jon E. Rodiek of the University of Arizona, sought to alert land managers to this danger.[40]

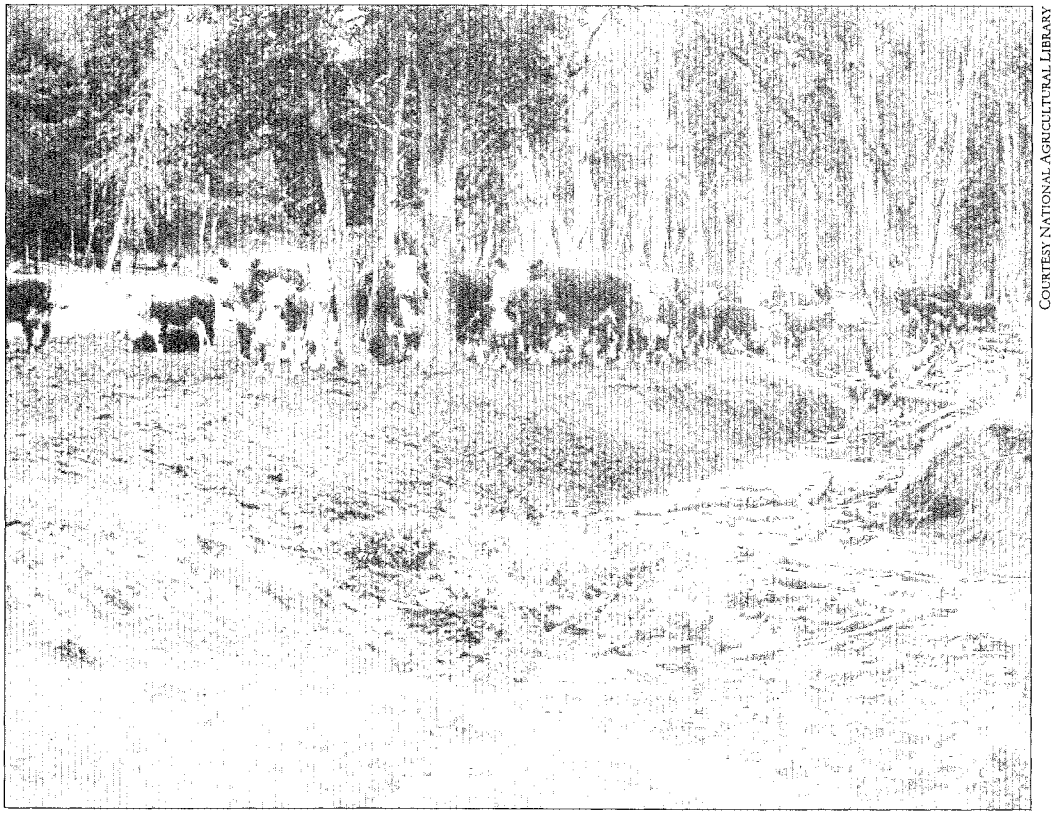
COURTESY USDA FOREST SERVICE

Livestock and people, as well as wildlife, are attracted to riparian areas.

The Forest Service and the National Park Service co-sponsored the first symposium on riparian habitat in Tucson, Arizona, in July 1977. Participants focused on the importance of these areas for maintaining biological diversity and the difficulty of managing these areas in the face of existing adverse land uses. Following the symposium, Forest Service Chief John McGuire formed a task force to review the agency's management of riparian zones on the national forests and grasslands and to recommend a new national policy.[41]

The task force urged the adoption of four principles for managing riparian zones. These principles straddled the line between protection of biodiversity and multiple-use management. On the one hand, the Forest Service would "plan for and manage riparian ecosystems with full recognition of their importance and unique values." On the other hand, the agency would "manage riparian ecosystems as an integral component of the adjacent lands, under the principles of multiple-use and sustained yield." The Forest Service would seek to improve riparian ecosystems as one of its basic stewardship responsibilities, and it would continue research programs on the management of riparian ecosystems for water, fish, wildlife, timber, livestock, and recreation values and uses.[42]

The most vexing problem was how to coordinate livestock grazing use with the protection of riparian habitat. In the mid-1970's, it was still the Forest Service's practice to combine riparian and upland areas within the same grazing units. Cattle tended to gather in the stream bottoms where the riparian vegetation was more palatable, drinking water was nearby, and shade was available. Even in the winter, stream bottoms often attracted cattle as a place to get out of the wind.[43] By the late 1970's, aquatic biologists were urging the Forest Service to divide riparian and upland areas into two separate entities for purposes of rangeland management.[44] But the cost of erecting and maintaining fences to keep cattle out of riparian areas seemed prohibitively high, and livestock owners resisted the idea. Indeed,



COURTESY NATIONAL AGRICULTURAL LIBRARY

From the Forest Services' earliest days, livestock management has been crucial to habitat restoration in many riparian areas.

the National Cattlemen's Association passed a resolution at its 1982 annual meeting opposing proposals by the Forest Service and the Bureau of Land Management (BLM) for fencing riparian areas.[45]

In addition to fencing priority areas when possible, the Forest Service tried a number of less stringent measures to protect and restore riparian habitat. These included the rest rotation grazing system, reductions of permitted stock in the grazing unit, livestock water developments in the uplands, shrub and tree plantings in the riparian zones, and herding of livestock to ensure limited grazing use of the riparian zones. Only the last method proved very successful in restoring riparian vegetation.[46]

The Forest Service sponsored other symposia on riparian habitat and emerged as a leader in bringing attention to this issue, but actual improvement of riparian conditions continued to elude many forest managers.[47] In 1987, the House Subcommittee on National Parks and Public Lands commissioned a study by the General Accounting Office (GAO). This agency found that improvement in livestock management was the key to restoring riparian habitat, and that both the Forest Service and BLM had made only limited progress. The GAO recommended that the Forest Service and BLM establish measurable goals, such as miles of riparian areas to be restored each year, and monitor their progress. The Forest Service endorsed the report's findings and recommendations.[48] By then, it seemed, resource managers had a fairly sound understanding of the problems surrounding riparian zones; the challenge was to find the funds and political will necessary for providing these areas greater protection.

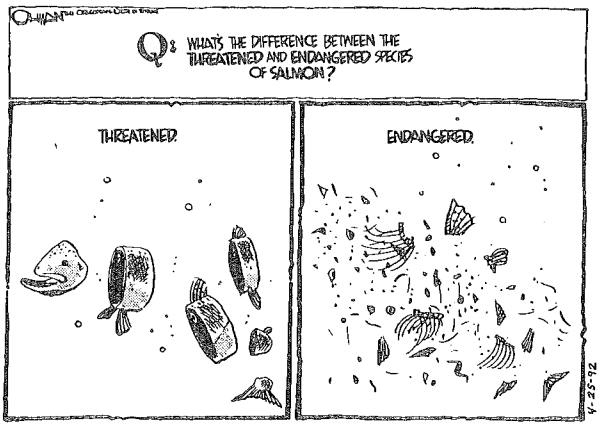
Despite the slowness with which riparian habitat was being restored, there were reasons to expect an improving outlook in the future. First, researchers and land managers had learned that degraded riparian systems could recover fairly quickly under the right management. Second, the demand for recreational fishing use of these areas was likely to increase. While there were still very few streams in the West where the economic value of resident sport fishing outweighed the economic value of livestock grazing, the cost-benefit ratio was gradually changing in favor of the fishery resource. Under the Forest Service's multiple-use mission, there would be a growing incentive for the land manager to provide more miles of fishing streams by curtailing the use of these same areas for livestock grazing.[49]

Anadromous Fisheries

In the 1980's, the Forest Service gave increasing attention to anadromous fisheries (primarily Pacific salmon streams in Alaska, Washington, Idaho, Oregon, and California). Salmon differed from trout in that they were harvested commercially in the ocean.[50] In the early 1980's, the value of the salmon harvest rose significantly, topping $300 million per year. After processing, salmon products reached a total market value of about $1 billion. Pacific salmon were one of the three most valuable marine commercial fisheries in the United States. The growth of the industry was fueled primarily by price increases, as the market value quadrupled between 1950 and 1980. Although the salmon industry remained only a fraction of the size of the timber industry in the Pacific Northwest, the Forest Service came to regard these fish as a significant economic product of the national forests.[51]

In its second 5-year report under the Resources Planning Act, *The 1980 Report to Congress on the Nation's Renewable Resources*, the Forest Service projected cumulative benefits from fish habitat improvement that would result in significant increases in harvests of anadromous fish by the end of the decade, "with the greatest surge in production expected in Alaska." Total output of anadromous fisheries on the national forests was projected to grow from less than a million pounds in 1980 to somewhere between 14 and 25 million pounds by the year 2000.[52] These projections assumed a much greater commitment to stream habitat management than in the past—more, it soon developed, than either Congress or the Reagan administration was willing to sustain.

Increased emphasis on the anadromous fisheries of the Pacific Northwest also reflected concerns about the outlook for certain salmon stocks. The salmon that spawn in each separate stream system are called a stock, and one stock is genetically distinct from another. Numerous stocks were already extinct; indeed, some stocks had vanished very early in the modern development of the Columbia River Basin. In 1980, biologists did not foresee the extent to which major stocks of Columbia and Snake River salmon would decline in the course of the decade, but they did recognize that these populations were in trouble. Part of the reason for conserving anadromous fish habitat on the national forests was to compensate for pressures on the species elsewhere, from harvest pressure at sea to the large multipurpose dams along the Columbia and Snake Rivers, which impeded salmon migration particularly for outmigrants. The Federal Government constructed large hydroelectric projects in the Columbia Basin from the 1930's through the 1970's. The construction of major dams, particularly in the West, ended with the passage of the Wild and Scenic Rivers Act of 1968, championed by Senator Frank Church of Idaho.[53]



COURTESY *THE OREGONIAN*

Anadromous fish habitat management on the national forests had to take into account the migratory behavior of these fish. Anadromous fish hatch in freshwater streams, travel downstream to the ocean, where they mature, and return to their home streams to spawn. The salmon's migratory behavior makes the species vulnerable to environmental changes all along its path to the sea and back. Large, multipurpose dams on the Columbia River system were identified as a major cause of salmon losses, along with pollution from city sewage and agricultural and industrial effluents that entered the river far downstream from the rivers' headwaters on the national forests.

Dams and Anadromous Fish

Large, multipurpose dams are a major cause of declining salmon and steelhead populations in the Columbia River Basin. Juvenile fish migrating downstream encounter a variety of hazards, including turbines. These devices operate as giant water wheels with large, smooth blades that can prove lethal to fish. During the low-flow years of 1973 to 1977, only limited spill over the dams was available—and nearly all juvenile fish had to pass through the turbines. Some biologists estimate that as many as 95 to 99 percent of the juvenile migrants died during those years.

Juvenile fish also suffer from delays in migration. The large, multipurpose dams on the lower Columbia and Snake rivers—constructed from the 1930's through the 1970's—controlled the seasonal flooding that once rapidly carried the young fish to the sea. As a result of the dams, impounded water moves more slowly, delaying juvenile migration as much as a month, which prolongs exposure to disease and predators.

Gas bubble disease is another serious cause of anadromous fish loss. As water plunges down a dam's spillway, the churning motion causes gas, mostly nitrogen, to be pressurized in the stilling basin and dissolved in the river. Entrained air that occurs naturally, such as in a waterfall, quickly returns to the atmosphere, just as dissolved nitrogen in a fast-moving river is rapidly freed. Dams, however, create slack-water, low-entrained air. Fish absorb the dissolved gas, which causes emboli, erupting in bubbles in their flesh and bloodstream. The symptoms are dramatic: salmon with gas bubble disease develop blistered scales as well as swollen and ruptured eyes. In 1971, biologists estimated that gas bubble disease killed 70 percent of the downstream migrants.

Courtesy USDA Forest Service

The Columbia was once the premiere salmon river in the northwest.

Anadromous fish habitat on the national forests was important because it was in these waters that the wild runs of salmon reproduce. For sockeye, chinook, coho, pink, and chum salmon the return to their home streams marks the end of the life cycle; steelhead do not always die after spawning. Salmon and steelhead typically spawn in cool, swift-moving water near riffles that keep eggs oxygenated. Like trout, they need silt-free gravel beds to spawn successfully. Thus, the same impacts of logging that affected inland fish such as trout also affected salmon.

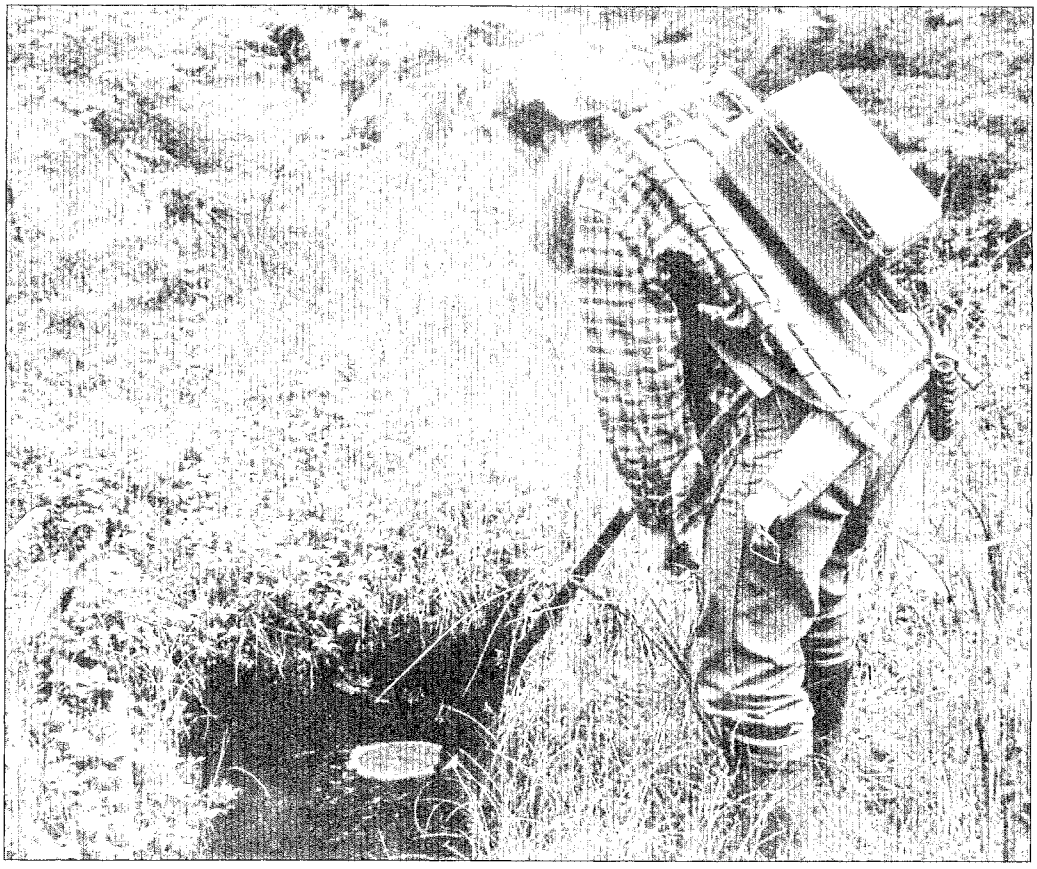
The Forest Service program now went beyond coordination with timber management to include "habitat enhancement." Past logging operations had degraded many salmon streams, and the agency experimented with various techniques for restoring and enhancing habitat. In some ways, the program was reminiscent of stream habitat improvement work in the CCC era. The program differed from earlier efforts, however, in its attention to many specific fish habitat requirements and management techniques that were formerly unknown to biologists.[54]

One significant change in thinking since the 1930's involved the role of large woody debris in the stream channel. In that earlier period, logs were often tractor-yarded down river channels and roads were located along streambanks with hardly a thought given to the fish habitat. Logging slash and road construction debris were often piled in the streambed. Although forest managers squelched these practices in the 1960's and 1970's, they sometimes overcompensated for past degradation. Now logging contractors were required to do so much cleanup that streambeds were often denuded of large woody debris. By 1980, fisheries researchers and biologists were finding that this material, now often missing from streams, was crucial for anchoring the stream channel and gravel bars in a streambed.[55]

Fisheries biologist James E. Doyle headed a program of habitat enhancement on the Mt. Baker-Snoqualmie National Forest in Washington in the early 1980's. The Mt. Baker-Snoqualmie National Forest encompasses the upper reaches of several rivers that drain the west slope of the Cascades and flow into Puget Sound. The focus of this program was to give anadromous salmon access to two types of small aquatic environments that Doyle described as "off-channels" and "terraced tributaries." Off-channels were subsidiary channels within the active floodplain that were blocked by gravel bars. Terraced tributaries were those streams that cut through the lower terrace in the floodplain before entering the main channel. In either case, the water was able to percolate downstream through loose gravel material while the anadromous fish were unable to swim upstream into these areas. Research suggested that these small features had special value as sheltered wintering areas for juvenile salmon. Doyle described a variety of structures that were employed in making these features accessible again: log weirs, deflector logs, digger logs, and the deliberate placement of boulders and root wads.[56]

Habitat restoration and enhancement took a unique form on the Ketchikan Ranger District of the Tongass National Forest in Alaska, where a combination of major flood events, mining, road construction, and hydroelectric development on the upper Salmon River in the

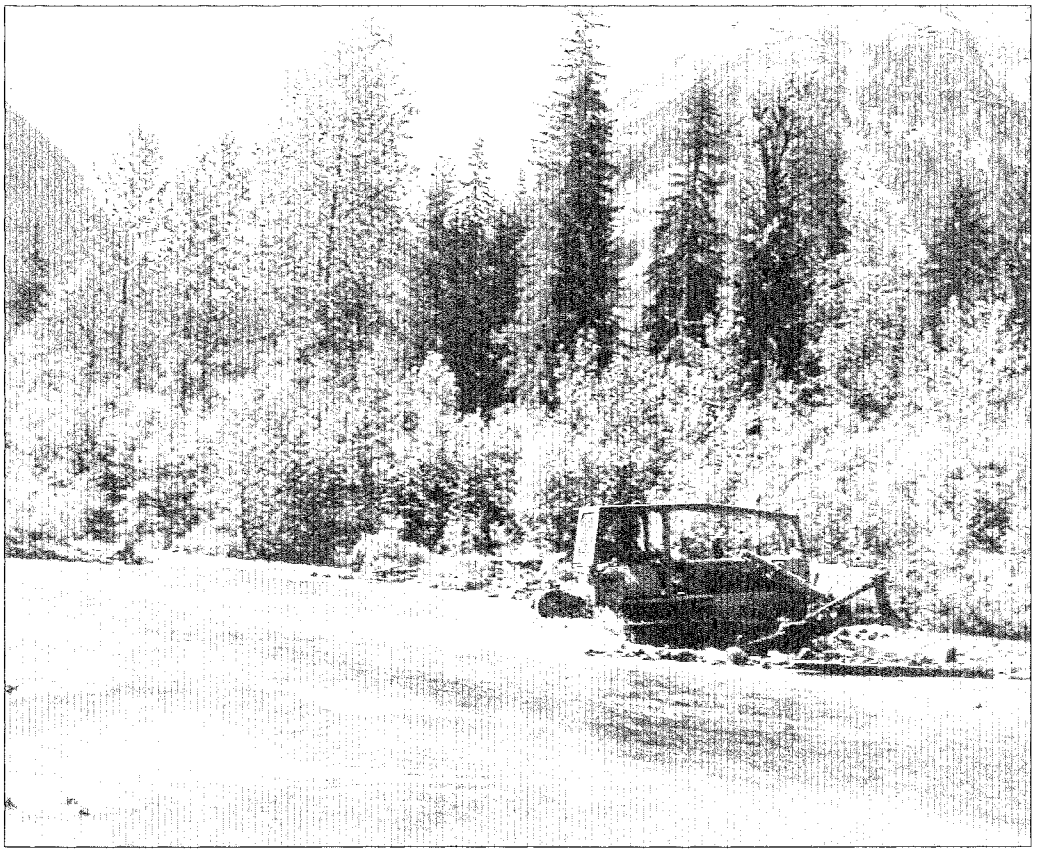
1960's and 1970's had adversely affected a key spawning area for a major stock of chum salmon. This large-sized stock of chum salmon are dependent on upwelling of water sources for spawning habitat. It was found that the worst harm to the habitat came from major flood events that changed channel courses as well as from silt deposition on top of the spawning areas. Rehabilitation of the spawning habitat began in the early 1970's with the construction of a road and dike system to prevent further flood damage. This was a cooperative effort involving the Alaska Department of Fish and Game, National Marine Fisheries Service, Forest Service, Fish and Wildlife Service, and Granduc Mining Company. A second phase of the work, conducted by the Alaska Department of Fish and Game, National Marine Fisheries Service, Forest Service, and Alaska Department of Highways, involved the removal of beaver dams and log jams to restore a stream gradient and flow necessary for chum salmon spawning, and overburdens of gravel and silt deposited by the floods. Counts of the total escapement of chum salmon made in 1982 and 1983 confirmed that these improvements had enhanced the productivity of the stock.[57]



COURTESY USDA FOREST SERVICE

Survey and improvement of salmon streams extended into the upper reaches of drainages. Here a biological technician uses an electroshocker to inventory salmon on the Tongass National Forest. The device paralyzes the fish long enough for the researcher to identify the species and take notes, Tongass National Forest, 1981.

Forest Service biologists undertook similar projects in Oregon and northern California, where sedimentation of spawning areas was responsible for an estimated 75 percent of the degradation of anadromous fish habitat. Sedimentation was attributed to erosion caused by past logging and road building practices, as well as from severe floods and landslides. To counteract this trend, the Forest Service experimented with a variety of techniques. Boulders and other instream structures were strategically placed to manipulate river currents. As biologist Joseph K. Moreau of the Six Rivers National Forest described this work, the intent was "to mimic natural conditions which create productive habitat." The currents would sort bed materials and cause local scour and aggradation, creating new spawning and rearing sites.[58]



COURTESY GLEN CONTRERAS, USDA FOREST SERVICE

Forest Service staff, along with personnel from the National Marine Fisheries Service and Alaska Department of Fish and Game, worked to restore chum salmon spawning area, Fish Creek, Tongass National Forest.

COURTESY GLEN CONTRERAS, USDA FOREST SERVICE

Fish Creek, on the Tongass National Forest, provided a high-quality chum salmon spawning habitat.

By 1990, the scientific thinking about anadromous fish habitat management had changed again. Too often, some critics asserted, habitat enhancement projects were not achieving the greater production levels that fisheries biologists anticipated. Limited funding gave rise to myriad projects of a limited size. These projects, often directed at increasing the amount of gravel substrate and pools that the salmon required for spawning and rearing, did not adequately consider collateral effects on salmon habitat such as sedimentation, channel morphology, and stream temperature. Because of funding shortages, habitat enhancement projects tended to be so small scale that they were overshadowed by other changes upstream or downstream.[59]

The new thinking in the 1990's also stressed the need to consider environmental changes in a longer time frame. Researchers and resource managers had to distinguish the influence of past logging practices from present and future practices, and to consider the role of natural disturbances as well. "After decades of work, we still cannot predict biotic changes from measured changes in the physical environment of watersheds or stream channels," wrote two Forest Service scientists with the Pacific Southwest Forest and Range Experiment Station.[60] They believed that it was time to develop an ecosystem approach to anadromous fish habitat management.

PACFISH and INFISH

In 1991, the Endangered Species Committee of the American Fisheries Society published its report on Pacific anadromous fish stocks outside of Alaska. The findings were alarming. More than half of all stocks in Washington, Idaho, Oregon, and California were at risk of extinction or of "special concern." Despite broad-based efforts to mitigate effects of hydropower, agriculture, logging, and overfishing, the authors of the report revealed, most stocks continued to decline. The authors called for "a new paradigm that advances habitat restoration and ecosystem function rather than hatchery production."[61] Underscoring the seriousness of the situation, three stocks of anadromous fish in the Snake River basin were listed under the Endangered Species Act that same year. Senator Mark Hatfield of Oregon responded to these developments by sponsoring a "salmon summit" of Federal land

managers, tribal governments, industries, and conservation groups to determine a plan for joint action. The Forest Service pledged to take action in four key areas: to acquire riparian land, to improve management of grazing allotments, to improve management of mineral claims, and to inventory needs for irrigation diversion screens. In addition, the agency began to develop a comprehensive strategy for managing anadromous fish habitat on national forests in the Columbia River Basin.[62]

With 70 percent of anadromous fish habitat in the basin occurring on 10 national forests, the Forest Service became deeply concerned about the effects that protection of these endangered species would have on forest plans. An analysis of the economic impacts on timber, rangeland, recreation, and minerals management programs for these national forests showed that the effects could be significant if the whole area were designated as critical habitat.[63] The study pointed to the need for a bold plan to improve Pacific salmon and steelhead habitat management and to mitigate the effects of other forest uses on these fish populations.

The strategy, known as "PACFISH," was inaugurated in 1993. The strategy called for delineation of riparian habitat conservation areas (RHCA's) along all perennial and intermittent streams in watersheds supporting anadromous fish. It specified riparian management objectives (RMO's) to assure maintenance or restoration of good quality fish habitat in the RHCA's. It included detailed specification of management standards and guidelines, and it looked to the restoration of anadromous fish habitat in additional watersheds. In 1993, the Bureau of Land Management joined the Forest Service's strategy effort, and its scope was broadened to include anadromous fish habitat on lands managed by the BLM.[64]

By the time the Decision Notice was signed on February 24, 1995, PACFISH had grown into one of the most intensive interagency efforts in the Pacific Northwest. The Forest Service and the BLM entered into special consultation with the National Marine Fisheries Service (NMFS) under Section 7 of the Endangered Species Act for evaluating whether or not the agencies' land managing activities had the potential to affect salmonids and fish habitat in upper Columbia River streams. In some instances, the NMFS mandated that the Forest Service and the BLM revise and upgrade their monitoring procedures. An interagency team prepared a new "monitoring protocol" for the Upper Columbia River Basin.[65]

Meanwhile, public concern about declining resident native fish populations outside of anadromous fish habitat led to a similar strategy for protecting these inland habitat areas. These fish were at risk, due to habitat degradation, introduction of exotic species, and overharvesting. Called the "Inland Native Fish Strategy," or INFISH, this counterpart to PACFISH also employed riparian management objectives (RMO's), standards and guidelines, and monitoring protocols. A Decision Notice for INFISH was signed in July 1995.

Growing concerns about the quality of inland fisheries, wetlands, riparian zones, and the sustainability of anadromous fish stocks all contributed to a significantly expanded effort in managing aquatic habitats. The commitment was charted in terms of program growth. In the Southern Region, for example, the program grew from a half million dollars and six biologists in 1985 to nearly 2 million dollars and 22 biologists in 1990.[66] The commitment was also apparent in terms of program development. Most important of these was "Rise to the Future," a fisheries management program directed at the improvement of fish habitats, recreational opportunities, and developing partnerships throughout the national forest system. Through Rise to the Future and other programs concerning threatened and endangered species, fisheries biologists assumed a prominent role in national forest management and research. Among Federal and State agencies the Forest Service was now recognized as being uniquely positioned to help meet growing demands and public interest in fisheries and aquatic resources.

Diamond Fork Aquatic and Range Habitat Improvement

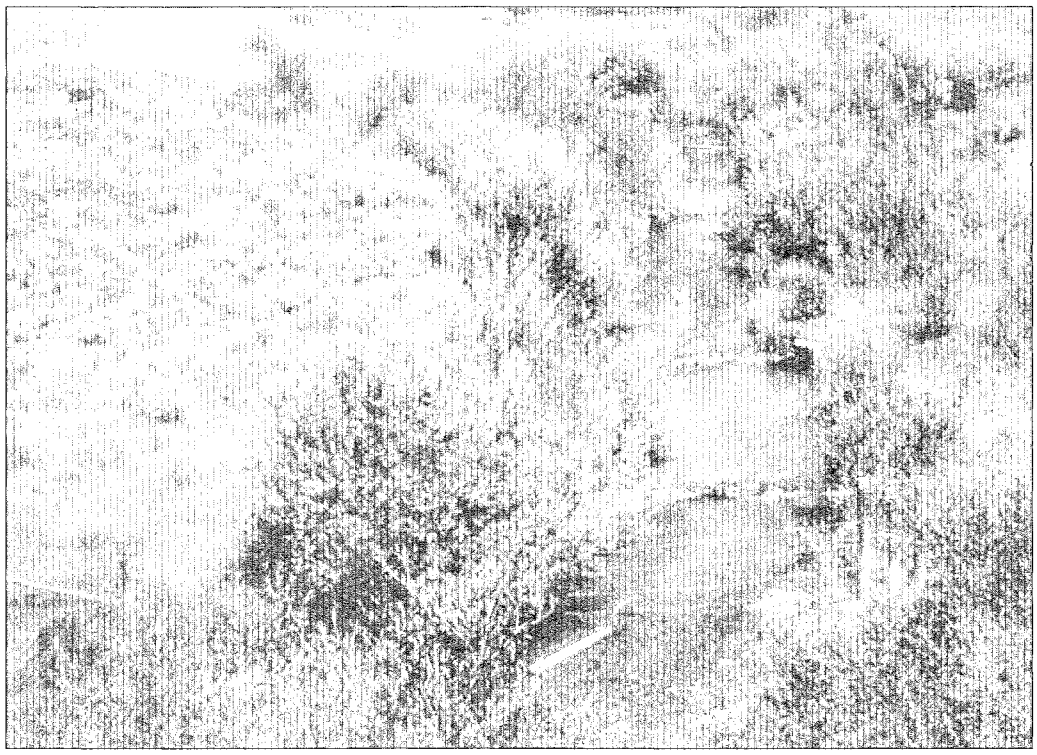
The Diamond Fork Cattle Allotment is located in the lower Wasatch Mountains of Utah. In 1962, a Forest Service range analysis revealed that decades of overgrazing had severely deteriorated the watershed. Recognizing the extent of the damage, grazing permit holders and the Forest Service entered into a formal agreement in 1963 to improve range conditions. This agreement called for a variety of recovery measures, including revegetation of approximately 10,000 acres, period of non-use, a 33 percent reduction in the number of cattle permitted, adjustments in the grazing season, and a study to determine the grazing capacity of the area.

Simultaneously, the Uinta National Forest began an independent fisheries habitat improvement project in the stream in this area. Cattle had trampled the vegetation and sod along the streambank, decreasing its value as fisheries habitat. This project initially focused on stabilizing the streambanks and placing artificial structures in the streambed, to benefit fish. Eventually, agency officials saw the value of combining this project and the effort to improve range conditions. They shifted the focus from the stream to the surrounding land where the cattle grazed, in an attempt to improve conditions for both fish and cattle. The Diamond Fork project thus exemplified the multipurpose potential of national forest lands.

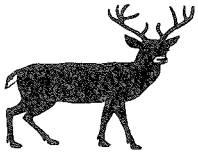
This approach proved to be successful, resulting in increased fish populations and improved range conditions. Periodic evaluations of the Diamond Fork throughout the 1960's and 1970's revealed management of grazing to be more effective in improving aquatic habitat in the watershed than stream manipulation with streambank stabilization and placement of structures. Photographs at established points illustrate the extent of the improvement over time.

Courtesy Uinta National Forest

Courtesy Uinta National Forest



Courtesy Uinta National Forest



CHAPTER TEN

Chapter Ten
Forging New Programs and Partnerships

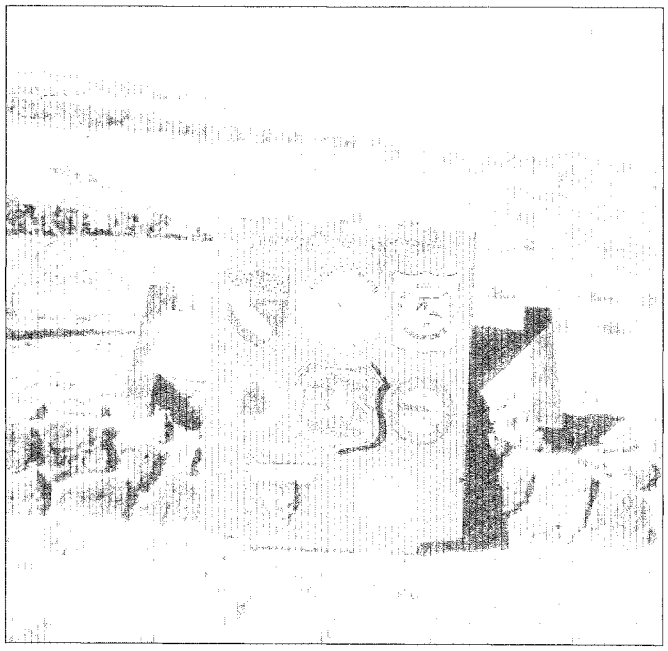
"Fish and wildlife management on the national forests has long been a cooperative venture with the State fish and wildlife agencies, but now we have a third full-time partner—the fish and wildlife organizations outside of government."

. . . *Forest Service Chief F. Dale Robertson, 1988.*

The political landscape of wildlife and fish conservation changed profoundly during the administration of President Ronald Reagan. After more than 10 years of expansion in the biological field, Federal land management agencies entered an era of fiscal retrenchment. Simultaneously, public support for wildlife and fish organizations outside of government burgeoned. Forest Service biologists adapted to the new political landscape by forging partnerships with the private sector. These new partnerships, springing from an effort to cover shortfalls in funding and staffing, soon acquired a momentum of their own. By the 1990's, they propelled the Forest Service toward fundamental changes in its mission and mode of operation.

Prelude: The Wildlife and Fish Program in the "Environmental Decade"

Environmental legislation in the 1970's laid the foundation for a significant expansion of the Forest Service's wildlife and fisheries program. As noted, the Marine Mammal Protection Act of 1972 and Endangered Species Act of 1973 recognized the goal of maintaining healthy ecosystems. The National Forest Management Act of 1976 mandated the preservation of biological diversity. Based on the premise that the ultimate value of wildlife and fish to humankind lay in the sustainability of life on Earth, these laws provided new direction for the conservation of wildlife and fish on Federal lands. In his Environmental Message to the Congress on May 23, 1977, President Jimmy Carter noted the awakening of the American public to the importance of *all* species of wildlife—game and nongame—since "they are part of the biological system that sustains us."[1]



COURTESY USDA FOREST SERVICE

The Forest Service's efforts to involve partners began with other Federal and State agencies and grew to include hundreds of private organizations.

Other legislation enacted in the 1970's provided the foundation for building a bigger Forest Service wildlife and fisheries program. The Forest and Rangeland Renewable Resources Planning Act (RPA) was enacted in 1974 to ensure adequate funding for all areas of Forest Service management and research. The act greatly stimulated planning activity and opened the door to a shift in funding allocations. The Sikes Act, passed the same year, provided for Federal-State cooperation in wildlife habitat planning and management on Federal lands.

Merrill L. "Pete" Petoskey, appointed director of the Forest Service's Division of Wildlife Management in 1975, initiated a rapid buildup of the wildlife and fish staff. As a long-time State biologist in Michigan, Petoskey came into the Forest Service on a 2-year tour of duty under the provisions of the Intergovernmental Personnel Act. As an outsider, his appointment was calculated to bring fresh thinking and vigorous leadership to the division, as well as to strengthen ties between the agency and State fish and wildlife programs. "As the newest wildlifer in the Forest Service," Petoskey wrote in a circular to all of his staff biologists in September 1975, "I've asked the indulgence of the Regional Foresters, just this once, to step outside channels and seek personally and directly, your help and guidance as I undertake an important and challenging job."[2] Stepping outside channels quickly became the stamp of Petoskey's management style, and it served the agency well. With increasing boldness, Petoskey defied the traditional Forest Service hierarchy and took his requests directly to the chief, even to congressional staffs on Capitol Hill.[3] He secured much bigger budgets for wildlife and fish habitat management under RPA and succeeding appropriation bills. When Petoskey returned to State government in 1977, Deputy Chief Tom Nelson appointed another bold administrator, Dale Jones, to head the division. Between 1977 and 1981, the number of biologists in the Forest Service more than doubled, from 266 to 562.[4]

Both Congress and the Carter Administration supported the staff buildup because they recognized that wildlife and fish habitat management had grown more complex. The environmental legislation of the 1970's required forest managers to conserve the full diversity of animal and plant species and to consider the entire web of wildlife-habitat relationships. The Endangered Species Act thrust Forest Service biologists into the role of managing threatened and endangered species as well as their habitat. The nationwide network of Forest and Range Experiment Stations gave new emphasis to research on nongame wildlife management.[5]

The ecological perspective embodied in the new legislation was not the only source of increased complexity in wildlife and fish habitat management. Recreational use of the national forests continued to grow during the 1970's, and much of the recreation involved a desire to hunt, fish, or observe wildlife and fish. Hunters and anglers put pressure on the resource, and everyone who enjoyed wildlife even in a nonconsumptive way wanted to see more of it. Thus, wildlife and fish habitat managers sought to increase populations of so-called "demand species." The Forest Service's move to intensive management was no longer confined to the timber resource; the public also wanted the national forests to produce a greater sustained yield of big game, sport fish, and other highly prized animals.

Adding further to the complexity of wildlife and fish habitat management, the Forest Service faced different demands in each region of the National Forest System. Within the multiple-use framework of forest management, recreational and wildlife values were proportionally greater in the more densely populated East than they were throughout most of the West. The eastern national forests, smaller in area though they were, comprised most of the public land in the East. Some eastern national forests attracted recreational visits in numbers that were comparable with western national parks.[6] Moreover, as recreational and wildlife values increased, private landowners were inclined to close public access to their lands or to charge user fees, thereby intensifying the pressure on public lands.[7]

In the Southern Region, sport hunters' access to the national forests became a class issue. Hunting preserves for wealthy hunters had long been a part of the southern landscape. Private forests in the South were managed increasingly for the collateral income that could be reaped from hunting fees. Upper and middle income hunters bought memberships in clubs that leased private lands, especially industrial forest lands, where club members could enjoy an exclusive privilege to hunt. Many low income hunters could no longer afford to hunt anywhere but on national forests or other Federal or State public hunting areas.[8]

In the West, urban and rural residents expressed diverging ideas and attitudes about national forest management. Residents of western cities looked to the national forests for amenities—recreation, wildlife and fish—and demanded a greater emphasis on environmental protection. Rural westerners looked to the national forests for commodities—timber and rangeland, and to a lesser extent minerals—and wanted to protect jobs and industries associated with resource extraction. There was a "real disconnect" between the two points of view, a biologist in California recalled, with the Forest Service "caught in the middle."[9] Urban perspectives became influential earlier in a populous State such as California, while rural perspectives still dominated national forest management in States such as Idaho, Montana, and Wyoming.

Rethinking the Program: "Framework for the Future"

By 1977, many biologists in the Forest Service were convinced that the agency should be moving to the forefront of wildlife conservation. With its vast area of wildlands and its historical commitment to research in support of management, the Forest Service was in a strong position to lead.[10] They wanted a new vision statement or guidelines, something more profound than bigger budgets and staffs. John Mumma, wildlife and fish staff director in the Intermountain Region, proposed an outside review of his program by the Wildlife Management Institute (WMI), a nonprofit organization with a focus on wildlife policy. Dale Jones in the Washington Office enlarged on Mumma's idea, requesting a national program review based on three representative regions. The WMI had conducted similar reviews for a number of State game departments over the years. The organization enjoyed high standing in the wildlife field. Founded in 1911 as the American Game Protective and Propagation Association, the organization had evolved into a kind of think tank for wildlife management. Since 1936, the institute had sponsored the annual North American Wildlife Conference and published the proceedings. It was one of the few wildlife organizations that had the trust of the Forest Service leadership. Mumma and Jones both believed the review by WMI would be a catalyst for reform.[11]

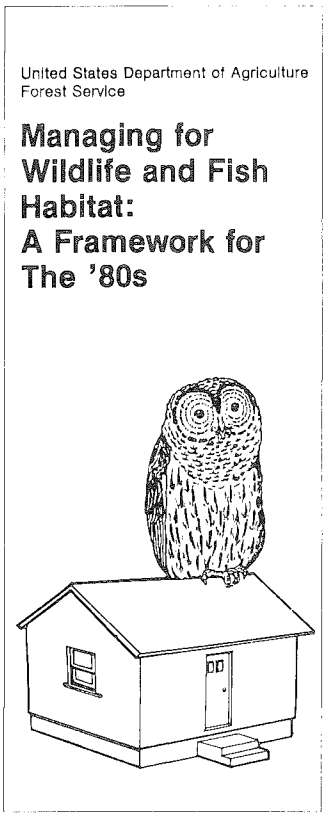
Jones sought authorization for the review from Deputy Chief Tom Nelson. Although Nelson was known for his support of high timber harvests, he was also eager to improve the Forest Service's standing with Congress and the American public. It was Nelson who had appointed Petoskey, and then Jones, with a view toward strengthening wildlife and fish habitat management within the organization. In Jones's estimation, Nelson sensed that Congress was in a mood to increase funding for habitat management. An external review of the program could be helpful in demonstrating need.[12]

WMI's review, completed in January 1979, was everything that Jones had hoped it would be. The authors—Dan Poole, Chester McConnell, and Bill Morris—made a total of 39 recommendations. Two recommendations were of outstanding importance. The first major point concerned the need for system-wide goals. The second major point called for a better system of accounting of wildlife work, so that efforts in managing the resource could be measured against past work and other resource outputs by the agency. These recommendations went to the very core of how the Forest Service evaluated its multiple-use mission. Jones arranged periodic meetings with the three WMI reviewers and Deputy Chief Tom Nelson to report his progress in implementing the recommendations. This way, he kept the reform initiative alive.[13]

The first area to be addressed was the need for system-wide goals. The WMI reviewers found that the Forest Service was "strongly planning oriented." Many wildlife plans existed at the regional and forest level, but there was no uniformity. In practice, goals for wildlife and fish habitat management depended on whether a given regional forester supported the program. Goals needed to be specific and measurable. "One of the most common frustrations encountered in the field was the lack of hard targets and objectives for fish and wildlife," the WMI reviewers noted.[14]

The Forest Service addressed this problem soon after the WMI review began. On May 24, 1978, Forest Service Chief John R. McGuire appointed teams of agency personnel to investigate four areas of wildlife and fish management and to develop a full statement of policy. One team considered policies, goals, and objectives; another focused on cooperation with States; the third examined wildlife and fish habitat management in resource planning; and the fourth team investigated habitat management units of measure. Before these teams completed their work, they received the WMI review and consulted with the reviewers. The fruits of this combined effort was a statement of policy titled "Framework for the Future." It shaped the development of the wildlife and fish program in the 1980's.[15]

The Framework's statement of policy was a forceful reiteration of long-standing program objectives. For example, it began with an acknowledgment of the Forest Service's multiple-use mission, but stated that wildlife and fish habitat would be given "equal consideration" with other Forest Service programs. It recognized State game departments as "full partners in habitat management." It promised to include wildlife and fish expertise in all resource management planning, and to manage all wildlife and fish habitat on an ecosystem basis.



COURTESY USDA FOREST SERVICE

Following the advice of the WMI, the Framework promised to establish measurable goals and objectives, and to monitor programs. Consistent with the new regulations developed for NFMA, the Framework committed the Forest Service to manage habitat to maintain self-perpetuating populations of wildlife and fish, and to protect and improve the status of threatened and endangered plants and animals. Finally, it pledged the Forest Service to improve coordination with other interested agencies and groups, and to recognize the legal treaty rights of Native Americans to wildlife and fish uses.[16]

The late 1970's proved to be a propitious time for redirecting fish and wildlife policy. President Carter had tapped the leadership of several environmental organizations to fill senior positions in his administration. By 1979, efforts were underway to develop general statements of fish and wildlife policy for both the Department of Agriculture and the Department of the Interior. At the 45th North American Wildlife and Natural Resources Conference in March 1980, a session was given to the discussion of a national fish and wildlife policy. Assistant Secretary of Agriculture M. Rupert Cutler and Assistant Secretary of the Interior Robert L. Herbst presented draft proposals by their respective departments. On July 8, 1980, Secretary of Agriculture Robert Bergland issued Secretary's Memorandum No. 2019, a policy on fish and wildlife for Agriculture. Interior's fish and wildlife policy, meanwhile, encountered resistance from the International Association of Fish and Wildlife Agencies on the grounds that it would tip the scales in the shared State-Federal jurisdiction over fish and wildlife. After the election of President Ronald Reagan in November 1980, Interior's fish and wildlife policy went through two more drafts and finally reverted back to a more affirmative position on States' rights.[17]

The Agriculture Secretary's Memorandum No. 2019 specifically addressed fish and wildlife policy in the National Forest System. Echoing the regulations pursuant to the National Forest Management Act, it began with the following statement:

> Fish and wildlife habitats on National Forest System lands will be managed to maintain viable populations of all existing native vertebrate species and to maintain and improve habitats of management indicator species.

Further, it stated that all land management plans would indicate the "desired future condition of fish and wildlife, where possible, in terms of both animal population trends and of amount and quality of habitat." *Desired future condition* was a key phrase. It adroitly blended both the desire to maintain biodiversity and the desire to produce maximum sustained yields of demand species.[18]

Inputs and Outputs

Both the WMI review and Framework for the Future pointed to the need for a more sophisticated system of accounting for fish and wildlife work. Forest Service officials recognized the need to establish a method of quantifying or reporting on all fish and wildlife projects throughout the National Forest System. As arcane an endeavor as this may have seemed, proponents of a stronger wildlife program believed this to be a vital step in enabling wildlife and fisheries biologists to compete effectively with other resource managers in the Forest Service's internal program planning and budget formulation process. This was very important since budget proposals were developed within constrained totals and each resource had to compete for a piece of the pie.

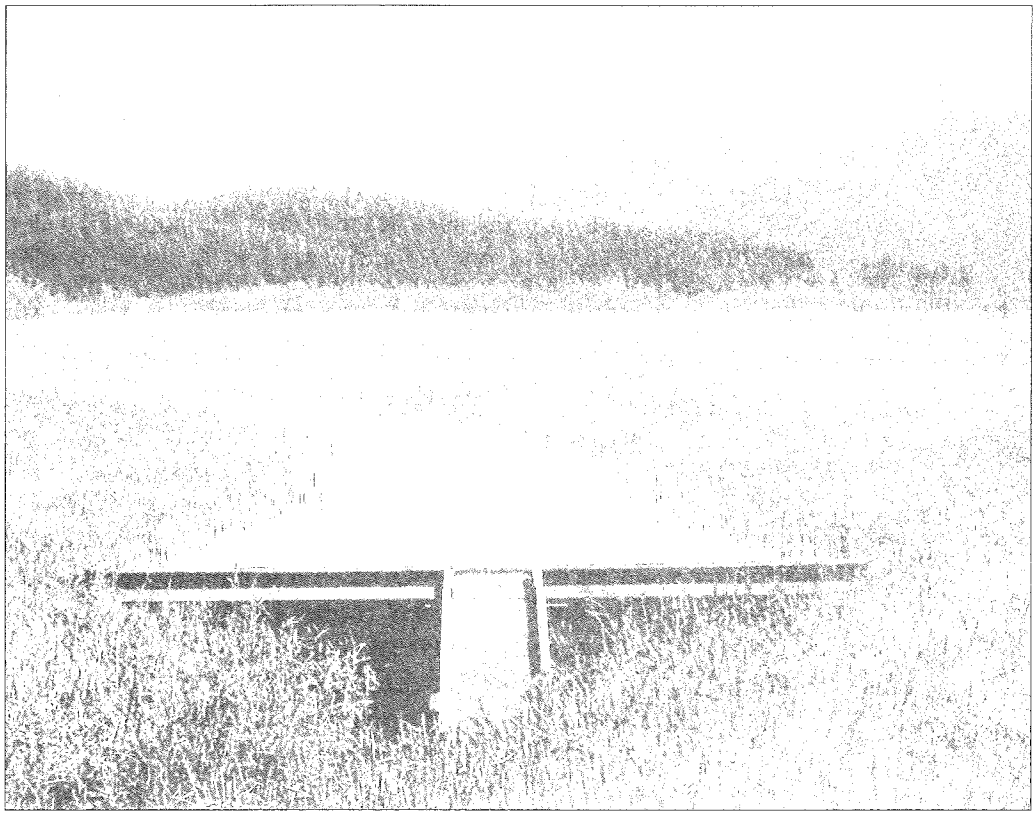
The review by WMI contained specific recommendations. First, the annual reports needed to be changed to reflect what was accomplished directly with fish and wildlife funds. Under the current system, "user days" of hunting, fishing, and wildlife viewing were credited to the recreation program, even though the costs of managing the habitat were borne by fish and wildlife funds. The Forest Service needed to invent a more accurate way of measuring outputs and accounting for program budgets.[19]

Second, the Forest Service had to make a strong effort to gather fish and wildlife data on national forests. Without good baseline data, wildlife and fisheries biologists could not evaluate long-range impacts of resource programs on a forest-wide basis or demonstrate the effectiveness of habitat improvements. "In practice," the WMI report noted, "decisions favor resources supported by the best data."[20] In short, wildlife and fisheries officials had to develop a more effective means of communicating their needs and accomplishments to the Forest Service leadership, Congress, and the fish and wildlife organizations outside Government so that these resources could truly receive "equal consideration" with other forest resources.

Although economic values had been an important consideration in Forest Service budgets and management plans since the agency's beginnings, economic values had become increasingly important as the Forest Service moved toward intensive forest management in the 1950's and 1960's. Within the framework of multiple-use management, it behooved all resource managers to justify their programs in terms of resource "outputs." Timber and rangeland outputs were the easiest to quantify. The standard unit of measure for timber production was thousand board feet (MBF). Foresters could readily calculate the economic value of a timber stand based on market prices for wood. Rangeland managers, meanwhile, expressed rangeland resource outputs in terms of animal unit months (AUM's). These amounted to the number of livestock that could be grazed on a tract, multiplied by the number of months out of the year that the tract was available. Again, land managers could establish the economic value of rangeland based on market prices for livestock.

Recreational use of the National Forest System did not translate into economic terms quite as easily as timber and rangeland resources did. The ill-defined recreational visit was the standard unit of measure for many years, until it was replaced by the recreational visitor day (RVD). Although the RVD was numerically precise, it did not convey a monetary value. After World War II, economists developed methods of surveying recreationists to determine how much money the average recreationist devoted to recreational pursuits. These studies enabled recreation managers to assign a monetary value to the recreational visitor day, and to quantify recreation's contribution to the economy.

Compared with timber, rangeland, and recreation, the economic value of wildlife and fish was more difficult to measure. At the time the WMI made its review in 1978, Forest Service biologists still reported their output in terms of "acre-equivalents." An acre-equivalent was defined as an acre of wildlife habitat improved as a result of any land management option. The amount of habitat "improved" depended on the wildlife species



COURTESY USDA FOREST SERVICE

Waterfowl habitat improvement structure in the early 1970's, Chugach National Forest, Alaska.

affected. Fish habitat improvement was quantified in terms of miles of stream or numbers of structures. Acre-equivalents indicated quantities and trends, but they failed to convey monetary values. They might qualify as a resource output, but they did not represent an economic output in the same sense as MBF, AUM's, and RVD's. They were, in any case, widely subject to interpretation. Numbers of acre-equivalents reported by each region rose year after year until they actually exceeded the total area of the National Forest System. In 1980, Dale Jones abandoned them as an inadequate unit of measure.[21]

The wildlife and fish profession had long recognized the difficulty of reporting the value of habitat improvement work and had proposed a variety of valuation methods, none of them completely satisfactory. Most valuation methods substituted the hunter or angler for the recreationist and estimated the average hunter's or angler's expenditures in pursuit of that activity. Reporting estimated expenditures connected with hunting and fishing, however, seemed to focus too narrowly on the sport hunter and angler, thereby favoring game and fish over nongame.[22] Moreover, it showed the cost to sport interests, not the value received.

Other methods gained favor among wildlife economists in the 1980's. The "travel cost method" examined travel costs and behavior associated with wildlife enjoyment; it cast a wider net to extrapolate the economic value of wildlife. The "contingent valuation method" surveyed people's desire for wildlife relative to other amenities. According to this method, respondents were asked to assign monetary values for the privilege (or forfeiture) of a specific wildlife experience such as hunting elk, viewing songbirds, or being assured of the presence of an endangered species on a given range. The contingent valuation method won favor among wildlife managers because they could use it to measure economic values associated with rare, endangered, and nongame species. Moreover, wildlife managers could use this method to evaluate different options for the future and to determine the public's "desired future condition" for a given area of wildlife and fish habitat.[23]

Forest Service biologists rarely had the financial resources to employ either the travel cost method or the contingent valuation method for measuring wildlife values in monetary terms, and often had to fall back on hunting and fishing expenditures as a measure of value. Without such economic data, it was difficult to quantify fish and wildlife work in economic terms. In 1980, Jones introduced a new reporting system based on "acres and structures" and "wildlife and fish user days," or WFUD's. These units moved wildlife and fish from a recreation measure to a wildlife and fish measure. The concept was to convey a relationship between inputs and outputs that could be tracked from year to year and to report outputs in a quantifiable form so that the wildlife and fish program could be compared more directly with other resource programs in the Forest Service and not remain as a subset of recreation. Resource inputs were reflected in 39 types of habitat improvements for streams, lakes, wetlands, uplands, and endangered species. For each type of improvement, the Forest Service recorded the number of acres (or structures, where applicable) and the cost. Resource outputs, meanwhile, were reflected in nine types of activities involving fishing, hunting, and nature study. For each type of activity, the agency recorded the number of WFUD's.[24]

Jones's system of acres and structures and WFUD's soon met opposition from other resource staff groups within the Forest Service. In the first place, the concept of correlating resource inputs and outputs in annual reports was questionable: habitat improvements generally did not produce fish and wildlife population increases—and hence more WFUD's—for 3 or 4 years after they were made. The system contained other ambiguities. Although the 39 categories of habitat improvement were more verifiable than the old system of acre-equivalents, some categories remained subject to wide differences of interpretation. For example, some managers reported most timber sales as habitat improvement under the category "habitat coordination," while others viewed this type of activity as primarily mitigative and reported it only in exceptional cases.[25] Jones made refinements to the system of reporting in 1981, most notably by eliminating this ambiguous category of "habitat coordination" in favor of a double listing of several types of wildlife work under two broad categories of "direct" and "indirect" habitat improvements.[26]

Yet another problem with acres and structures was that the breakdown of activities was too bewildering for planners who were now in the midst of developing comprehensive management plans for each forest under the National Forest Management Act. Eventually, the Forest Service imposed a limit of 20 units of measure for each major resource (timber, rangeland, water, recreation, and wildlife and fish). Ostensibly, the limitation was made to prevent the national forest planning effort from collapsing under its own weight. To wildlife and fisheries biologists, however, it seemed that the system was rejected because it revealed that lands were frequently more valuable for wildlife and fish habitat than for timber production. Jones had to discontinue the reports in 1985.[27]

The concept of measuring wildlife and fish user days, or WFUD's, was perhaps even more controversial. In the context of multiple-use, it was important to distinguish whether the sport hunter's use of the forest was a product of wildlife and fish habitat improvement or recreation management. The wildlife and fisheries staff believed that the sport hunter's presence was properly attributed to both; according to their calculations, fish and wildlife users accounted for approximately 15 percent of all recreation on national forests.[28] Recreation staff complained that WFUD's encroached on their own RVD's. Timber and rangeland managers objected that with both WFUD's and RVD's in the mix, the Forest Service was counting the same output twice.[29]

While the Forest Service debated the validity of WFUD's, natural resource economists made great strides in wildlife and fish valuation. In the late 1980's and early 1990's, peer-reviewed valuation research progressed to a point where travel cost and contingent value methods both produced sound results. In addition, the sheer wealth of applied studies provided a basis from which biologists could convey real values associated with wildlife and fish resources and associated recreational use. If the collection of wildlife and fish valuation measures still fell short of being an easily quantifiable economic measure such as MBF, they came as close as any system yet devised. Director of Wildlife, Fish, and Rare Plants Robert D. Nelson resurrected the staff's annual reports in 1987—without the controversial WFUD's but using other numbers that demonstrated the program's accomplishments. These reports underwent yearly modification to reflect changing

program priorities and accomplishments, and summaries of the information were distributed to the Forest Service regions, partners, Congress, and the Administration.[30]

Wildlife valuation methods continued to cause debate within the Forest Service during the 1990's. It seemed that wildlife and fisheries biologists would never be able to describe their program fully in the multiple-use language of commodity value inputs and outputs. Nevertheless, advances in the reporting system finally ensured the wildlife staff director "a place at the table" with the directors of timber, rangeland, recreation, minerals, and watershed management.[31]

Rare Plants

Another resource that defied market valuation was rare plants. The Endangered Species Act of 1973 addressed plants as well as animals. During the late 1970's, region after region brought rare plant specialists into the wildlife and fisheries staff, where they worked under the existing program concerning threatened and endangered species.[32] The assimilation of the rare plants program into wildlife and fisheries habitat management further distinguished the biologists in the Forest Service as the guardians of biological diversity in national forest administration.

The evolution was most striking in the Pacific Southwest (California) Region of the National Forest System, where wildlife and fish biologists were still attached to the range division as late as 1975. In that year, Robert D. Nelson transferred from the Pacific Northwest Region to California to head the new regional wildlife and fisheries staff group. Soon after his arrival, environmental groups began to challenge national forest timber sales in California on the basis that they would harm threatened and endangered plants. Nelson persuaded his superiors that his staff should mediate in this conflict, and his staff began to develop a model program in the Pacific Southwest Region to conserve rare plants on the national forests.[33]

PLANT COLLECTING IN THE FOREST SERVICE

Many of the early rangers and forest supervisors served as naturalists. Their duties during the early 20th century included collecting herbarium specimens for local use and for the National Botanist and National Forest Service Herbarium in Washington, D.C. These repositories housed 150,000 to 200,000 specimens, used for taxonomy, vegetation classification, watershed, range projects, and related research. During the late 20th century, Forest Service botanist Duane Atwood and others discovered some of these long-abandoned collections in storage, and donated them to the University of Idaho, Brigham Young University, and the Rocky Mountain Herbarium in Laramie, Wyoming. Today, taxonomists continue to find these collections useful for reference and type specimens.

The Forest Service also continues to maintain its own facilities, including the Intermountain Region Herbarium in Ogden, Utah. This facility holds more than 40,000 specimens—some of which date to the 19th century. Mont E. Lewis, an avid collector, served as its curator for many years. After retiring in the early 1970's, he continued to work at the herbarium, volunteering around 44,000 hours through the 1990's. In addition to his lifelong dedication, Lewis became a well-known authority on the sedge group (*genus carex*). "He loved his work," recalled Alma H. Winward, current curator of the facility.

COURTESY PAULA BROOKS, USDA FOREST SERVICE

MacFarlane's four-o'clock *(Mirabilis macfarlanei)* with the only moth that feeds on this rare flower.

California had the most diverse flora of any region in the National Forest System. A review of endangered plants in the United States published by the Smithsonian Institution in 1975 featured many species found only in California. The first four plant species officially listed under the Endangered Species Act by the U.S. Fish and Wildlife Service, in August 1977, were all endemic to California.[34]

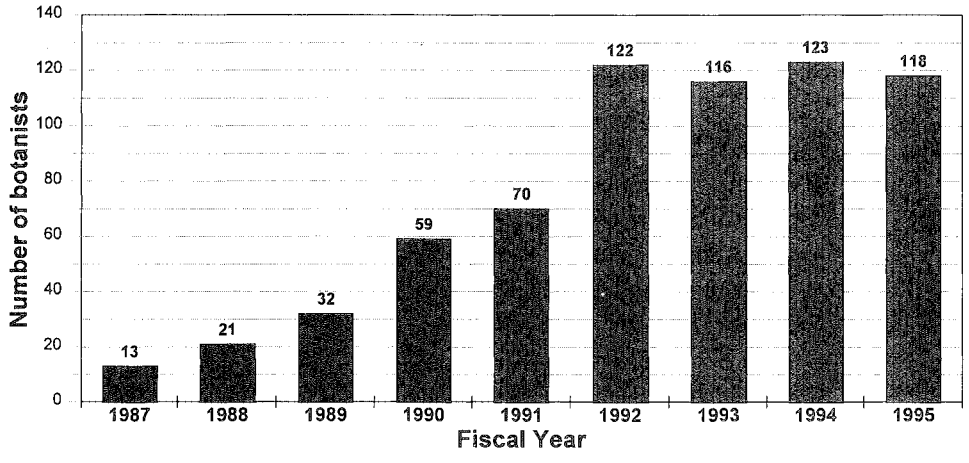
With its large urban population, California also supported one of the most advanced State programs for plant conservation in the United States. The California Native Plants Society enjoyed a wide membership, and the California Department of Fish and Game had an endangered plant program before many other States. The Nature Conservancy was also very active in the State.[35]

Nelson noted that his wildlife and fisheries biologists were in a strong position to mediate between environmentalists and commodity-oriented forest users. The biologists had closer ties to the environmental community than any other group of professionals in the agency. Forest Service biologists had been working for many years with the National Audubon Society, State biologists, and the U.S. Fish and Wildlife Service in the effort to save the California condor. Biologists in the Pacific Southwest Region had recently earned the respect of California environmentalists by developing an advanced snag management policy for the protection of cavity-nesting birds.[36] Now the rare plant specialists who joined the Forest Service brought experience with the California Native Plants Society and other botanical organizations. Other divisions in the Forest Service—timber, rangeland, even recreation—could not match the wildlife division's contacts with the environmental community.[37]

Support emerged for the rare plants program both externally and internally. Plant conservationists were pleased, for example, when these new botanists were made a part of the biological assessment process for timber sales. The rare plant specialists developed mitigative measures to help rare plants survive disturbances associated with forest management, and they studied how rare plants fared under different conditions, learning which plants could flourish in the face of various disturbances.[38] The rare plants program won internal support when the specialists inventoried rare plant populations, helped with

rare plant taxonomy, and often showed these species to be more widespread than was supposed—sometimes leading to a "sensitive" species' delisting.[39] Rare plant specialists worked with foresters to modify the way logs were skidded on a timber sale or to avoid logging in sensitive areas. They supported the use of fire as a management tool, and worked with rangeland specialists to modify livestock grazing practices. Livestock use might be permitted in an area only during a season when the sensitive plant was less palatable or susceptible to impacts, for example. There were many ways in which the botanist could coordinate rare plant protection with forest uses.[40]

Outside of California, the Forest Service made slower progress in the conservation of rare plants. Botanist Duane Atwood, who joined the agency staff as a rare plant specialist stationed in Provo, Utah in 1979, remained the only full-time botanist in the Intermountain Region for nearly a decade. Other regions did not incorporate rare plant specialists into the staff until the late 1980's. Plant conservation groups were unable to muster the strong public support that wildlife groups could generate for an endangered animal species; consequently, plant conservation on the public lands remained a poor cousin of programs for threatened and endangered wildlife and fish. Due to organizations such as the Center for Plant Conservation, however, public awareness about endangered plants gradually increased during the 1980's.



Number of Forest Service botanists, Fiscal years 1986-1995

SOURCE: USDA FOREST SERVICE

The rare plants program received an enormous boost from the Natural Resources Defense Council. Faith Campbell, a leading plant conservationist and driving force behind this initiative, challenged the Forest Service by bringing the issue before Congress. Campbell testified on the importance of plant conservation when the Reagan administration sought to amend the Endangered Species Act in 1982, and she informed congressional staffs of the need for more botanists in Federal land managing agencies. As a result of Campbell's efforts, Congress enacted a special appropriation for the Forest Service's rare plants program. Later, a national rare plants specialist was added to the Washington staff with the assistance of The Nature Conservancy.[41]

In May 1994, the Forest Service joined six other Federal land managing agencies in forming the Federal Native Plant Conservation Initiative. The initiative recognized the need to accumulate basic scientific data on hundreds of plant species and the importance of pooling knowledge. Other objectives included interagency coordination of classification, inventory, and assessment of sensitive plants, and the development of guidelines and management techniques for propagating sensitive plants through ecological restorations.[42]

Plant Conservation on California's National Forests

The Pacific Southwest Region's rare plants program has expanded and now manages more than 300 sensitive native California plants, many of them known to occur in fewer than 15 locations. Nearly a third of these species are restricted to the national forests in California, and dozens more occur predominantly on the national forests. Twelve of these plants are listed under the Endangered Species Act.

The Forest Service uses special land classifications to assist in the conservation of rare plants. In addition to 4.4 million acres designated as wilderness areas under the Wilderness Act of 1964, plus 958 miles of rivers designated as wild, scenic, or recreational under the Wild and Scenic Rivers Act of 1968, the Forest Service administratively reserves research natural areas (RNA's) and special interest areas (SIA's).

RNA's are designated to conserve a wide spectrum of representative pristine areas that typified important forest, shrubland, grassland, aquatic, alpine, geological, and other areas for scientific study. This program, started in 1927, is now comprised of 408 areas within the Forest Service. There are more than 36 RNA's in the Pacific Southwest Region.

SIA's preserve areas with high species diversity, unique assemblages, or habitat types. By 1995, the national forests in California had more than 100 SIA's, many of them established primarily for botanical purposes. Examples of botanical areas include the Ancient Bristlecone Pine Forest and Butterfly Valley *Darlingtonia* Area.

Sensitive Species

Even more than the rare plants program, the addition of "sensitive species" to the Forest Service biologists' range of concerns deepened the Forest Service's partnerships with the U.S. Fish and Wildlife Service and State wildlife departments in preventing extinctions. Wildlife staff director Robert D. Nelson largely crafted the Forest Service's sensitive species policy himself during the 1980's, overcoming considerable resistance by other divisions within the agency. "Bob Nelson laid in the bushes with that [sensitive species] list for years," confident that it would greatly strengthen the Forest Service's commitment to biodiversity once it took root in Forest Service policy, his former threatened, endangered, and sensitive species program manager Kirk Horn recalled.[43]

The term "sensitive species" was originally coined by the Fish and Wildlife Service when it began developing a list of threatened and endangered species for its "Red Book." Sensitive species were those that had the potential to become threatened, just as threatened species had the potential to become endangered, and endangered species had the potential to become extinct. The term was for administrative use; it had no standing under the Endangered Species Act. Forest Service biologists took the term from the Red Book. It began to appear in official correspondence as early as the 1970's, but it had no basis in the laws and regulations that guided Forest Service actions.[44]

The concept of an official listing of sensitive species acquired new significance with implementation of the National Forest Management Act in the early 1980's. As noted in Chapter 6, NFMA regulations required the Forest Service to maintain viable populations of all vertebrate species found on the national forests and to designate management indicator species to assist with that effort. In drafting the NFMA regulations, the Committee of Scientists wrestled with what degree of latitude the Forest Service should have in selecting indicator species. Should it be required to select endangered species? Should it have the option to select nonvertebrates? In this context, the concept of sensitive species acquired new resonance.[45]

About 1984, the Washington Office sent a directive to all regions to prepare a list of sensitive species. The directive was deliberately vague as to what priority the task should receive or when it should be completed. Anxious not to push too hard too soon, Nelson kept the directive low key. There was no mention, still, of sensitive species in the wildlife section of the Forest Service Manual. The lists were developed as time and the political climate in each regional office permitted and the results varied greatly from region to region. Nevertheless, the concept found a footing in the Forest Service. By the last years of the Reagan administration, some regions had well-developed lists of sensitive species and were regularly selecting sensitive species for use as management indicator species.[46]

By the 1990's, sensitive species were an integral part of Forest Service planning and policy. Procedures for identifying sensitive species were incorporated into the Forest Service Manual. The sensitive species program had become a valuable, proactive tool for identifying species whose habitats were at risk and that could become threatened or endangered because of Forest Service management activities. The policy provided for

inventory and evaluation of habitats that might support sensitive species, and it required biological evaluations of management actions affecting those habitats under the National Environmental Policy Act.[47] Together with the rare plants program, it aided the Forest Service in its mission to protect biodiversity on the national forests.

The Reagan Revolution

Ronald Reagan was elected president on a platform of tax cuts, strong national defense, and reduction of all other Government programs. Reagan's antipathy toward the environmental movement was also well known, although the strength of his public support on this issue in the election of 1980 was less clear. During his first year in office, the Democratic Congress acceded to a dramatic cut in taxes, then struggled through the remainder of Reagan's two terms to maintain popular Federal programs with less revenues. With increased billions of dollars going to defense spending, budget considerations loomed large in the Federal Government. As the national debt soared during the 1980's, to become a fixture in American political debate, the Forest Service was faced with a new era of fiscal conservatism that would last through the Bush and Clinton administrations and possibly into the next century.

The presidential election of 1980 had more immediate implications for the Forest Service's wildlife program. One of President Reagan's major campaign themes was his contention that the environmental movement had gone too far, that Americans desired more economic freedom and less environmental protection. In contrast to President Carter's emphasis on limits, particularly in the area of energy use and development, Reagan offered an optimistic vision of resource abundance and economic growth. Reagan's vision extended to the national forests. He selected John Crowell, Jr., an attorney for the timber industry, to replace Assistant Secretary of Agriculture Rupert Cutler, a former executive in the Wilderness Society and the National Wildlife Federation. Crowell then appointed Douglas MacCleery as deputy assistant secretary.

Crowell and MacCleery quickly took charge of the elaborate forest planning process currently underway to ensure that the maximum acreage was classified as "suitable" for timber production and that the calculated "Allowable Sale Quantity" (ASQ) was as high as possible. Crowell and MacCleery announced that the Forest Service was going to liquidate old-growth Douglas-fir forests in the Pacific Northwest in order to grow more wood fiber on those acres that were cutover. This would enable planners to establish the ASQ at a higher level on those forests. They described their approach as a "departure" from the long-standing policy of nondeclining, even-flow, sustained-yield timber management practiced in the past, and several forests were actually designated as "departure" forests. The departure policy troubled many professional foresters and others in the Forest Service, but as appropriations for timber management increased from year to year while other sections of the Forest Service budget diminished, internal resistance to the program declined.[48] In the middle years of the Reagan administration, timber harvesting on the national forests increased for the first time in a decade.[49]

Besides bringing overall reductions in the Forest Service budget and a renewed emphasis on timber output, the election of 1980 had another important effect on national forest management. During the presidential campaign, Reagan announced his support for the so-called Sagebrush Rebellion. This was a movement led by western stockgrowers, with strong backing from the mining and petroleum industries, to transfer public lands in the West from Federal to State and private ownership, or better, simply to exploit the lands' resources with less interference from the Federal Government. Although the Sagebrush Rebellion was most intense where livestock grazing lands under the Bureau of Land Management were concerned, it affected the national forests, too. So convinced were western stockgrowers that Government agents presented a hindrance to their use of the public lands, that they lobbied Congress and the Reagan administration to make cuts in the Forest Service's rangeland management program. The stockgrowers' allies in the petroleum and mining industries, meanwhile, sought to open wilderness areas on the national forests to oil exploration and mining. The Sagebrush Rebellion aroused widespread opposition. The movement's objectives proved to be unpopular even in the West. After Reagan's outspoken Secretary of the Interior, James Watt, resigned in October 1983, the movement quickly lost steam.[50]

Although the Sagebrush Rebellion was short-lived and unsuccessful, it was significant because it galvanized the environmental community. Many environmental organizations posted large gains in their memberships during the early 1980's. The organizations that the public associated most directly with land protection—the Sierra Club and the Wilderness Society—grew dramatically. Some of the large wildlife organizations, including the National Wildlife Federation, the National Audubon Society, and the Defenders of Wildlife, made substantial gains as well. On the whole, environmental organizations were financially robust as never before. They fielded a small army of lobbyists who worked the congressional committees and formed an effective counterbalance to the well-heeled representatives of the timber, livestock, and mineral industries.[51]

Perhaps more importantly, the Sagebrush Rebellion caused the environmental organizations to unite in their defense of the public lands. It was an indication of the environmental movement's broad appeal that even Wyoming's two conservative senators, Malcolm Wallop and Alan Simpson, opposed Secretary Watt's proposals to open wilderness to oil exploration. The threat of the Sagebrush Rebellion tended to soften the differences between urban and rural, liberal and conservative, and nonhunting and hunting sectors of the environmental community.[52]

The many changes that issued from the election of 1980 only increased the resolve of biologists in the Forest Service to improve their rapport with wildlife organizations outside the Government. They were determined, for example, to protect the big gains in staffing and program development that the wildlife division had made since the mid-1970's. Their first line of defense was the Forest Service's latest 5-year plan, or RPA, prepared under the Forest and Range Renewable Resources Planning Act. The 1980 RPA provided some insurance against sharp cuts in the budget for wildlife and fish. Environmental groups

now made a science of following the budget process, tracking how well the Department of Agriculture, the Office of Management and Budget, and Congress responded to these 5-year projections of Forest Service needs, and alerting constituents to any shortfalls. The RPA carried less weight as time passed, however. The Reagan administration showed its disregard for the whole process when it never released an assessment for 1985.[53]

The Reagan administration's commitment to increased timber output arrested the trend toward a more balanced workforce in the agency. The wildlife and fisheries staff leveled off at slightly more than 600 biologists during the Reagan years; the recreation, soil and water, and rangeland staffs actually lost ground; while foresters and engineers remained the dominant professions in the agency—accounting for two thirds of professional positions in the Forest Service. Funding for the various resources followed the same pattern, with wildlife and fisheries holding steady at about half the recommended levels in the 1980 RPA; recreation, soil and water, and rangeland faring worse; while timber received annual funds at or near the 1980 RPA target amount.[54]

More serious than the budget plateau, however, was the administration's indifference to the biologists' growing responsibilities under NFMA, the Endangered Species Act, and other legislation. Forest planning consumed an increasing amount of the biologists' time as the first generation of plans under NFMA neared completion in the early 1980's. More and more species were listed under the Endangered Species Act. Biologists were spread thin by the high volume of timber sales to assess. And recreational use of the national forests for hunting and fishing continued to rise, intensifying the need for direct habitat improvements. All of these items competed for the wildlife and fisheries staff's attention.

Help had to come from the private sector. In 1985, Lonnie Williamson of the Wildlife Management Institute conveyed an important proposal to the office of Senator Jim McClure of Idaho. McClure, a Republican, was one of several western senators who had begun attaching riders to Forest Service appropriation bills in the 1980's setting minimum quotas for timber harvests in their States. Williamson proposed a rider that would allow up to $300,000 in Federal matching funds for money raised in the private sector toward habitat improvement. It happened that this proposal involved the Bureau of Land Management rather than the Forest Service. Senator McClure liked the idea and inserted it in that year's appropriation bill.[55]

The next year, Williamson approached the Forest Service with the same idea. Robert Nelson, by this time the director of the wildlife, fish and rare plants staff in the Washington Office, was immediately receptive. Dale Jones had appointed Nelson deputy director in 1980 with a view toward expanding the wildlife program, and together they had struggled against cutbacks instead. Considering the political climate, Nelson thought there was no better way to expand the program than through partnerships. Forest Service Chief Max Peterson agreed; it was consistent with the President's desire to give the private sector more influence on the management of public lands.[56]

Challenge Cost-Share

Congress called its invitation to the private sector the "Challenge Cost-Share Program." Each year, the legislature raised the limit on Federal matching funds for projects completed under this program. Nelson acted aggressively to make the program a success. From an initial set of 57 partners in 1986, he and his staff expanded the pool to nearly 200 in 1987 and more than 2,000 by 1991. Seven years after the program began, Forest Service partners were contributing nearly $20 million a year to habitat improvement projects. (Not all of this money came from the private sector; other Federal and State agencies were counted among the Forest Service's Challenge Cost-Share partners.)[57]

Members of Congress were enthusiastic about the program, since it stretched the tax-payer's dollars and yielded tangible results back home. At a 1992 hearing on the program before the House Subcommittee of Forests, Family Farms, and Energy, several congressmen took turns complimenting Forest Service Chief F. Dale Robertson, on the program's accomplishments in their States. The chairman of the subcommittee, Representative Harold L. Volkmer of Missouri, remarked, "I wish we had more media here. They're always saying how these Federal agencies can't do anything out here, can't do anything right. It appears that this one is 100 percent." Other members of the committee lavished praise on the program, prompting Representative Robert F. Smith of Oregon to quip, "It just occurs to me that we ought to have one of these love feasts at least once a month to raise Dale's spirits through difficult times."[58]

The Forest Service engaged a wide variety of partners through Challenge Cost-Share. It formed partnership agreements with such organizations as the Boy Scouts of America, Ducks Unlimited, National Fish and Wildlife Foundation, National Wild Turkey Federation, Rocky Mountain Elk Foundation, The Nature Conservancy, and Trout

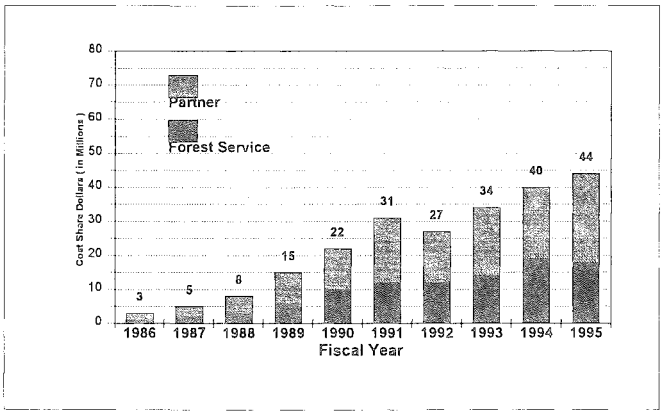
PARTNERSHIPS

To help fund Federal habitat improvement projects, Congress established the *Challenge Cost-Share Program* in 1986—a venture that encourages the public and private sectors to share costs as well as management. Congressional funding of the Forest Service Cost-Share projects requires matching contributions from private enterprise, conservation groups, individuals, or other public agencies. Partnerships encourage direct public involvement in managing wildlife and fisheries habitats on national forests and grasslands. They also involve sharing technical skills, labor, and equipment for the benefit of wildlife, fish, and rare plants.

Partnerships with the Forest Service include Ducks Unlimited, National Fish and Wildlife Foundation, National Wild Turkey Federation, Rocky Mountain Elk Foundation, North American Foundation for Wild Sheep, The Nature Conservancy, Trout Unlimited, and the Boy Scouts and Girl Scouts of America. Public partners include State fish and wildlife agencies, the Bureau of Land Management, and the U.S. Fish and Wildlife Service. The Forest Service also administers partnership initiatives, including *Get Wild*, a national program that encourages management of habitat for all forms of wildlife, and *NatureWatch*, a national program featuring interpretive walks, festivals, and distribution of educational materials on wildlife, fish, and rare plants.

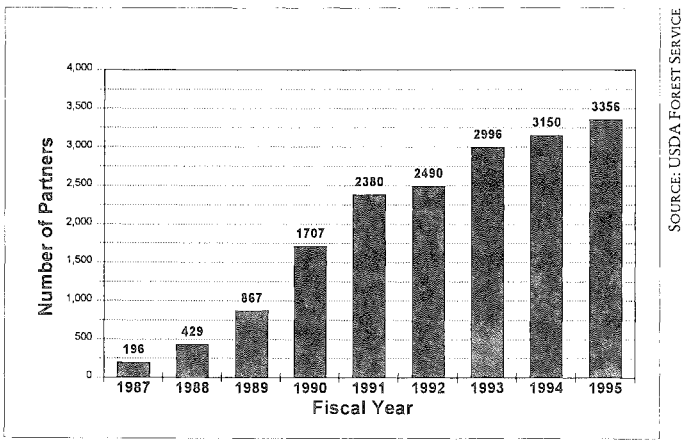
Unlimited. Some partnerships were of prior standing, such as the agency's cooperative agreements with 44 State fish and wildlife agencies. Other partners included Indian tribal governments and generous individuals. The rare plants program came to benefit from Forest Service partnerships with 43 State Natural Heritage Inventory Programs.[59]

The variety of Forest Service partners reflected the diversity of interests that the wildlife conservation movement had come to encompass. Indeed, the movement had become so broad and institutionalized it was better described as an industry. Political scientist James A. Tober defined the wildlife industry in *Wildlife and the Public Interest* (1989) as consisting of "individuals, organizations, and institutions that, through private action or public participation, demonstrate their interest in wild plants and animals." The term "industry" might conjure up images of extractive processes and commodity production, Tober noted, but in this instance it involved a range of human values "from utilitarian to aesthetic to spiritual."[60]



SOURCE: USDA FOREST SERVICE

Challenge Cost-Share Program Dollars, 1986-1995.



SOURCE: USDA FOREST SERVICE

Growth in the number of partners for wildlife, fish, and rare plant habitat improvement projects, fiscal years 1987-1995.

Nelson conceived of the movement in similar terms. The variety of organizations concerned with wildlife, fish, rare plants, and endangered species constituted a powerful interest in the management of public lands. This wildlife "industry" legitimized the Forest Service's *wildlife* program in the same sense that the timber industry legitimized the agency's *timber* program.[61] Partnerships, in other words, were the biologists' long sought answer to the foresters' corner on forest outputs.

The wildlife industry consisted of a wide array of government and nongovernment organizations. There were, in the first place, numerous Federal and State agencies that implemented wildlife policy. In addition to these, Forest Service biologists were interested in scores of nongovernment organizations that could be grouped into at least a dozen categories:

- Associations representing State wildlife agencies (e.g., International Association of Fish and Wildlife Agencies);
- Research or policy institutes (e.g., Wildlife Management Institute);
- Foundations (e.g., National Fish and Wildlife Foundation, National Forest Foundation);
- Professional associations (e.g., The Wildlife Society, American Fisheries Society);
- Organizations that acquired habitat, often for transfer to governments (e.g., The Nature Conservancy);
- Environmental law organizations (e.g., Environmental Law Institute, Natural Resources Defense Council);
- Sporting organizations that defended traditional and legal rights of hunters (e.g., National Rifle Association, Izaak Walton League);
- Broad-based wildlife organizations (e.g., National Wildlife Federation, National Audubon Society);
- Other environmental organizations with an interest in wildlife (e.g., Sierra Club, Wilderness Society);
- Coalitions of environmental organizations (e.g., Greater Yellowstone Coalition);
- Wildlife organizations with roots in the humane movement (e.g., Defenders of Wildlife);
- Wildlife organizations with interests in single species or species groups (e.g., Ducks Unlimited).[62]

Many Challenge Cost-Share partners came from the last group in this list. Other organizations from this group included the National Wild Turkey Federation, Trout Unlimited, Whitetails Unlimited, Foundation for North American Wild Sheep, and the Ruffed Grouse Society. Each one was committed to work for improvements in habitat and other benefits for its own featured species. Forest Service biologists were impressed by the drawing power of these organizations. It seemed that as the wildlife field became more crowded, people showed an inclination to join the organization that matched their personal values most closely. The Rocky Mountain Elk Foundation was typical of the single-species organizations. Its mission was straightforward and to the point: to stay out of politics and to do good things for elk.[63]

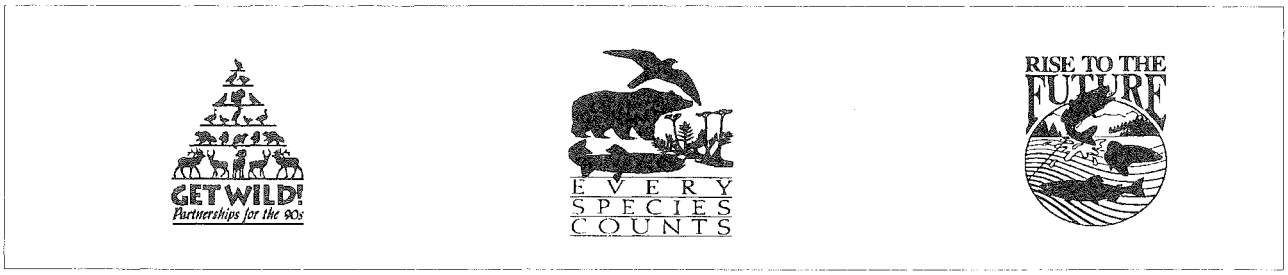
The Rocky Mountain Elk Foundation enjoyed phenomenal growth. In 13 years it grew to 110,000 members in 50 States and 30 countries. It not only attracted a large membership, it was hugely successful at fundraising. Its dinner banquets raised big sums that went primarily to the acquisition and improvement of elk habitat. In 1990, the Rocky Mountain Elk Foundation opened a visitor center in Missoula, Montana. Visitors were treated to a tasteful combination of natural history museum and wildlife art gallery. One room bristled with the trophy heads of bull elk, while another explained the life history and habitat requirements of this magnificent animal. Although sales of art raised funds with which to buy or improve habitat, the visitor center's primary purpose was to interest the public in wildlife conservation. By 1997, the foundation had acquired or enhanced more than 2 million acres of habitat at a cost of $55 million.[64]

Single-species organizations such as the Rocky Mountain Elk Foundation used other effective marketing tools. Often they published magazines featuring stories and photographs of their flagship animal. *Bugle*, the magazine of the Rocky Mountain Elk Foundation, appeared on magazine stands throughout the West. Jack Lyon, a Forest Service research biologist in Missoula, Montana, once asked the head of the Rocky Mountain Elk Foundation why a cow elk never graced the cover of this burly magazine. The pragmatic reply: because sales of that month's issue would drop in half.[65]

Observing the success of these organizations, Forest Service biologists urged that Government wildlife agencies could learn from what was happening in the private sector. In a paper delivered at the 54th North American Wildlife and Natural Resources Conference in 1989, Hal Salwasser and three other agency biologists presented the case for a "marketing approach to fish and wildlife program management." There did not have to be a clear producer-seller-consumer relationship in order to accept the applicability of business principles in Government work, they contended. Wildlife programs, like businesses, lived and died according to the program managers' ability to create and keep a customer base.[66]

Wildlife agencies needed to consider product differentiation and value added benefits, the authors argued. A herd of bighorn sheep was one product for hunters, and a different product for wildlife viewers. If the hunter hired a guide, that was value added. If the wildlife viewer read about the animal in anticipation of viewing it, that was value added, too. By serving the needs of both the hunter and the wildlife viewer, the wildlife manager could create and hold more customers and augment the value of the resource. "Handled creatively," the biologists wrote, "that can mean more support for management programs—something like a profit in the public sector."[67]

The concept of product differentiation soon emerged in the multitude of new programs that Nelson established to take advantage of Challenge Cost-Share. The programs were grouped under three major themes. The first program theme, called "Rise to the Future," was launched in 1987 for coordinating partnership projects involving fisheries and aquatic habitat. The second program theme, titled "Get Wild," was established a year later for coordinating partnership projects involving terrestrial wildlife species, particularly demand

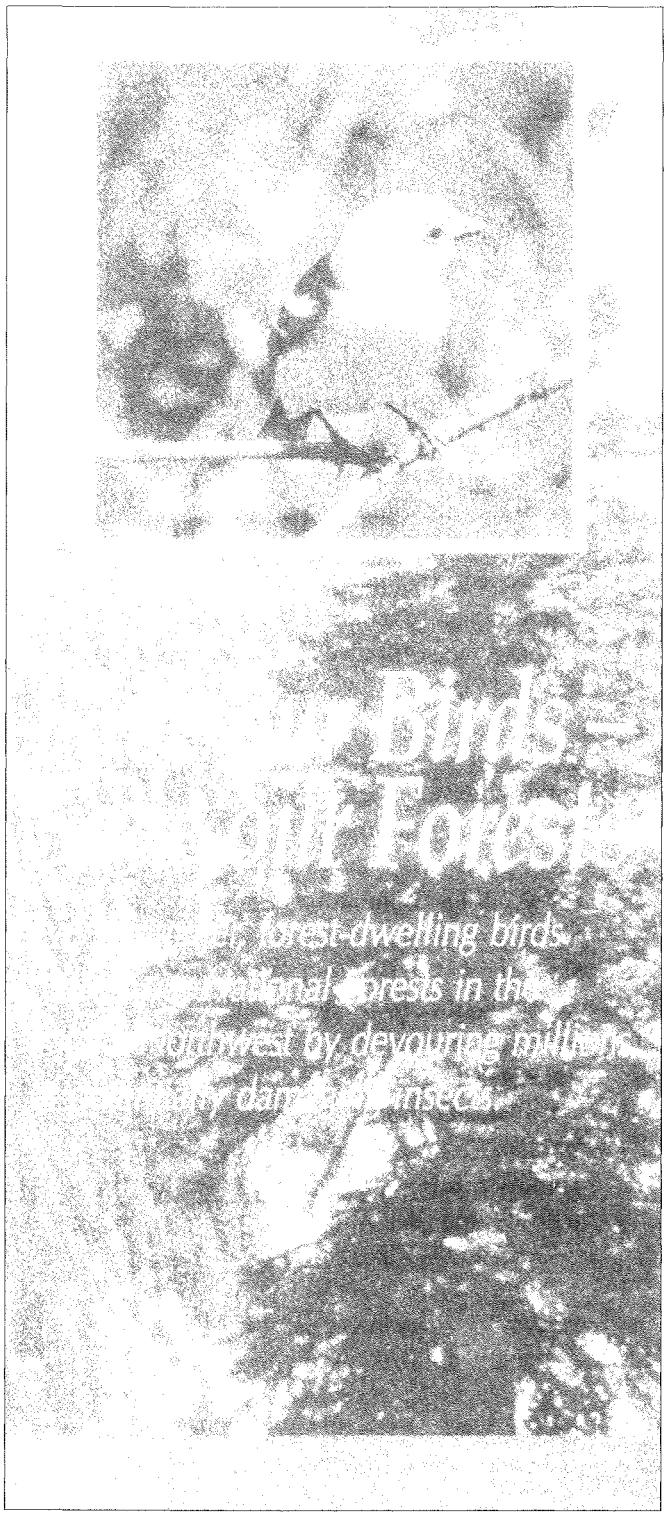


The Forest Service adopted marketing techniques—including these three "product labels"—to advance the Challenge Cost-Share Program.

species. The third program theme, known as "Every Species Counts," was initiated in 1990 for coordinating partnership projects involving rare, threatened, and endangered species.[68]

Product differentiation did not stop there. Get Wild soon comprised nearly a dozen emphasis areas, each one featuring a species, group of species, or unique biological community. These included the following:

- "Eyes on Wildlife" for wildlife viewing and appreciation;
- "Partners in Flight" for neotropical migratory bird conservation;
- "Taking Wing" for wetland wildlife;
- "Making Tracks" for wild turkey;
- "Answer the Call" for quail;
- "Full Curl" for wild sheep;
- "A Million Bucks" for deer;
- "Elk Country" for elk habitat management;
- "Bring Back the Natives" for indigenous fish species;
- "Dancers in the Forest" for grouse and woodcock;
- "Animal Inn," an informational and education program for children about wildlife dependent upon dead wood and snags, and;
- "Ecosystem Management/Restoration and Special Habitats" for unique species groups and communities.[69]



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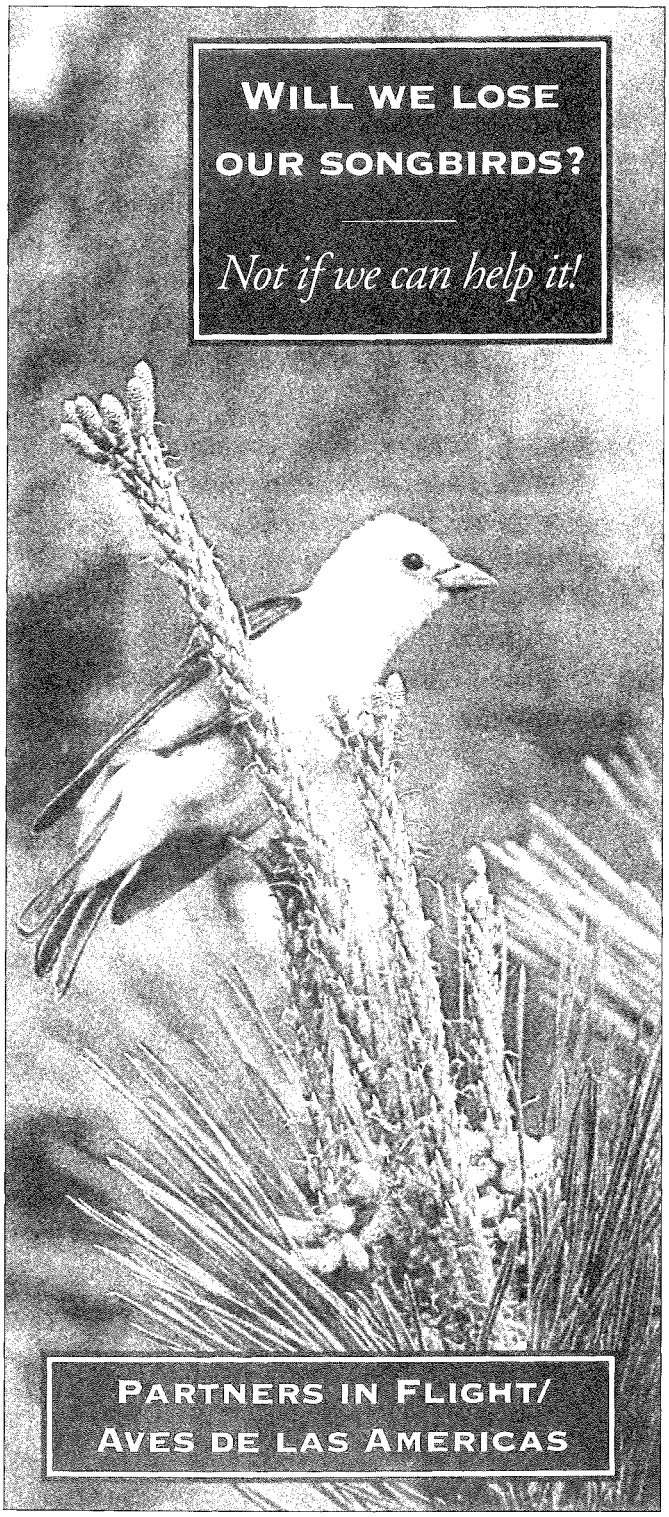
Like products in the marketplace, these programs could prove to be big sellers or busts, depending on the Forest Service's ability to bring in partners. "Eyes on Wildlife" was such a big seller, for example, that it spawned a new series, including "FishWatch" and "Celebrating Wildflowers," all under the umbrella of "NatureWatch." This program benefitted from skillful marketing efforts. The Forest Service packaged the NatureWatch program with its own logo—a pair of binoculars—which appeared on everything from State wildlife viewing guides to California and Montana highway maps. Between 1991 and 1994, NatureWatch accrued $2.4 million in cooperative funds. In 1995, the Forest Service appointed a national coordinator and produced a booklet, *On the Right Track: NatureWatch Highlights*, that celebrated the program as evidence of a changing outlook in the Forest Service.[70]

Some programs fitted a particular partnership like a glove. "Answer the Call" matched the Forest Service's partnership with Quail Unlimited. The program was directed at coordinating habitat improvement projects specifically for quail—another example of product differentiation in Nelson's program management. When quail populations declined because of habitat loss, a pamphlet on this partnership stated, "the hunter or quail enthusiast loses the chance to take part in the thrill of bagging a limit of quail or flushing a covey in the early morning." Answer the Call coordinated numerous projects to increase supplies of food, cover, and water for quail.[71]

The marketing approach to program management paid huge dividends. As the number of Challenge Cost-Share programs proliferated, the budget for wildlife, fish, and rare plants rose

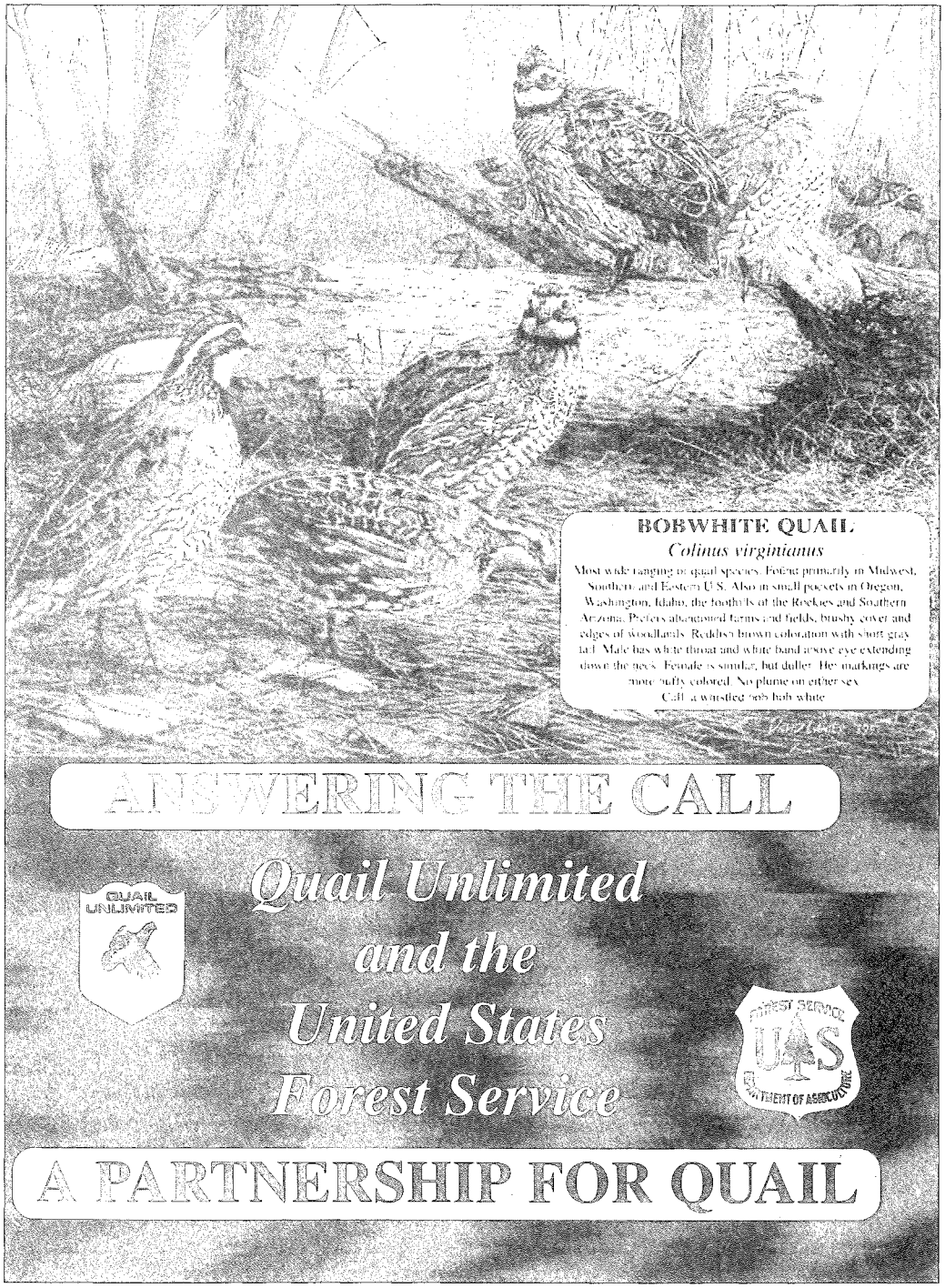


COURTESY PARTNERS IN FLIGHT

dramatically. Having reached a plateau of about $30 million in the first term of the Reagan administration, it began to grow in 1987 and climbed rapidly under the Bush administration, peaking at $116 million in 1993. Although a mere fraction of the wildlife budget actually went to Challenge Cost-Share programs, no one had any doubts about Challenge Cost-Share's role in the budget process. The impressive public response to these programs strengthened both the agency's and the wildlife staff's position in negotiating bigger budgets. Most of the budget increase was used to bring more biologists and botanists into the agency. In addition to supervising partnership projects for habitat improvement, these people provided input for the planning and review of thousands of timber sales, rangeland management plans, and mineral claims.[72]

Challenge Cost-Share was such a powerful catalyst for expanding the Forest Service's wildlife program that even its progenitors were surprised by their success. Robert Nelson believed it was the most significant development for wildlife management on the national forests since the National Forest Management Act.[73] Lonnie Williamson of the Wildlife Management Institute contended that Challenge Cost-Share had given the Forest Service the wherewithal to "pull ahead of other agencies" in the wildlife field.[74] Ten years after the program was launched, the Forest Service employed more wildlife and fish biologists than any other Federal agency in the Nation.

The new emphasis on partnerships was not without problems. Some staff biologists complained that it was an inefficient way to get the job done. Each separate project involved a unique proposal and environmental assessment, coordination with multiple partners, supervision of volunteers, and cost accounting. A few



COURTESY USDA FOREST SERVICE

biologists at the field level tended to view partnerships primarily as a fiscal measure for stretching taxpayers' dollars, and suspected that private contributions were replacing rather than augmenting whatever Congress gave them to work with. Despite these irritations, however, biologists adopted partnerships as an integral new part of their job.

Some staff biologists enthused that the Challenge Cost-Share program created more opportunities to work with the public in a highly positive atmosphere. Moreover, they found the local volunteer effort to be inspiring and professionally rewarding. In the Forest Service's Southern Region, which had one of the strongest Challenge Cost-Share programs in the National Forest System, volunteer labor accounted for about 25 percent of the staff hours that were put into habitat improvement.[75]

Some biologists who worked in the regional offices had a more philosophical outlook on partnerships. Melanie Woolever, a biologist in the Rocky Mountain Regional Office in Denver, regarded the educational function of partnership programs to be a vital part of the agency's mission to conserve the national forests for future generations. Americans' predominantly urban, post-industrial society was in danger of losing touch with wild nature. Woolever applauded groups such as the Rocky Mountain Elk Foundation and the Foundation for North American Wild Sheep for raising public consciousness about wild animals, and by extension, the whole environment. She represented the Forest Service on various advisory boards and helped these organizations decide how to best use funds for wildlife conservation.

Across the entire West, the population was becoming more urban. Increasing numbers of people resided within a short drive of the national forests, yet had no knowledge of the history and purpose of these Federal lands and no grasp of ecology. Children in big cities were particularly at risk of growing up in ignorance of their inheritance. Forest Service biologists Laurie Fenwood and Melanie Woolever conceived of a roving, interactive, classroom exhibit, called a "Sally" or "Sammy Snag," that would familiarize school-age children with the basic concept of habitat. In partnership with many city schools, Forest Service biologists developed a host of mobile natural history exhibits that went from classroom to classroom and raised children's awareness about ecology.[76] As children's lives became more and more circumscribed by artificial environments—from video arcades to virtual reality—putting Sally Snag in the classroom was one small but significant step toward reconnecting people with the outdoors.

Public involvement in habitat management was the ultimate value of partnerships. When people outside the agency participated in Challenge-Cost Share projects, they became stakeholders in the national forests. By nurturing people's proprietary interest in the public lands, the Forest Service helped to make the people more environmentally aware. In the broadest sense, partnerships helped to create a citizenry that was more committed to the support of its public land heritage.[77]

CHAPTER ELEVEN

CHAPTER ELEVEN
ECOSYSTEM MANAGEMENT

"This is a mind-wrenching thing to pull back and pull up and start to look at the world with a satellite view. But that's how we're going to deal with it."

. . . *Jack Ward Thomas, 1992.*

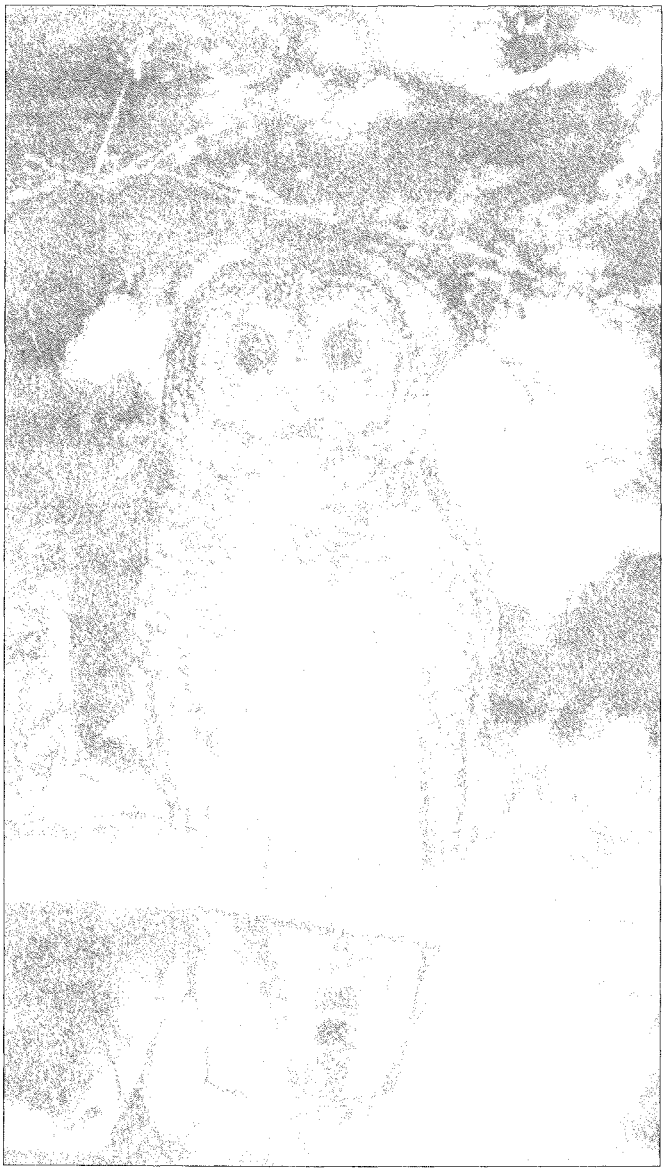
The Forest Service's move toward ecosystem management was primarily about scale. It was about enlarging the land manager's view across both space and time. In the 1960's and 1970's, biologists and foresters had argued over 40- and 200-acre clearcuts; in the 1980's and 1990's they battled over the fate of an old-growth forest ecosystem stretching from the Canadian border to central California. In the earlier period, biologists and foresters focused on ecological changes over 1-, 5-, or perhaps 50-year increments; now they concerned themselves with once-in-100-year disturbances and 500-year forest fire cycles. The broader perspective crystallized in the efforts to save the northern spotted owl (and other wide-ranging threatened or endangered species) from slipping toward extinction. As the owl moved inexorably toward listing under the Endangered Species Act, the "viable populations" regulation promulgated so quietly in 1979 finally came home to roost. Here was a vital test of Forest Service resolve: would ecosystem management be imposed on the Forest Service by the courts over viability issues concerning the northern spotted owl, or would it be integrated into the agency's organizational culture and value system through a process of reform?

Symbol of a Crisis: The Northern Spotted Owl

The northern spotted owl makes its home in the cool, dark reaches of old-growth forest in the Pacific Northwest. The bird hunts small mammals at night and rests high in the big trees by day. It is a medium-sized owl with dark eyes, chestnut brown coloring, whitish spots on the head and neck, and white mottling on the breast and abdomen. Although the owl is nocturnal and inconspicuous in its forest habitat, it is so docile that it will descend from the safety of a high branch to take a mouse from a human's hand.[1]

This bird became a highly contentious symbol of the Nation's environmental crisis during the 1980's. Biologists, environmentalists, and the timber industry fought over the meaning of the symbol as much as they clashed over larger issues involving old-growth forest ecosystems, conservation biology, and the social and economic welfare of thousands of Americans who worked in the region's timber industry.

When biologists in the Forest Service nominated the animal as a "management indicator species" on several national forests in 1983, they gave the owl symbolic as well as management significance. As an indicator species, the owl served a function much like the proverbial canary in the coal mine. Nineteenth-century coal miners, working underground in oxygen-deficient air, knew they were in trouble if their caged canary died of asphyxiation. Similarly, biologists assumed that a decline in the northern spotted owl



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Northern spotted owl, Mount Hood National Forest, Oregon.

population would alert them to the imminent failure of another life-support system—the old-growth forest ecosystem.[2]

Environmentalists, meanwhile, pushed to get the northern spotted owl listed under the Endangered Species Act. Formal listing of the species carried symbolic as well as legal weight. Environmentalists had a term for it: the northern spotted owl served as a "flagship species." Once the bird was listed, the law required Federal agencies to develop a conservation strategy for the species. The conservation strategy would have numerous collateral effects, including less logging and road development and more protection for other sensitive species associated with the old-growth ecosystem.

Loggers and the timber industry, for their part, made the bird a symbol of environmental extremism. They portrayed the animal as a false idol elevated by environmental zealots over the interests of everyday Americans. In logging towns of western Washington and Oregon, protesters hanged the bird in effigy in shop windows, and derided it on T-shirts, bumper stickers, and in the local press.[3] Many politicians accepted and reinforced this symbolism. "I don't think that saving the owl is worth 30,000-35,000 jobs," Senator Robert Packwood of Oregon remarked. "I'll say it very baldly."[4] He expressed the kind of simplified logic that drove biologists to distraction. They feared that the symbolism surrounding the northern spotted owl had diverted public attention away from the fundamental issues of old-growth forest and sustainability.

In the late 1980's and early 1990's, the courts came to play a critical role in interpreting the substance behind the owl's symbolism. U.S. District Judge William Dwyer ruled that the Endangered Species Act required Federal agencies to protect ecosystems on which threatened and endangered species depended, therefore, Federal agencies had to develop a conservation strategy for the northern spotted owl on an ecosystem scale. The area of land involved was unprecedented. The owl's range within the United States extended from the

Canadian border to northern California. It spanned two National Forest System regions and numerous national forests. The court decision was a milestone in pushing the Forest Service toward a new management paradigm called "ecosystem management."[5] Ironically, when members of Congress challenged the Chief of the Forest Service to show where the agency had been given a mandate to manage ecosystems, their attention was directed to the National Forest Management Act of 1976, the Endangered Species Act of 1973, or even back to the Organic Act of 1897.[6]

COURTESY USDA FOREST SERVICE

Ecosystem management emerged simultaneously throughout the country, centered around different issues. It received public attention in the effort to conserve the grizzly bear in the Greater Yellowstone Ecosystem, and in the conservation measures taken for the red-cockaded woodpecker in longleaf pine forests of the South. No situation involving the move toward ecosystem management was more contentious or influential, however, than that which unfolded in the Pacific Northwest.

Jack Ward Thomas, who would emerge in this crisis as the Forest Service's recognized authority on wildlife habitat management in the old-growth ecosystem, took a strong position on the need for reform. He told a Senate panel in 1992, "To allow a species to slip to the point of being threatened is a terrible error; it is a terrible economic, social, biological error." In the case of the northern spotted owl, Thomas testified, "we watched our options slip away over a period to the point that we did not have a lot of options left." If the government had acted responsibly in the early 1980's, it could have lessened the social and economic costs of protecting the environment. Thomas argued that the government's decade-long mismanagement of the situation should stand as a lesson for the future.[7]

Management of Spotted Owl Habitat in the 1970's and 1980's

The Pacific Northwest's forest ecosystem contains some of the oldest and largest trees and densest accumulations of organic matter found in the world. Commercial logging of old growth commenced in the 1850's, and increased to supply the national market around the 1890's and early 1900's. After World War II, logging intensified on the national forests as the timber supply on private lands dwindled. While a hundred years of clearcutting replaced much of the old-growth forest with second- and third-generation stands, extensive fires in the 19th and early 20th centuries damaged much of the timber in other areas. In the late 20th century, the former burn areas were characterized by mixed-aged stands. These

stands were difficult to classify since they contained many old surviving trees but lacked the structural characteristics of old-growth forest. Consequently, in the last quarter of the 20th century, environmentalists, Government officials, and industry representatives debated and fought over the amount of old growth remaining and the rate at which it was being cut.[8]

As the Forest Service moved toward intensive management of the national forests after World War II, its plans in the Pacific Northwest came to assume the eventual harvesting of most old-growth forest outside of wilderness areas and its replacement with fast-growing, even-aged stands, primarily of Douglas-fir. Non-agency biologists challenged that assumption soon after they began to study the northern spotted owl in the 1960's. As with any rare species, owl researchers started by investigating the animal's population and distribution. Initially it appeared that this highly territorial species was confined strictly to old growth. By the early 1970's, biologists were beginning to suggest that the bird's long-term chances of survival might depend on the preservation of old-growth habitat on the national forests in addition to what was already reserved in national parks and wilderness areas.[9]

The continued logging of irreplaceable stands of old growth, coupled with mounting evidence that the northern spotted owl was ecologically dependent on this very habitat, posed an unprecedented challenge to multiple-use management. The Forest Service had responded to past challenges to its timber program by making small set-asides. It had established natural areas for research, protective zones for exceptional sport fisheries, and sanctuaries for endangered species such as the California condor and the Kirtland's warbler. National forest lands had been set aside as wilderness, too, although most designated wilderness areas were at high elevations and often above timberline where the timber program had limited potential. At that time none of these past set-asides had seriously encroached on the Forest Service's timber base.[10]

Faced with the need to protect the owl and its old-growth habitat, the Forest Service assumed that it could resolve the conflict through its usual procedures for coordinating multiple-use. The owl was classified as a "sensitive species." This designation triggered the Forest Service's own early warning system: it would take precautions to prevent the species from slipping toward a "threatened" or "endangered" listing under the Endangered Species Act. To this end, foresters and biologists would attempt to develop a compromise solution by allocating a certain acreage of old-growth habitat around each nesting pair of owls. However, it gradually became apparent that the traditional line-staff-research organization of the Forest Service made a realistic compromise unattainable. Despite an announced policy in the late 1970's to move some biologists from research and staff roles into line-officer positions, such placements were rare. Foresters continued to occupy virtually all the district ranger and forest supervisor positions in the Forest Service.[11] These officials were directly responsible for meeting timber sale targets, and often could not agree upon adequate protective measures for the owl because of timber's priority. With the

advantage of hindsight, political scientist Steven Lewis Yaffee, author of *The Wisdom of the Spotted Owl: Policy Lessons for a New Century*, argues that the Forest Service (together with the Bureau of Land Management) made a strategic error when it decided to stand by its "standard operating procedures."[12]

Forest Service biologists were among the first to sense the agency's predicament. Kirk Horn was a biologist on the Mount Hood National Forest when the owl's relationship to old growth was first brought to light in the early 1970's. In consultation with owl researcher Eric Forsman, a graduate student at Oregon State University, Horn advised Regional Forester Dick Worthington of the need to set aside a certain percentage of old growth from the region's timber base for the protection of the owl. Worthington dismissed the idea that the northern spotted owl depended on old growth. Exhibiting what Horn described as a "sawdust mentality" or preoccupation with "getting out the cut," the regional forester made his point by ordering Horn to look for spotted owls on a Portland, Oregon golf course.[13]

Worthington further rejected the preliminary recommendations of an Oregon Interagency Endangered Species Task Force. The Task Force, composed of biologists from the Fish and Wildlife Service, the Bureau of Land Management, the Oregon Department of Fish and Wildlife, and Oregon State University, proposed the establishment of a 300-acre buffer of old-growth forest around every known nest site on national forest and BLM-managed lands in Oregon. Worthington criticized the plan in a joint statement with the State director of the BLM in August 1973. To manage forest lands based on the locations of individual animals would set a chilling precedent, Worthington insisted, and would constitute a "land management spectre of considerable magnitude."[14]

During the next 4 years, the Task Force assembled additional research findings that pointed to the need for old-growth reserves to protect the spotted owl. In 1977, it renewed its recommendation to set aside areas around all known nest sites and it proposed a long-range goal of 400 pairs of spotted owls as a minimum viable population for the State of Oregon. Approximately three-fourths of known nest sites were located on national forests.[15]

Reluctantly, Worthington endorsed the plan in February 1978. As the Pacific Northwest Region proceeded to implement these guidelines, however, the Oregon Wilderness Coalition appealed the Forest Service's decision on the basis that each owl pair needed more than 300 acres around each nest site. With the interagency plan now at an impasse, the Forest Service resorted to its own forest planning process under the National Forest Management Act. The agency formed an internal Spotted Owl Task Force to prepare "minimum management requirements" (MMR's) for protection of the spotted owl.[16]

Forest Service biologists now tried to determine how many owls constituted a viable population on each forest, and whether logging under certain prescriptions would be possible within the owl's habitat. Research findings at this point were inconclusive. Various hypotheses were proposed to explain the owl's dependency on old growth, focusing alternatively on the owl's nesting sites, prey, predators, and thermoregulation. Each hypothesis had different implications for management. For example, one hypothesis held

that the northern spotted owl required deep shade and cool ambient temperatures in summer to compensate for its warm plumage, leading to the conclusion that microclimates such as occurred in cool, moist, forested canyons could provide suitable roosting sites for the owl whether or not the microclimate was located in old growth. Complicating the picture further, it was difficult to differentiate old growth from mixed-aged stands dating from the burns of the past century, as one type shaded into the other.[17]

In 1984, the Forest Service co-sponsored a symposium, "Ecology and Management of the Spotted Owl in the Pacific Northwest," in Arcata, California.[18] Conservation biologists expressed growing concern that patches of habitat were insufficient to ensure the long-term viability of this (or any other) species commonly found in old-growth Douglas-fir forest.[19] They suggested that the population would become too small and spread out to maintain its genetic diversity. Andy Stahl of the National Wildlife Federation asserted that it was not enough to ensure that no individuals in the population became isolated; rather, the perpetuation of genetic diversity required that each individual had "an equal probability of mating with any other individual." Therefore, the density and quality of habitat areas, not merely their distribution, were critical factors.[20] Despite such warnings, however, the Forest Service's only concession to the owl in the mid-1980's was to accept the recommendation of the Oregon Endangered Species Task Force that each owl pair needed a minimum buffer of 1,000 acres rather than the 300 acres sought previously.[21] Meanwhile, timber harvests actually increased on the national forests in Oregon and Washington—to about 71,000 acres per year.[22]

By now, some environmental groups had decided that actual listing of the bird under the Endangered Species Act was their only recourse, as neither the Forest Service nor the Bureau of Land Management was taking the necessary steps to ward off probable extinction of the species. In 1987, a coalition of environmental groups petitioned the Fish and Wildlife Service to review the status of the species (the Fish and Wildlife Service's Portland office had already found the species "vulnerable" in 1981). When the Fish and Wildlife Service issued a negative decision, the coalition sued in Federal district court in Seattle, alleging that the decision was based on economic considerations not allowed under the Endangered Species Act. The court voided the Fish and Wildlife Service's decision and ordered the agency to review the case yet again.[23]

In December 1988, while awaiting for a third time a possible listing of the spotted owl under the Endangered Species Act, the Forest Service adopted a Record of Decision (ROD) and Final Supplemental Environmental Impact Statement (SEIS) on a revised plan for managing the northern spotted owl in the Pacific Northwest Region. Scientists inside the agency found the ROD to be based on a flawed analysis, and many Forest Service biologists expressed reservations about it.[24] Nonetheless, the Secretary of Agriculture refused to consider administrative appeals of the two decisions. A few weeks later, a coalition of environmental groups filed suit, and in March 1989 the district court granted a preliminary injunction that halted 16 timber sales in spotted owl habitat.[25]

ADMINISTRATIVE APPEALS

Members of the public and Congress have expressed concern over the growing number of administrative appeals, and the time and expense involved in processing them. Between 1983 and 1988, the number of administrative appeals filed annually more than doubled. During the same period, the time required to process appeals rose significantly—from an average of 201 days in 1986 to 363 days in 1988. The cost of handling and processing appeals also increased from an estimated $2.8 million in 1983 to $10.1 million in 1988. Increases in time and costs were largely attributable to the growing sophistication of the administrative appeals themselves.

The system's critics charge that the administrative appeals process has been abused and that the forest planning process has "broken down." Many appeals are described as mere harassment, a delaying tactic used to challenge the Forest Service's timber program. An analysis of the Forest Service's timber program from the late 1980's to the late 1990's found no evidence to support the assertion that administrative appeals have significantly decreased the volume of timber available for sale. However, administrative appeals have impaired the Forest Service's ability to ensure a smooth flow of timber to market in some regions, particularly the Northern Region.

In defense of the administrative appeals system, it would seem that many appeals appear to be justified, because a high percentage of appeals have led to reversal or remand of the initial decisions—a majority due to NEPA related problems. Between 1985 and 1988, the agency reversed or modified its decisions in 40 percent of timber sale appeals resolved in Washington, Oregon, Montana, and northern Idaho. Thus, appeals have played a significant role in exposing inadequate environmental analyses and documentation. The appeals process and resulting litigation helped clarify legal requirements and test the soundness of current policies and procedures. It provided an opportunity for more consistent decisions and accountability of responsible officials.

Conflict and Compromise, 1989-1993

Two developments in 1989 complicated the ensuing battle in the courts. First, in June, the Fish and Wildlife Service completed its study and proposed that the northern spotted owl be listed as threatened. (A 12-month public review period followed before the bird was finally listed in June 1990.) Second, Congress passed the Department of the Interior appropriation bill with a rider stipulating that Forest Service and BLM plans were adequate to protect the owl. This act temporarily derailed the court's consideration of the issue. Instead, the court turned its attention to the constitutionality of the act, addressing the issue of whether Congress had intruded on the decisionmaking process of Federal courts. The politics of the northern spotted owl controversy had grown to remarkable proportions. Not only had biologists' recommendations been pushed aside by cabinet-level officials, but now the judicial and legislative branches of Government were dueling over which could direct the executive branch.[26]

While that controversial provision in the appropriation bill was being litigated, the Forest Service tried to regain the initiative with the appointment of research scientist Jack Ward Thomas to head an Interagency Scientific Committee (ISC) on the northern spotted owl. Thomas had already proven to be outspoken on the need to take a fresh, regional, interagency approach to the problem, and he was allowed to select other members for the

committee who shared his perspective. The ISC's objective was to develop an innovative strategy for the conservation of the owl that would have a high probability of success and would minimize social and economic impact. Its principal recommendation was to go beyond the prevailing concept of 1,000-acre reserves located around each nesting owl pair by designating big blocks of old growth.[27]

On October 3, 1990, the Forest Service announced that it was abandoning its former Record of Decision of December 1988—the object of the pending lawsuits—and amending all forest plans under NFMA to be consistent with the ISC recommendations. Although environmentalists viewed the ISC findings as a step in the right direction, they were troubled by the ISC's provision for more logging of old growth. Therefore, the environmentalists' attorneys amended the complaint by alleging that the administrative procedures outlined by the Forest Service on October 3 were in violation of the National Environmental Policy Act and the National Forest Management Act. The Forest Service countered by stating that any recovery plan for a species listed under the Endangered Species Act took precedence over the NFMA guidelines.[28]

Five months later, in March 1991, U.S. District Judge William Dwyer ruled against the Forest Service. In a stinging rebuke of the agency's leadership, the court found that the Forest Service had intentionally broken laws concerning the protection of wildlife. The court quoted testimony by agency biologists who described the "political pressure" they were under "to create a plan . . . [that] had a very low probability of success and . . . [that] had minimum impact on timber harvest." Dwyer wrote the following in his opinion:

> More is involved here than a simple failure by an agency to comply with its governing statute. The most recent violation of NFMA exemplifies a deliberate and systematic refusal by the Forest Service and the FWS to comply with the laws protecting wildlife. This is not the doing of the scientists, foresters, rangers, and others at the working levels of these agencies. It reflects decisions made by higher authorities in the executive branch of Government.[29]

Significantly, Dwyer ruled that the Forest Service could not finesse its way out of the 1988 Record of Decision by substituting the ISC report, for such unilateral action violated public review procedures required by the National Environmental Policy Act and the National Forest Management Act. Moreover, the court rejected the Forest Service's contention that the listing of a species under the Endangered Species Act negated the agency's obligations under NFMA. To the contrary, the regulations under NFMA explicitly addressed endangered and threatened species. There was no conflict between the two statutes and the Forest Service had never acted as though there were one prior to the situation that had arisen in the Pacific Northwest. Dwyer gave the Forest Service 1 year, or until March 1992, to develop a new owl plan that complied with NFMA.[30]

Finally, Dwyer indicated what the court would expect to see in such a plan to make it legally sound. This was perhaps the court's most important finding, for it confirmed that there existed a statutory basis for ecosystem management. "The duty to maintain viable populations of existing vertebrate species," Dwyer wrote, "requires planning for the entire biological community—not for one species alone. It is distinct from the duty, under the ESA, to save a listed species from extinction. . . ."[31] In other words, the court did not want to see another plan for the conservation of only the northern spotted owl as an indicator species, but a plan for conserving the ecosystem on which this animal—and others—depended. In the meantime, Dwyer issued an injunction stopping all new timber sales on public lands involving northern spotted owl habitat.

Two months after the court's decision, in May 1991, Congress made another move to break the impasse in the Pacific Northwest. Several House committees joined together in commissioning a panel of scientists to identify, map, and classify all old-growth forest areas on Federal lands within the range of the northern spotted owl. The panel, which included Thomas together with several distinguished professors of forestry and ecosystem analysis, agreed to develop a range of options for the designation of "late-successional forest reserves." The scientists insisted, however, that the selection of an option was a political decision and not for them to make. Thomas later remarked that the process of preparing options was "kind of like Goldilocks and the Three Bears. Some porridge is too hot, some's too cold, and some's just right."[32] Thomas and his co-panelists hoped that the decisionmakers would select an option with at least a medium probability of success, but they were notably less confident of their ability to predict political outcomes than biological outcomes.[33]

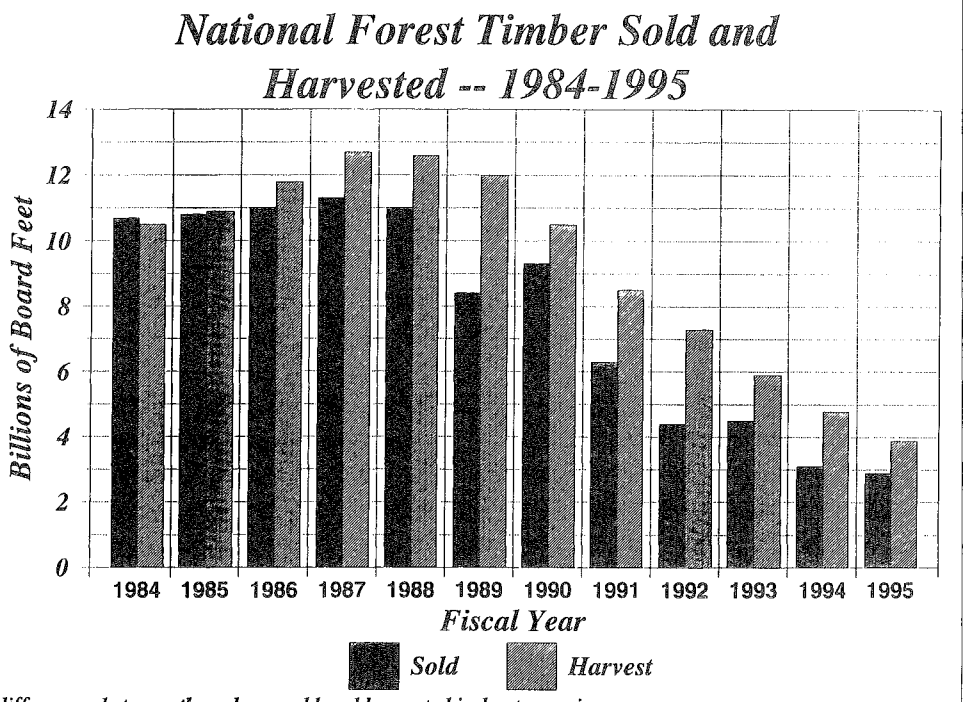
As the 1992 presidential election year dawned, the crisis in the Pacific Northwest seemed hopelessly stalemated. The judicial, legislative, and executive branches of the Federal Government were at loggerheads, mills were closing, and no one was able to put forward a credible plan for the recovery of the northern spotted owl. Presidential candidate Bill Clinton argued that the crisis was a prime example of "Washington gridlock," and he promised if elected to call a "timber summit" and to reach a solution.

On April 2, 1993, shortly after taking office, President Clinton convened the proffered timber summit, renamed the Pacific Northwest Forest Conference, in Portland, Oregon. He posed the fundamental question to the forest conference: "How can we achieve a balanced and comprehensive policy that recognizes the importance of the forests to the economy and jobs in this region, and how can we preserve our precious old-growth forests, which are part of our national heritage and that, once destroyed, can never be replaced?"[34] To answer that question, Clinton created three interagency working groups—a Forest Ecosystem Management Assessment Team, a Labor and Community Assessment Team, and an Agency Coordination Team.

ECOSYSTEM MANAGEMENT MOVES EAST

The President's Plan included direction to conduct an East-Side Ecosystem Management Assessment to promote the long-term health of ecosystems on the east side of the Cascade Range.

Jack Ward Thomas was appointed team leader for the ecosystem management assessment. The team was comprised of more than a hundred scientists, analysts, and technicians, and was drawn from six Federal agencies as well as several universities. An estimated 500 additional people contributed to the study in some fashion. In the remarkably short span of 4 months, the Forest Ecosystem Management Assessment Team (FEMAT) produced a 1,000-page document. The Assessment Team proposed 10 options that mixed and matched two types of reserves— late-successional and riparian—with non-reserved Federal lands, which it called the "Matrix." Under all 10 options, timber harvesting was confined to the Matrix. Clinton selected Option 9, which became The President's Northwest Forest Plan.[35] Although the habitat needs of the northern spotted owl weighed heavily in the selection of reserve areas, anadromous fish and other sensitive species were taken into account as well. To a greater extent than any previous effort, the Assessment Team sought to protect not just a single species but an entire ecosystem.



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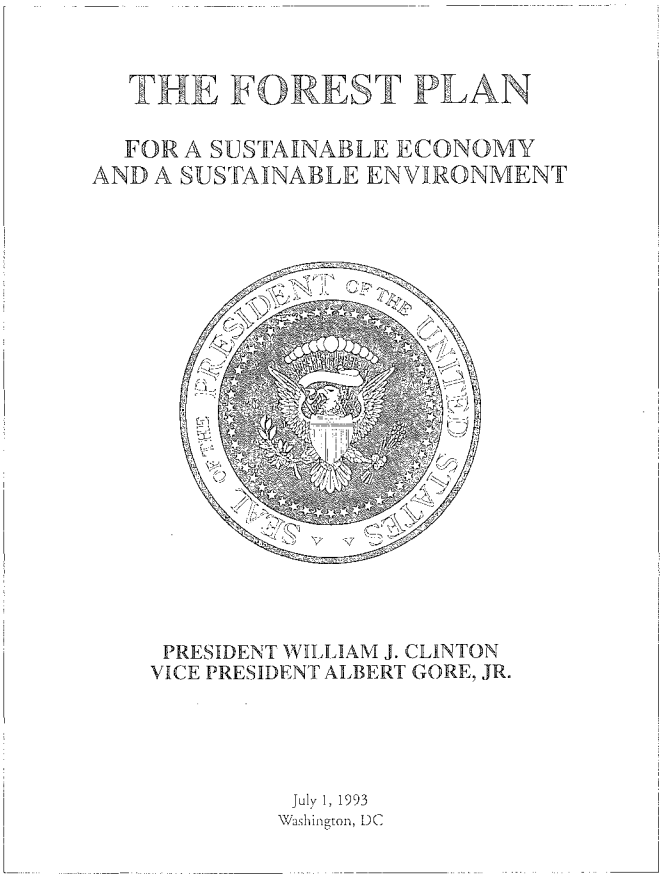
The differences between the volume sold and harvested is due to previous volumes under contract and the 3 to 5 year lag between sell and harvest.

Source: Annual Report of the Forest Service



THE FOREST PLAN

FOR A SUSTAINABLE ECONOMY
AND A SUSTAINABLE ENVIRONMENT

PRESIDENT WILLIAM J. CLINTON
VICE PRESIDENT ALBERT GORE, JR.

July 1, 1993
Washington, DC

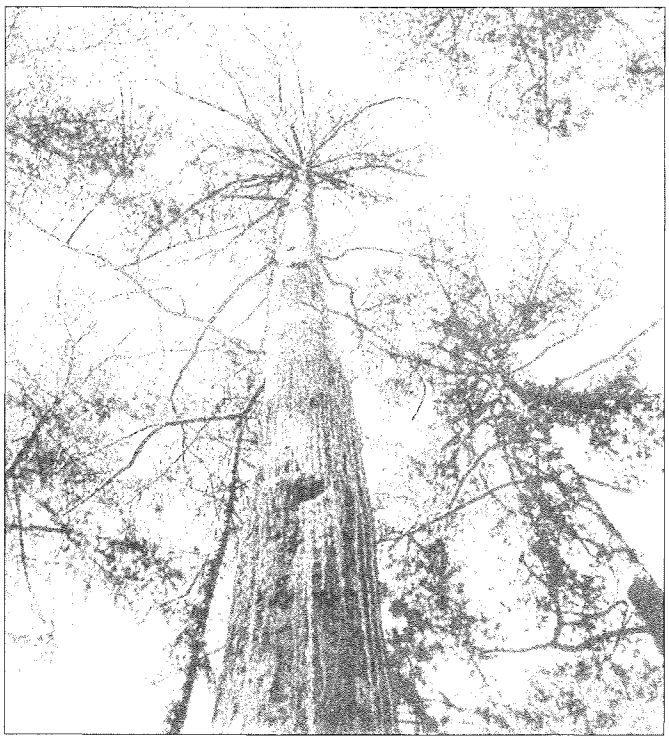
Thomas considered large-scale ecosystem assessments such as this to be the obvious course for the future. They appeared to be an effective vehicle—both politically and scientifically—for modifying forest plans on a regional basis when a wide-ranging animal such as the northern spotted owl became threatened or endangered. Faced with the alternative of piecemeal planning efforts and prolonged litigation, large ecosystem assessments were worth the considerable expense that they entailed. Ecosystem assessments for other regions were soon underway: first for the upper Columbia River Basin, where several salmon stocks were listed under the Endangered Species Act in 1990; next for the Southern Appalachians; another for the Sierra Nevada Range in California, and another for the national grasslands. "Ecosystem management must happen," Thomas insisted. "You can't resist ecosystem management anymore than you can order the incoming tide to go back out." It only remained for the policy "to evolve past the point where it [was] being driven by the Endangered Species Act," he argued.[36]

A FRAMEWORK FOR BREAKING THROUGH GRIDLOCK

- A sustainable harvest that will allow timber sales and logging based on a scientifically sound and legally responsible plan, improving forest management and ending the confusion and uncertainty of past policies;
- New economic assistance to help local workers, businesses and communities to strengthen the region's economy, create family-wage jobs, offer new economic opportunities and ensure the region's long-term economic health, confronting economic issues ignored by past Administrations;
- An innovative, new approach to environmental protection focusing on key water supplies and valuable old-growth forests, that will once again base forest management on science and a respect for existing law;
- A comprehensive system of old-growth reserves to protect old-growth ecosystems;
- New opportunities for people in the region to participate in decisions regarding management of the Nation's forests for the economic and environmental benefits they provide and to help plan for their future;
- Improved coordination among Federal agencies responsible for managing Federal lands, ensuring that Federal agencies will work together with State and local officials, with tribes, and with private landowners for the best interests of people and communities in the region, instead of working against each other, undermining the law and creating gridlock.

New Perspectives

If the report by the Forest Ecosystem Management Assessment Team and the President's Pacific Northwest Plan were milestones on the road to ecosystem management, Forest Service Chief F. Dale Robertson had already pointed the agency in that direction 3 years earlier with the latest 5-year program prepared under the Resources Planning Act (RPA). Known as the 1990 RPA, the program called for a 15 percent reduction in timber harvest levels compared with those in existing forest plans, and it put greater emphasis on recreation, wildlife, and fisheries resources. In addition, the program outlined three strategic goals: to improve the base of scientific knowledge about natural resources, to respond to global resource issues, and to produce commodities in "ways that were environmentally acceptable." How the Forest Service would define "environmentally acceptable" was the vital question. In an effort to convince the public that the reforms were substantive, Robertson christened the program "New Perspectives" and established a new staff group in the Washington Office.[37]



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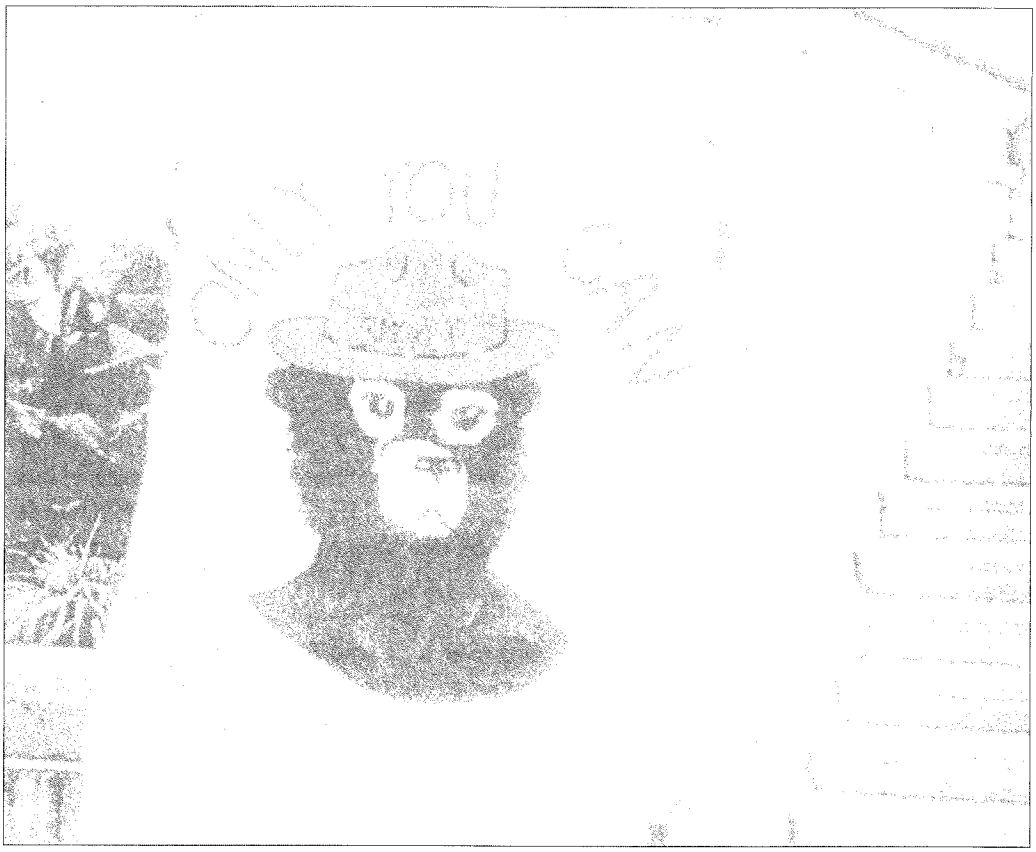
A red-cockaded woodpecker nest in a longleaf pine, Sabine National Forest, Texas.

Robertson selected Hal Salwasser, a prominent Forest Service biologist, to be the director of New Perspectives. As director, Salwasser received a roving commission to explain the principles of ecosystem management to Forest Service personnel and public audiences throughout the country. Salwasser argued that New Perspectives embodied a fundamental shift in forest values, which he defined as "sustainable ecosystem management." New Perspectives was "an elaboration of the concept of multiple-benefit, sustained-yield resource management." Although the new approach to land management still rested upon those twin pillars of Forest Service policy, multiple-use and sustained yield, it went beyond the agency's traditional focus on human-centered resources and yields to consider "the full range of services, values, uses, diversity, and continuity of ecological systems."[38] It addressed the problem of sustainability on a regional and global scale.

Robertson and Salwasser both recognized that the Forest Service faced a credibility gap. Salwasser compared his mission as director of New Perspectives to that of a diplomat trying to negotiate a cease fire. The Forest Service was under attack from the wood products industry on the one side and environmentalists on the other.[39] Even more disturbing, perhaps, were the stirrings of revolt in the agency's own ranks. Less than a year before Salwasser went on the road with New Perspectives, a disaffected Willamette National Forest employee, Jeff DeBonis, had founded the Association of Forest Service Employees for Environmental Ethics (AFSEEE), to provide a voice of dissent against Forest Service policy decisions that were harmful to the environment. Based in Eugene, Oregon, the group soon claimed a national membership of 5,000 (many of them not connected with the Forest Service) and began documenting case after case in which line officers who were bent on getting out the cut had stifled or circumvented staff officers' warnings about ecological damage. Some of the whistleblowers who took their stories to AFSEEE claimed that forest supervisors had altered their scientific reports to minimize ecological impacts.[40] AFSEEE's existence and the publicity given to these stories increased the sense of public skepticism surrounding national forest management.



COURTESY USDA FOREST SERVICE

Smokey Bear sheds a tear for the national forests. Environmentalists saw the Forest Service as a house divided.

Forest supervisors themselves felt pinched between the standards and guidelines in place to protect environmental quality and the hard targets for timber sales demanded by Congress and the Bush administration. Following a national conference of forest supervisors held in Tucson, Arizona ,in November 1989, the forest supervisors addressed a memo to Chief Robertson in the bluntest possible terms. Professional principles were being compromised and the land ethic they revered was being routinely violated.[41] "Many members of the public and many of our employees no longer view us as leaders in environmental conservation . . . There is a growing concern that we have become an agency `out of control' . . . change must come faster."[42]

After the "Sunbird" conference (so named because it followed the first national conference of forest supervisors in Snowbird, Utah), the participants developed a lengthy action plan to address their many concerns. One item was finally accomplished when Chief Robertson sent a letter to the field stating that standards and guidelines spelled out in each Forest Plan would take precedence over timber sale targets mandated by Congress. Even this statement did not resolve forest supervisors' uncertainty, however. A few weeks after Robertson's circular to all regional foresters, Associate Chief George Leonard informed the Intermountain Forestry Industry Association that "nonessential" Forest Plan environmental standards could be amended to meet timber sale targets.[43]

Thus, at the same time that Robertson and Salwasser were touting "New Perspectives" as an effective vehicle for reviewing the timber policies and projections made in the previous decade, forest supervisors were feeling the squeeze of commodity and environmental interests as never before. In 1991, the spotlight on national forest management shifted rather suddenly from the Pacific Northwest to the Northern Region where forest supervisors began scaling back the amount of timber sales in order to protect fish and wildlife habitat and other resources in the forest plans. Regional Forester John Mumma, the first professional wildlife biologist in the Forest Service to attain that rank, came to his forest supervisors' support. Bucking strong pressure from Idaho and Montana congressmen, as well as his superiors in Washington, Mumma instructed the forest supervisors that they could choose between implementing the environmental protection standards in their forest plans or meeting the timber sale targets set by Congress. In other words, he was not going to order his forest supervisors to violate any standards based on environmental laws in order to get the cut out.[44]

The conflict between the Forest Service's traditional focus on timber production and its broader mission to conserve other resources had never been so stark. Senator Larry Craig of Idaho complained to Chief Robertson that the national forests in his State had offered a mere 16.2 percent of the timber required to meet assigned targets through the mid-point of 1991. For the senator, this demonstrated "a complete lack of management direction and execution." He did not believe Robertson's assurances that the forests would reach 95 percent of the planned program in Idaho by October 1. "Quite honestly, Dale, I expect that this is just another wishful estimate of what will be a drastic under-accomplishment of the directed program."[45]

That August, Associate Chief Leonard met Mumma at the Denver airport and informed him that he must accept a directed reassignment to Washington, D.C. Robertson cited "poor performance ratings"—an explanation that Mumma found disingenuous in light of his 30 years of service and several awards for outstanding achievement. Mumma quit in protest, convinced that his removal was politically motivated.[46]

Few doubted that Mumma's removal was political. As the first wildlife biologist to attain the position of regional forester, he seemed to personify the Forest Service's new outlook in the 1990's. Now his ouster was widely perceived as part of a reactionary "coup" by so-called hardliners in the agency. There were rumors that Robertson was about to lose his job as well. A number of sport hunters' groups protested. Trout Unlimited blamed Mumma's removal on Agriculture Secretary Edward Madigan, while AFSEEE's Jeff DeBonis alleged that Republican Senator Larry Craig of Idaho had threatened forest supervisors with their jobs if they did not meet their timber targets.[47]

Mumma himself testified to the House Subcommittee on Civil Service that Senator Conrad Burns of Montana, Congressman Ron Marlenee of Montana, and Senator Craig of Idaho had pressured him to cut more timber than was possible without violating environmental laws, and that Marlenee had said he did not want Mumma recertified for senior executive service. Mumma also testified that he had been confronted the previous spring by an investigator from the Office of Inspector General who was looking into suspected misappropriations of funds. The investigator told Mumma he was filing weekly reports to Senators Craig and Burns.[48] The turmoil continued after Mumma's departure. Although Robertson outlasted the furor, together with the continuing debacle over the northern spotted owl, it undermined his effectiveness.

Agency Culture and Reorganization

If New Perspectives encountered a lot of skepticism on the part of the public, it also engendered a new wave of studies on the Forest Service's organizational culture and its value and reward system. Not since the Forest Service's early years, when the agency was universally recognized as a model of *esprit de corps* in the Federal Government, had its bureaucratic structure come under such intensive scrutiny. These studies had a common thread: what could explain the agency's sagging morale? The question was relevant to wildlife habitat management because many biologists in the Forest Service believed that the agency had to confront the gap between rhetoric and reality when it came to balancing competing forest values.[49]

Two of the most influential works were *Change in the USDA Forest Service: Are We Heading in the Right Direction?* and a series of research papers by J.J. Kennedy and T.M. Quigley. The authors of the first report surveyed more than 1,800 employees and attempted to locate significant rifts in workforce attitudes about what the authors called "the new environmental paradigm." Differences of views by gender and race were noted but were not significant, while differences based on hierarchical position—especially between line and staff officers—were somewhat more marked. More striking were the rifts found among disciplines, with foresters and biologists showing the widest variance of perspectives on the environment. Finally, the sharpest differences of views were based on years of service.

Newer, generally younger, line and staff officers were most likely to view environmental concerns as "very serious." These same personnel were also least likely to feel that the Forest Service was "very committed" to addressing those concerns.[50]

Kennedy and Quigley, meanwhile, attributed the Forest Service's internal stress to its changing management paradigm. For decades, the Forest Service organization was based on a "machine-model" view of nature. The organizational culture evolved in keeping with the idea that nature could be controlled and manipulated to produce a sustained yield of commodities, or "outputs." Staff organization, unit planning, budget accounting—all revolved around this central idea. During the last quarter of the 20th century, however, the Forest Service organization began to adopt an "organic-model" view of nature. This view of reality contained many more uncertainties and called for a more expansive outlook on land values. Much of the dissent and low morale in the agency, Kennedy and Quigley argued, was attributable to the difficulty of restructuring organizational culture around the organic-model view of nature.[51]

Forest Service Chief Robertson undertook to lead the organization to embrace new values and perspectives. For example, he used the occasion of the 1991 National Forest System centennial to name three past Forest Service employees—Gifford Pinchot, Aldo Leopold, and Bob Marshall—to a pantheon of conservation "heroes." At the 56th North American Wildlife and Natural Resources Conference held in March 1991, Robertson distributed copies of Leopold's *A Sand County Almanac* to all attending Forest Service employees with the note, "I think he has some good advice for us in dealing with current issues. Sometimes what we think is new is really 'rediscovered wisdom' from the past."[52] These symbolic gestures underscored Robertson's desire to weave ecological and aesthetic values more fully into the organizational culture.

In 1992, Robertson sought to accelerate the Forest Service's move toward ecosystem management. In April, he held a national workshop on ecosystem management in Salt Lake City, Utah. In an important speech, Deputy Chief James C. Overbay declared, "it is time to embrace the concept of managing ecosystems to sustain both their diversity and productivity and to chart a course for making the concept the foundation for sound multiple-use and sustained yield management."[53]

After the workshop, on June 4, Robertson elaborated on the principles adopted in Salt Lake City. He predicted, for example, that ecosystem management would result in a 70 percent reduction in clearcutting from 1988 levels, and a short-term reduction of 10 percent in total harvest volume on the national forests. He directed each regional forester to develop guidelines for putting the new principles to work throughout the National Forest System.

The guidelines produced for the Eastern Region—the first to appear, in September 1992—gave a taste of how far-reaching and complicated the move to ecosystem management could be. The Forest Service would not give up its traditional emphasis on planning; rather, it would redouble the effort on a larger scale. "Our National Forests will be viewed as mosaics of dynamic ecosystems," these guidelines pronounced. A major thrust of the new approach was to classify, inventory, and divide the entire land area into ecological units for planning, management, and study. The guidelines proposed a hierarchy of seven levels of scale from "province" (multi-State) down to "site" (less than 1 acre).

The Forest Service expected to coordinate with other agencies to develop a national hierarchical "Ecological Classification and Inventory System," and it began to employ new satellite and computer technology (Geographic Information Systems, or GIS) to complete the inventory.[54]

The planning effort was so ambitious and fundamental that it required a major staff reorganization. The effort began in the Eastern Region in March 1990 with the formation of an interdisciplinary Ecosystem Management Team of 16 resource specialists. By 1992, the team had absorbed a dozen researchers from the Northeastern and North Central Forest Experiment Stations. Most national forests in the Eastern Region followed suit, forming their own Ecosystem Management Teams in the supervisor's office.[55] As a pilot for other regions, the reorganization did not work well. Forest Service partners felt stymied and confused; environmentalists suspected that ecosystem management was a smoke screen for more outputs across the board. Biologists were phased out and replaced by other specialists as if ecosystem management in the Eastern Region did not include fish and wildlife.

In other Forest Service regions similar staff reorganizations occurred. Old staff divisions were dissolved and replaced with a more interdisciplinary staff organization at both the regional and forest level. Embracing ecosystem management, the Rocky Mountain Region proclaimed that its overarching goal was to achieve "environmentally sensitive commodity production." Still, people wondered: was this substantive change or rhetorical artifice? Greatly complicating the effort to achieve a meaningful staff reorganization was the fact that it coincided with sweeping reductions in the workforce throughout the Federal Government. The Forest Service's move toward ecosystem management began under the Bush administration and continued under the Clinton administration, but it was modified in the latter period by President Clinton's and Congress' concerted effort to achieve a balanced budget as well as Vice-President Al Gore's initiative to "reinvent Government."

Concepts of Ecosystem Management

The move toward ecosystem management required much systematic analysis of what the concept really meant in its myriad applications given the current state of knowledge and modern tools at the land manager's disposal. One of the most thoughtful plans to emerge from this exercise was that of the Southwestern Regional Ecosystem Management Study Team. Titled *An Ecological Basis for Ecosystem Management* (1994), the plan was more like a philosophical treatise on ecosystem sustainability than a discrete set of guidelines. It too started from an organic-model view of nature. The authors had the following "working assumptions":

> naturally evolving ecosystems (minimally influenced by humans) were diverse and resilient, and that within the framework of competition, evolutionary pressures, and changing climates, these ecosystems were sustainable in a broad sense. Many present ecosystems modified by modern industrial civilizations do not have all these characteristics. Our guiding premise for sustaining ecosystems and protecting biodiversity now and into the future is to manage ecosystems such that structure, composition, and function of all elements, including their frequency, distribution, and natural extinction, are conserved. Conservation focuses on maintaining and restoring suitable amounts of representative habitats over the landscape and through time.[56]

Humans and ecosystems were interdependent. The central goal of ecosystem management, the authors contended, was to balance short-term demands for products and services from ecosystems with long-term needs for persistence. Wherever social and economic needs were out of balance with ecological capabilities, ecosystem management had to work toward a greater convergence of the two. This fundamental purpose was reminiscent of the land ethic described by Aldo Leopold. "A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community," the authors recited from Leopold. "It is wrong when it tends otherwise." It was in the human interest to limit or even curtail natural resource use in order to assure ecosystem sustainability.[57]

The Forest Service, as mandated by the NFMA, had to manage the land in terms of centuries. The new approach started with the premise that all ecosystems were dynamic entities shaped not only by natural succession but also by natural disturbances such as fire, drought, and wind. Change, even violent change, was part of the natural system. As the authors' working assumption implied, if humans wanted to maintain healthy, productive ecosystems in the long run, then biological diversity was the only plausible substitute for the old concept, now discredited, of a "balance of nature." To maintain biological diversity, land managers had "to allow normal fluctuations in populations that could have occurred naturally." The intent was "to promote biological diversity and provide for habitat complexity and functions necessary for diversity to prosper."[58] Too much control, too much stability, was actually destabilizing in the long run.

The Forest Service also had to manage ecosystems in a broader spatial context. It should be a goal of Forest Service ecosystem management to maintain the full diversity of natural ecosystems from alpine tundra to deserts. Moreover, the agency had to blend "coarse-filter" and "fine-filter" approaches to the conservation of biodiversity. Here the Southwestern Regional Ecosystem Management Study Team was drawing upon the latest theories in conservation biology. The coarse-filter approach assumed that a representative array of plant communities and cover-types in a region would satisfy the habitat needs of most species and preserve perhaps 85 to 90 percent of the region's biodiversity. The advantage of this approach was that it could be applied reasonably effectively over broad areas on the basis of limited information; it was efficient. Its weakness was that some species depended on smaller-scale elements that fell outside its purview; that is, certain species would slip through a coarse filter and be extirpated in conflict with law and policy. The fine-filter approach, on the other hand, addressed the specialized needs of individual species. More restrictive and costly, it could be applied selectively to the species and habitat types that needed it.[59]

The concept of screening proposed projects through coarse and fine filters enabled biologists to approach wildlife habitat management on a regional basis—as was required in the case of the northern spotted owl. It added a landscape-scale perspective to the conceptual approach of the late 1970's and early 1980's involving wildlife-habitat relationships at stand and watershed scales. Too often, it now seemed, protection or improvement of wildlife habitat in a small area could be overwhelmed by changes occurring on a landscape scale. The concept of coarse and fine filters came into currency at the end of the 1980's in response to biologists' growing realization that stand and watershed scale approaches alone were too confined to conserve wide-ranging species such as the northern spotted owl. The reason: habitat "fragmentation" throughout the range.

Fragmentation referred to the progressive transformation of large blocks of contiguous habitat into small, semi-isolated patches as a result of road building, logging, residential development, wildfire (often a result, in turn, of fuels accumulated during decades of fire suppression), or forest diseases (often a result, similarly, of past forest management practices that produced overly dense even-aged stands of pine or fir). Biologists became concerned about this process on at least three levels. First, they feared that fragmentation of habitat would tend to isolate small breeding populations of animals. When a population became genetically isolated and the number of individuals fell to low numbers, conservation biologists had learned, it was likely to become weakened over time by inbreeding. Moreover, patches of habitat were less likely to sustain isolated populations over long time periods, because the animals would have nowhere to relocate after a natural disturbance. Sooner or later the isolated population would disappear. Habitat fragments that possessed the most ideal structural characteristics imaginable would nevertheless be unsuitable habitat, if the wildlife species in question did not have the ability to move freely between fragments and maintain genetic diversity.[60]

Second, biologists worried about the effects of fragmentation on the quality of the remaining fragments themselves. This idea involved a fairly startling reversal of perception. Forest clearings—whether accomplished by harvest, burning, blowdown, or disease—created more forest edge, which wildlife biologists had long contended to be a good thing for species enrichment. The forest margin tended to support a high diversity of plants and animals, because it juxtaposed two habitat types, bringing the advantages of both into close proximity. The "edge effect" was a long-standing principle of ecology. For decades, Forest Service wildlife manuals had encouraged the creation of as much edge as possible to increase both the abundance and diversity of fauna.[61] Increasing emphasis on rare plant and nongame species in the 1970's and 1980's, however, revealed that the edge effect was deleterious to many species in the forest interior. The northern spotted owl, for example, was found to abandon nest sites within a certain distance of a clearcut. By the late 1980's, many wildlife biologists were concerned about the creation of more edge, because by eliminating habitat for late-successional species such as the northern spotted owl it actually threatened to reduce biodiversity on a landscape scale.[62]

COURTESY USDA FOREST SERVICE

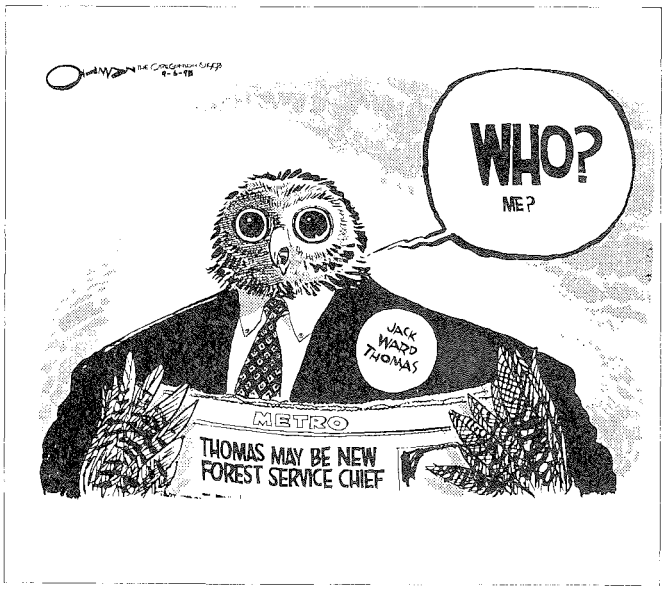
Fragmentation.

Third, biologists recognized that fragmentation was occurring on a landscape scale that demanded unprecedented levels of interagency coordination. Indeed, fragmentation of habitat on *private* lands was occurring at such a rate as to place more and more of a burden on *public* lands for conservation of biological diversity. Increasingly, Federal land managers were thrust into Noah's role before the great flood, with Federal lands serving in place of the biblical ark. Thus, the attention given to fragmentation stemmed not only from changes in perception, but also from changes in actual conditions that threatened to engulf these Federal lands.[63]

These various concerns led biologists to shift focus from the prime wildlife habitat areas to what they called the "matrix" or land-use patterns surrounding those areas. The key to conserving most sensitive species, many biologists now believed, was to maintain corridors of passable habitat between patches of quality habitat. The goal was to minimize, or at least mitigate, the process of fragmentation. Such a satellite view of the landscape gave rise to the concept of coarse and fine filters for conserving biodiversity.[64] With such concepts—coarse and fine filters, fragmentation, corridors and the matrix—the Forest Service began to flesh out their view of ecosystem management on a regional planning level.[65]

A Biologist Heads the Forest Service

In December 1993, the Clinton administration picked Jack Ward Thomas to succeed Dale Robertson as Chief of the Forest Service. The appointment of a wildlife biologist to the position of Chief was viewed by many as the most compelling evidence yet that the Forest Service's move toward ecosystem management was both genuine and significant. To many environmentalists, the selection of Thomas to head the Forest Service was a symbol of the Clinton administration's commitment to putting long-term concerns about sustainability ahead of short-term concerns about economic and social stability. To people within the Forest Service, meanwhile, Thomas's appointment was equally notable for the fact that he was a research scientist without any prior experience in national forest management. Indeed, he did not meet the usual qualifications for Senior Executive Service and had never been groomed by his superiors for leadership of the agency. That, too, could be interpreted as a sign of the Clinton administration's determination to break with the past and bring about meaningful reform.[66]



COURTESY *THE OREGONIAN*

Thomas encouraged the spirit of reform. Shortly after assuming his new duties, he sent a memo to all deputy chiefs and regional foresters stating that his goals would be to obey the law, tell the truth, implement ecosystem management, and reorganize the agency to reflect its new values.[67] Shrewdly, he made regaining the public's trust

his first priority. Regaining the public's trust, however, was only the means to an end. Public trust translated into greater latitude for the agency. Ultimately, Thomas wanted to give Forest Service managers more freedom to manage.

Thomas's overriding mission was to get ecosystem management operating on the ground and to institutionalize it within the Forest Service. Ecosystem management had to be an interagency effort, for natural boundaries seldom conformed to jurisdictional lines between land managing agencies. One agency had to take the lead, however, and Thomas was convinced that the Forest Service should be that agency. With 191 million acres of forests and grasslands under its care, it was the natural choice. Moreover, its workforce possessed a diversity of training and expertise, its forest research program was the strongest in the Federal Government, and its advisory role in State and private forestry, together with its international arm, positioned the agency to cooperate with other land managers around the world.[68]

It followed that the Chief of the Forest Service should serve as the Federal Government's leading apostle of ecosystem management. Thomas welcomed the role. A year and a half before he was picked to head the agency, he told a Senate subcommittee of the need for stronger leadership in that area. "I see movement all across the scientific community to move in that direction," he said. "But I don't see anybody that's got the real mission to grab that thing and press it." Asked who was best positioned to provide that leadership, Thomas said he thought it could be done "within the Federal Government across agencies," provided that the Government worked closely with the academic community.[69] That turned out to be a fairly accurate statement of how he would proceed after he was appointed Chief.

In the spring of 1994, the Chief initiated a second large-scale assessment even more sprawling than the Forest Ecosystem Management Assessment Team effort addressing the northern spotted owl's range. This new assessment treated the upper Columbia River Basin, including eastern Washington, eastern Oregon, most of Idaho, western Montana, and small portions of Nevada, Utah, and Wyoming. Specifically called for by The President's Northwest Forest Plan, the East-Side Ecosystem Management Assessment examined issues of forest health, watershed health, and the condition of anadromous fisheries in light of the conservation measures now being taken on the west side of the Cascades.[70] The East-Side Ecosystem Management Assessment revealed certain inconsistencies between the Forest Service's concept of ecosystem management and what academics, environmentalists, and industry scientists believed it to be.

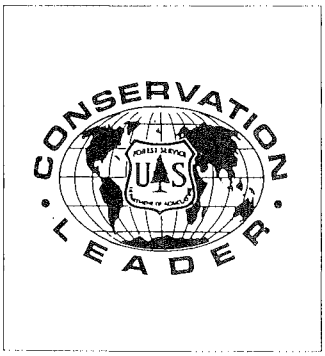
Thomas responded by mapping out a series of meetings and proclamations that would move the Forest Service and other Federal agencies inexorably toward ecosystem management. His first initiative was to develop a new mission statement for the Forest Service. Issued in October 1994, the so-called "Course to the Future" provided the fullest explanation yet of what the new approach entailed. It contained a "service ethic" based on Aldo Leopold's land ethic. The Forest Service's land ethic was to "promote the sustainability of ecosystems by ensuring their health, diversity, and productivity."[71] "Course to the Future" also aimed to give the Forest Service a new face. It offered a new symbol—the Forest Service shield

superimposed on a world map, with the words "Conservation Leader" ringing the globe. The original Forest Service shield, with its single pine tree splitting the letters "US," remained suggestive of a commodity orientation. But timber harvesting, Thomas insisted, was no longer the dominant land management activity on the national forests. Rather, he saw biological diversity itself as the "dominant output."[72]

The chief's second initiative was to organize the Ecological Stewardship Workshop. Bringing together land managers and scientists from a variety of disciplines and institutions, the purpose of the workshop was to strengthen ecosystem management's theoretical underpinnings and to broaden its base of support outside the Government. Among 74 leading presenters, 36 were with the Forest Service, 22 with universities, 10 with other Federal agencies, 5 with nongovernment organizations, and 1 with private industry.[73]

Thomas turned to numerous foundations and corporations for financial help in putting on the workshop, including, he noted, many groups that were suing the Forest Service. He also took a personal interest in selecting the participants, seeking out the "early adopters" across a spectrum of disciplines from biology to sociology to environmental law.[74]

As a result the Ecological Stewardship Workshop convened in Tucson, Arizona, from December 4 to 14, 1995. It was organized to maximize interdisciplinary teamwork and participation. Almost everyone at the workshop was given a topic and a writing assignment. Each session juxtaposed a "management paper" and a "science paper" to provoke discussion. The workshop had the hallmarks of a Forest Ecosystem Management Assessment Team transferred onto the national stage. Thomas wanted everyone to work 12-hour days, "get battle fatigue together . . . and crunch it out."[75] Later, the workshop participants' combined efforts would go into a book, which would serve as a "common reference for ecological stewardship." The book would include a series of proposals for changes in land management, law, bureaucracies, research, and education. A digital version was widely distributed on CD-ROM and the Internet.[76]



COURTESY USDA FOREST SERVICE

"The phrase 'Caring for the Land and Serving People' captures the spirit of our mission. As set forth in law, our mission is to achieve quality land management under the sustainable multiple-use management concept to meet the diverse needs of people."

. . . from *The Forest Service Ethics and Course to the Future*, October 1994

After the mission statement and the national workshop, the next item on Thomas's agenda was to support a Forest Congress—the seventh of its kind since President Theodore Roosevelt called the American Forest Congress in 1905. At the Seventh Forest Congress, the Forest Service garnered further support for its move toward ecosystem management. Lastly, Thomas proposed to streamline the National Forest Management Act planning regulations so that ecosystem management could be written into the next generation of forest plans. This would be his biggest hurdle in implementing the new approach to land stewardship. Thomas anticipated that some environmental groups would resist his efforts to refine the regulations on population viability. He expected that some organizations in the timber industry would oppose changes, too, preferring to bide their time in the hope that Congress would repeal the National Forest Management Act or weaken the Endangered Species Act, or both. By mid-1996, it was evident that this fourth milestone on the Forest Service's road to ecosystem management would have to wait until after the Presidential election.

On October 10, 1996, Thomas announced to the public his decision to resign. After a scant 3 years in the national capital, he left behind an uncertain legacy. During his tenure, timber harvest volumes on national forests continued to fall until they were one-fourth the high point reached in the Reagan years. Unquestionably, he moved the Forest Service closer to its announced goal of managing ecosystems for their long-term health, diversity, and productivity. Yet ecosystem management remained only partially integrated into the Forest Service organization.[77]

On January 6, 1997, Dr. Michael Dombeck was appointed the 14th Chief of the Forest Service. A fisheries biologist with experience in research and management in both the Forest Service and the Bureau of Land Management, Dombeck became the second biologist to come up through the ranks and head the agency. Dombeck promised to promote the ecosystem management principles and land ethic that Thomas had advanced during the previous 3 years. He announced that no Forest Service program would have dominance over another. Neither timber nor wildlife and fish would have dominance over minerals, recreation, or rangeland management.

As Acting Director of the Bureau of Land Management since 1994, Dombeck had wrestled like Thomas with the administration's imperative to reduce the size of the Federal workforce. Despite personnel cutbacks over the previous 3 years, he inherited an impressive staff of about 37,000 Forest Service employees and an organization dedicated to the conservation of some 191 million acres of national forests and grasslands—the largest field structure in the Federal Government with the exception of the Department of Defense. How this agency develops through the turn of the century will be of vital importance to fish, wildlife, and people across the land.

Much has been said of the Organic Act's emphasis on timber production . . . What is far less understood is the Act's emphasis on watershed maintenance and restoration. [These] are perhaps the oldest and highest callings of the Forest Service and the agency is, and always will be, bound to them by tradition, law and science.
. . . Chief Michael Dombeck, *Sierra* (July/August 1998), pp. 18-20.

COURTESY USDA FOREST SERVICE

Michael Dombeck.

JACK ADAMS AWARD

In 1984, the Forest Service established an award to honor a wildlife biologist, fisheries biologist, or botanist who exemplified the qualities of Jack Adams—a wildlife biologist with a strong commitment to the agency and its role in protecting fish and wildlife resources. Adams had worked for the Forest Service throughout the Southwest, including the Cache, Dixie, and Apache-Sitgraves National Forests. During the 1970's, he served as the wildlife program manager at the Regional Office in Albuquerque. Later, he oversaw planning and the budget in the Fish and Wildlife staff in Ogden. In 1984, he succumbed to cancer at the height of his career.

Recipients of the Jack Adams award are individuals noted for their dedication to balanced resource management of the national forests, ensuring that wildlife, fisheries, and rare plants are reflected in all management decisions. Those who receive this award are also known for their concern for people. Generally, they are individuals who are nearing the end of their careers.

Every year each region nominates a candidate—and the Wildlife, Fisheries, and Rare Plants Staff at the Washington Office selects one individual from this pool. Recipients receive a plaque, which is presented at the Director's meeting in conjunction with the North American Wildlife and Natural Resources Conference.

Jack Adams Award Recipients

year	*recipient*	*region*
1985	Roger Bumstead	Southwestern Region
1986	Dave Dunaway	Alaska Region
1987	Paul Shields	Intermountain Region
1988	Roger Kirkman	Eastern Region
1989	Dave Wills	Rocky Mt. Region
1990	Jack Kahl	Pacific SW Region
1991	Al Espinosa	Northern Region
1992	Bob Dewey	Alaska Region
1993	Monte Seehorn	Southern Region
1994	Don Bartschi	Intermountain Region
1995	Larry Hedrick	Southern Region
1996	Richard (Dick) Petersen	Pacific NW Region
1997	Ellen Campbell	Alaska Region

COURTESY USDA FOREST SERVICE

In 1997, Ellen Campbell, a wildlife biologist with the Alaska Region, became the first woman to receive the Jack Adams Award. She joined the Forest Service in 1977 as a biologist on the George Washington National Forest in Virginia. By 1990 she had become wildlife program manager for the Alaska Region. Also pictured here (left to right) are Jack Capp, Mike Dombeck, Bob Nelson, Phil Janik of the Forest Service, and Matt M. Millenbach of the Bureau of Land Management.

Courtesy USDA Forest Service

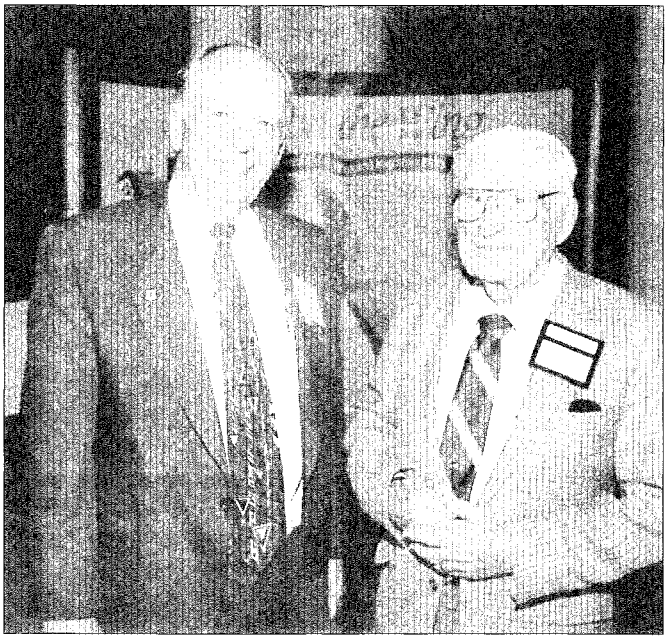
Jack Ward Thomas.

ALDO LEOPOLD AWARD

To commemorate Aldo Leopold's contributions to conservation, The Wildlife Society established an award medal in his memory. J.N. "Ding" Darling, a political cartoonist and noted conservationist, became the first recipient of The Wildlife Society's medal—which bears Leopold's likeness—in 1950. From that point, The Wildlife Society awarded one medal a year, selecting recipients whose distinguished service to wildlife and fisheries protection had national, and sometimes international, significance. The Aldo Leopold Award is not issued posthumously, and recipients include some of the most prominent conservationists of the 20th century: Olaus J. Murie, Ira N. Gabrielson, and A. Starker Leopold. In 1991, The Wildlife Society named Jack Ward Thomas, who would later serve as Chief of the Forest Service, as a recipient, in recognition of his contributions to research in the agency.

Five years later, Robert D. Nelson, Director of the Forest Service's Wildlife, Fisheries, and Rare Plants Staff, received this prestigious award. He was unusual among recipients in that his contributions to conservation grew from his management skills and his success in forming cooperative ventures with a variety of conservation groups and public agencies.

Throughout his career, Nelson encouraged innovation, efficiency, cooperation, and workforce diversity. His achievements included "Rise to the Future," an innovative program that established fisheries as a major concern for the Forest Service. He also developed multi-agency aquatic ecosystem management strategies, called PACFISH and INFISH [see chapter 9]. Nelson further promoted continuing education programs that provided wildlife and fisheries biologists opportunities to improve their technical and management skills. His commitment to the agency's wildlife and fish program and its staff inspired a loyal following. "His dedication," recalled one employee, "was hardly short of extraordinary." Nelson retired in 1997.



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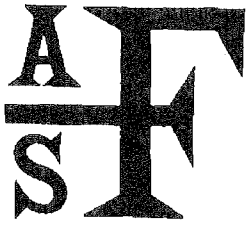
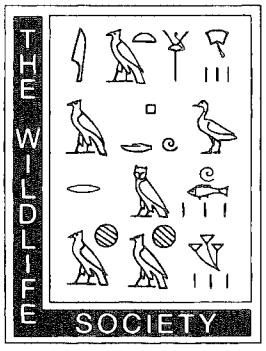
Robert D. Nelson and Lloyd Swift.





Professional Societies

As the wildlife and fisheries professions developed during the 20th century, a variety of organizations provided training and expertise—as well as a forum for biologists to exchange research and ideas. Among the most prominent were the American Fisheries Society and The Wildlife Society.

Founded in 1870, the American Fisheries Society (AFS) is the Nation's oldest and largest professional society representing fisheries scientists. Throughout the 20th century, it promoted scientific research and management of resources for optimum use and enjoyment by the public. The AFS has encouraged a comprehensive education for fisheries scientists, including on-the-job training, and it organized scientific meetings, where biologists could present and discuss research results. The organization also has distributed information through its publications, which include the *Transactions of the American Fisheries Society*, *North American Journal of Fisheries Management*, *The Progressive Fish Culturist*, *The Journal of Aquatic Animal Health*, and *Fisheries*.

The Wildlife Society, founded in 1937, remains active at the end of the 20th century. By 1998, this nonprofit organization, dedicated to science and education, had attracted 10,000 members. Its mission includes enhancing the ability of wildlife professionals to conserve diversity, sustain productivity, and ensure responsible use of wildlife resources. The Wildlife Society continues to develop professional standards for research and management, and to enhance the technical capabilities of natural resource managers. Its publications include *The Journal of Wildlife Management*, *The Wildlife Society Bulletin*, and *The Wildlifer*.

Conclusion

CONCLUSION

"The national forests are treasures that belong to every American, a priceless 191-million-acre inheritance that each generation can proudly pass on to the next."
. . . *National Audubon Society, 1988.*

Since the creation of the National Forest System a century ago, the national forests have become increasingly important to wildlife conservation. Wildlife conservationists, sport hunters and anglers, and nonhunting wildlife enthusiasts are as appreciative of the national forests today as they were in the early part of the century when these lands were home to an estimated three-quarters of all big game in the United States. Decades ago, national forests were prized by conservationists for their remnant herds of big game. Today, they are valued as islands of relatively intact ecosystems in a sea of destructive land-use practices. Changing perspectives on wildlife and the national forests notwithstanding, the National Forest System has remained important to wildlife conservation for one essential reason: it harnesses the public responsibility of Federal land stewardship to a land base rich in wildlife habitat.

The Forest Service initially assumed a role in wildlife conservation by virtue of this public land base. In the early years, the Forest Service recruited a breed of men who were inherently sympathetic to wildlife conservation. Most were hunters, anglers, amateur naturalists, or some combination of the three, and much of the Forest Service's early efforts in wildlife conservation sprang spontaneously from the inclinations of its well-placed ranger staff. Even as the Forest Service grew more professionally diversified, the agency continued to nurture a wildlife aesthetic within its organizational culture. Characteristically, it adopted a forest animal—Smokey Bear—as an icon of fire prevention and its land stewardship role.

Wildlife conservation was implicit in the Forest Service's mission to conserve and develop all the resources of the national forests for use by present and future generations. Under Gifford Pinchot's guiding hand the Forest Service did not content itself with its two primary tasks specified in the 1897 Organic Act of protecting watersheds and the Nation's timber supply, but sought to make the national forests useful for other purposes, too. First among these was their use as pasturage for livestock, followed by their use for recreation and as habitat for wildlife and fish. These multiple uses of the national forests were already well established in administrative policy when Congress codified them in the Multiple Use–Sustained Yield Act of 1960.

The multiple-use concept framed the Forest Service's approach to wildlife management. This multiple-use framework distinguished the Forest Service's wildlife program from the programs of other Federal land managing agencies such as those developed by the Fish and Wildlife Service and the National Park Service. The multiple-use concept sprang from the legislative underpinnings of the National Forest System. Unlike the system of national wildlife refuges, whose purpose was for wildlife protection and propagation, or the national

park system, whose purpose was for protecting and developing the Nation's "treasures" for nature appreciation, Congress intended for national forests to serve a variety of uses and needs. Forest Service officials always insisted that the conservation of wildlife habitat should be coordinated with other land uses.

As a result, conflicts over wildlife policy on the national forests developed primarily in relation to competing resource uses. Before World War II, the most significant conflict over wildlife policy was that between ranchers and sport hunters. Ranchers wanted to continue their use of the national forests and grasslands as range on which to graze livestock in summer; sport hunters wanted those same areas set aside to support big game. The fact that a lot of big game migrated from national forest land to private rangeland in winter tended to aggravate the situation. The Forest Service sought to adjust livestock grazing use so that the national forests could accommodate both domestic livestock and big game, but in some controversial instances the agency found it necessary to reduce the size of deer and elk herds as well as the numbers of permitted livestock in order to protect range conditions. During this process of adjustment the Forest Service made the transition from wildlife protection to wildlife management, with an emphasis on managing habitat.

After World War II, timber harvesting increased and gradually eclipsed livestock grazing as the major point of conflict between wildlife habitat and other forest uses. As was the case earlier with livestock-wildlife competition, Forest Service officials began with the premise that silvicultural practices could be modified so that the national forests could produce a sustained yield of timber and support healthy populations of wildlife at the same time. Where silvicultural practices would not actually enhance wildlife habitat, foresters and biologists believed, silviculture options could at least be coordinated with wildlife habitat requirements so as to mitigate or neutralize their effects as much as possible. But as the demand for timber expanded and as biologists' understanding of ecology became more sophisticated, the logic of this position grew increasingly strained.

The conflict between timber and wildlife was particularly wrenching because timber production had such a dominant position in the Forest Service organization. This was no struggle between secondary functions within the agency such as occurred between rangeland use and wildlife prior to World War II. Rather, this conflict went to the agency's core. The multiple-use framework of national forest administration had always inspired a healthy amount of conflict between different functions within the agency, and Forest Service biologists were no strangers to intra-agency discord. But the growing tension between timber production and wildlife conservation after World War II was unlike any internal conflict that the Forest Service had experienced before. In the 1960's and 1970's, it was marked by the unequal footing between foresters and biologists in the Forest Service power structure; in the 1980's, by their growing parity; in the 1990's, by the surprising possibility that wildlife conservation had overtaken timber production as the driving force in the agency.

Changes in the Forest Service's internal landscape in the last three decades of the 20th century reflected even more dramatic changes in the way the public valued the natural world in general and the national forests in particular. As noted, these changing values sprang from a variety of sources, including concern about the effects of pesticides and radiation fallout on wildlife populations and human health. The counterculture's questioning traditional values further encouraged people to view protection of the natural world from an ecological perspective.

The wilderness movement, which gained considerable momentum during the 1960's, reflected these changing values. At that time, conservation groups like the Sierra Club and the Wilderness Society criticized the Forest Service for dedicating too much emphasis to intensive forest management and too little to recreational uses. Wilderness values appeared to pit timber against recreation, not wildlife. But the wilderness idea invoked a more holistic approach to land management—a kind of Leopoldian land ethic—that appealed to many wildlife conservationists. The wilderness movement widened the breach between those who viewed the land primarily in terms of resource extraction and those who viewed it from an ecological standpoint. Biologists and other supportive employees in the Forest Service tended to align with the latter. This popular ecological orientation soon became known as environmentalism.

In a related development, wildlife conservation groups began to question the traditional emphasis on game species in State and Federal wildlife policy. Demanding a more holistic policy, these groups helped foster a ground swell of interest in nongame animals, principally song birds, during the 1970's. The enthusiasm for nongame animals was based simultaneously on aesthetic and ecological considerations. Bird watchers and other nonhunting wildlife fanciers asserted their interest in having a greater abundance of watchable wildlife to enjoy, but they did so in the knowledge that what was good for nongame habitat was also good for the whole environment. Many biologists in the Forest Service avidly supported the shift in emphasis from game to all wildlife, fish, threatened and endangered species, and rare plants.

The identification of wildlife with environmentalism reached a climax with the passage of the Endangered Species Act of 1973. Among many environmental laws that Congress passed during the 1960's and 1970's, this act was one of the strongest. Its purpose was to identify threatened and endangered species and to take remedial action that would save them from extinction. Federal land managing agencies, including the Forest Service, were required to cooperate with recovery efforts, as well as to avoid actions that would adversely affect a listed species or cause any species to become endangered or extinct.

The Endangered Species Act began a new era in national forest administration in which the conservation of specific tracts or types of wildlife habitat became a statutory requirement. The Forest Service recruited many more biologists to help the agency comply with the law. These mostly younger technical staff found themselves in the line of fire between environmental groups on the one hand and timber interests on the other. Nicknamed "combat biologists," these individuals were maligned by many within the agency and

championed by others. The Endangered Species Act raised the stakes for fish and wildlife habitat in national forest management at the same time that it highlighted the dominance of timber in the Forest Service's multiple-use program.

The Endangered Species Act also helped to define a new, basic objective of U.S. environmental policy. Broadly conceived, that objective was to protect the natural life-support systems that sustained all of human civilization. More narrowly defined, the aim of the Endangered Species Act was to prevent extinctions, or stated positively, to preserve biodiversity—in Aldo Leopold's phrase, to "save all the parts." Historian Stephen Fox described this objective as the defining element of the modern environmental movement:

> For most of its history conservation had focused on nonhuman parts of the natural world: wildlife, natural resources, and wilderness. When humans themselves were added to the list, the circle was closed and the movement underwent a fundamental transition. Modern man believed himself the Lord of Creation. Now it seemed he was only another victim of his own cleverness, merely the last endangered species.[1]

The Endangered Species Act put a spotlight on animals and plants that were in danger of extinction, but its larger purpose was to protect the web of life upon which human civilization ultimately depended.

While the Endangered Species Act enlisted the Forest Service in the cause of preserving biodiversity, the National Forest Management Act of 1976 made the agency a major player in that effort. Under the latter act, the Forest Service was required to preserve "minimum viable populations" of all vertebrate species that occurred on the national forests. No other land managing agency had an equivalent mandate for preserving biodiversity. Forest Service biologists were thrust into a realm of wildlife management that was still in a theoretical stage of development. They used "management indicator species" to monitor changes in habitat conditions, and they developed predictive models under the "Wildlife and Fish Habitat Relationships" system to assist with land use decisions. Finally, they developed a "sensitive species" policy designed to prevent such species from declining to a point of potential listing under the Endangered Species Act.

After passage of the National Forest Management Act, the Forest Service embarked on the most ambitious program of land-use planning ever mandated by Federal law. The forest plans that began to take effect nearly 10 years later were drafted by interdisciplinary teams of experts and put through the most exhaustive public review process ever attempted by a land managing agency. The plans were predicated on the preservation of biodiversity throughout the National Forest System. Yet because of the pressure of commodity interests, most of the plans called for substantial *increases* in timber production over 1975 levels. Gravely disappointed, environmentalists questioned whether the Forest Service had really embraced its new mandate for preserving biodiversity. Virtually every new forest plan became the subject of administrative appeals, lawsuits, and litigation.

By 1990, it had become clear that the Forest Service was caught between two conflicting missions. Its traditional mission was to manage the national forests for multiple use. The National Forest Management Act and other legislation in the 1970's affirmed the principle. Land-use planning and budgeting continued to be based on achieving a maximum sustained yield of resource "outputs." In this respect, the Forest Service's organizational structure and culture retained the value system of the older conservation movement dating back to the time of Gifford Pinchot. Meanwhile, the agency's long-standing interest in the conservation of *all* living things acquired new meaning with the rise of the biodiversity concept. The Endangered Species Act, the National Forest Management Act, and other laws specifically directed the Forest Service to preserve biodiversity. Environmental groups came to regard the national forests as vital reservoirs of biodiversity, and most environmentalists believed that biodiversity was the national forests' most precious resource—more important than timber and other commodity resources.

As the National Forest System reached the centennial year of the Organic Act of 1897, it remained to be seen whether the Forest Service could successfully integrate its dual mission, restructure itself, and create a new value system based on ecosystem management. Beginning with the program called "New Perspectives," the agency's leadership sought to invest national forest management with a new paradigm. Fish and wildlife habitat management and timber production were both to be harnessed to the larger goal of managing ecosystems. Ecosystem management was aimed at maintaining and restoring biological diversity, maintaining long-term site productivity, and bringing social and economic needs into closer harmony with ecological capabilities. Failing a transformation of Forest Service mission and culture, it seemed that the agency would be spun in circles by the crosscurrent of commodity-based funding and court-ordered compliance with environmental laws.

Through the years biologists were the voice of caution in the Forest Service. They raised concern about heavy livestock grazing, excessive timber cutting, and the consequences of too much fire suppression. They were in the forefront in forging cooperative relations with the States, and they listened and responded to public criticism of the agency long before such actions were forced upon the agency by Congress and the courts. Perhaps because substantial funding for wildlife and fish habitat management was so long in coming, biologists saw the problems that output-based funding would cause a multiple-use agency. No ecosystem could be healthy until all types of resource management and use were brought into balance. Only then could the Forest Service manage in a way that preserved biodiversity, retained recreational values, and ensured that forests looked like forests.

ENDNOTES

ENDNOTES

PREFACE

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CHAPTER NINE

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26. See USDA Forest Service, *Wildlife and Fish Habitat Management in the Forest Service 1981* (and subsequent years to 1984), *passim.*

27. Nelson interview.

28. USDA Forest Service, *Wildlife and Fish Habitat Management in the Forest Service, Fiscal Year 1984*, p. iii.

29. Nelson interview.

30. Cindy Swanson, communication with Theodore Catton and Lisa Mighetto, December 1, 1997; Nelson interview.

31. Nelson interview.

32. The Forest Service already had a cadre of botanists in its range management staff. Consequently, botanists on the wildlife, fish, and rare plants staff were referred to as rare plant specialists.

33. Nelson interview.

34. Edward S. Ayensu and Robert A. DeFilipps, *Endangered and Threatened Plants of the United States* (Washington, D.C.: Smithsonian Institution and World Wildlife Fund, Inc., 1978), p. i.

35. Kent E. Holsinger and L.D. Gottlieb, "Conservation of Rare and Endangered Plants: Principles and Prospects," in *Genetics and Conservation of Rare Plants*, edited by Donald A. Falk and Kent E. Holsinger (New York: Oxford University Press, 1991), pp. 195-196.

36. Nelson interview.

37. William Burbridge, interview with Theodore Catton, October 10, 1996 [hereafter Burbridge interview].

38. Nelson interview.

39. James Sherock, interview with Lisa Mighetto, February 26, 1996.

40. Burbridge interview.

41. There was internal competition to administer the rare plants program. Forest Service range specialists maintained that their division was in a better position than the wildlife and fish staff to monitor and protect rare plants on the national forests, but Robert Nelson, who by this time had transferred to the Washington office, countered effectively that the management of rare plants came under the wildlife and fish division's threatened, endangered and sensitive species (TES) program. In 1987, range specialists in the Intermountain Region almost succeeded in having the botanist position eliminated, prompting a barrage of protests from outside groups, such as The Nature Conservancy (Burbridge interview).

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43. Kirk Horn, telephone communication with Theodore Catton, February 25, 1998.

44. Kirk Horn, telephone communication.

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46. Kirk Horn, telephone communication.

47. Jack Ward Thomas, Chief, to Regional Foresters, Station Directors, and WO Staff, February 9, 1994, File: 2670, administrative files, Eastern Region, Milwaukee, Wisconsin.

48. Win Green, comments to Theodore Catton and Lisa Mighetto, November 1997.

49. Hirt, *A Conspiracy of Optimism*, pp. xxxviii-xxxix. Despite Crowell's goal to increase outputs of timber on national forests, a drop in the home building industry caused wood prices to fall in the early 1980s. In 1982, the Reagan administration repurchased many timber sale units that had not been harvested. In 1982, under the Reagan administration, many timber sale units were repurchased that had not been harvested.

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51. Tober, *Wildlife and the Public Interest*, pp. 24-39, 107-120.

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54. Hirt, *A Conspiracy of Optimism*, pp. 268-270; Max Peterson, "Forest Service Fish and Wildlife Programs: Continuing Progress," speech at the National Audubon Convention, September 1, 1983, File: 1650 Press, Radio, and Television Forest Service Speeches (2), Forest Service Region 8.

55. Lonnie Williamson, interview with Theodore Catton, November 29, 1995 [hereafter Williamson interview].

56. Nelson interview; Williamson interview.

57. USDA Forest Service, Wildlife, Fish, and Rare Plants Staff, *Partnerships for Habitat Improvement* (Washington, D.C.: Government Printing Office, 1994), p. 5.

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59. USDA Forest Service, Wildlife, Fish, and Rare Plants Staff, *Partnerships for Habitat Improvement*, p. 1.

60. Tober, *Wildlife and the Public Interest*, p. 9.

61. Nelson interview.

62. Tober, *Wildlife and the Public Interest*, pp. 22-23.

63. Jack Ward Thomas, interview with Theodore Catton, August 15, 1996.

64. Kevin Brown, interview with Theodore Catton, December 18, 1997.

65. Jack Lyon, interview with Theodore Catton, December 28, 1995.

66. Salwasser, et al. "A Marketing Approach to Fish and Wildlife Program Management," pp. 261-262.

67. Salwasser, et al. "A Marketing Approach to Fish and Wildlife Program Management," pp. 264-265.

68. USDA Forest Service, Wildlife, Fish, and Rare Plants Staff, *Partnerships for Habitat Improvement*, pp. 6-7.

69. USDA Forest Service, *Sharing the Commitment: Partnerships for Wildlife, Fish, and Rare Plants on the National Forests* (Washington, D.C.: Government Printing Office, 1993), p. 6.

70. USDA Forest Service, Wildlife, Fish, and Rare Plants Staff, *On the Right Track: NatureWatch Highlights* (Washington, D.C.: Government Printing Office, 1995), pp. 1-6.

71. Quail Unlimited and the United States Forest Service, *Answering the Call: A Partnership for Quail* (pamphlet, no date or publisher information).

72. USDA Forest Service, *Sharing the Commitment*, p. 13.

73. Nelson interview.

74. Williamson interview.

75. Steve Rickerson, interview.

76. Melanie Woolever, interview with Theodore Catton, December 19, 1995. In the Southern Region, Laurie Fenwood developed a companion exhibit, Sally Snag, with the same objectives.

77. Steve Rickerson and Dennis Krusac, interview with Theodore Catton, April 17, 1994.

CHAPTER ELEVEN

1. Ted Gup, "Owl vs. Man," *Time*, June 25, 1990, p. 60.

2. Carrie Casey, "The Bird of Contention," *American Forests* 97 (September/October 1991):28.

3. Gup, "Owl vs. Man." *Time*, June 25, 1990, p. 60.

4. U.S. Congress, Senate, Subcommittee on Environmental Protection of the Committee on Environmental Protection and Public Works, *Conservation of the Northern Spotted Owl*, 102nd Cong., 2d sess., May 13, 1992, p. 17.

5. Jack Ward Thomas, interview with Theodore Catton, August 15, 1996 [hereafter Thomas interview].

6. Jim Fenwood, communication with authors, November 4, 1997.

7. Subcommittee on Environmental Protection of the Committee on Environmental Protection and Public Works, *Conservation of the Northern Spotted Owl*, p. 59.

8. John Bellamy Foster, "Capitalism and the Ancient Forest," *Monthly Review* 43 (October 1991):1; USDA Forest Service et al., *Forest Ecosystem Management: An Ecological, Economic, and Social Assessment*, Report of the Forest Ecosystem Management Assessment Team, July 1993, p. II-2.

9. Casey, "The Bird of Contention," p. 28.

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11. Larry Martoglio, interview with Theodore Catton, March 4, 1996.

12. Steven Lewis Yaffee, *The Wisdom of the Spotted Owl*, p. 40.

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14. Lee, "History and Current Status of Spotted Owl (*Strix Occidentalis*) Habitat Management in the Pacific Northwest Region, USDA, Forest Service," in *Ecology and Management of the Spotted Owl in the Pacific Northwest*, Ralph J. Gutierrez and Andrew B. Carey, eds, General Technical Report PNW-185 (Portland: USDA, Forest Service, Pacific Northwest Forest and Range Experiment Station, September 1985), p. 6.

15. Leon W. Murphy, "An Ounce of Prevention," *Oregon Wildlife* 20 (May 1978):11; John R. Donaldson, Director, Oregon Department of Fish & Wildlife, "Position Statement on the Biological Requirements of the Northern Spotted Owl," March 28, 1986, File: 2670 Spotted Owl General Threatened and Endangered Species FY86, Pacific Northwest Regional Office, Portland; Philip L. Lee, "History and Current Status of Spotted Owl," p. 6.

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17. R.J. Gutierrez, "An Overview of Recent Research on the Spotted Owl," in *Ecology and Management of the Spotted Owl in the Pacific Northwest*, Ralph J. Gutierrez and Andrew B. Carey, editors, General Technical Report PNW-185 (Portland: USDA, Forest Service, Pacific Northwest Forest and Range Experiment Station, September 1985), pp. 44-45.

18. A parallel effort to manage old growth for the northern spotted owl was taking shape in the Pacific Southwest Region (California) in the early 1980s. This was primarily linked to the Regional Guide, which was to provide overall direction for many things including the northern spotted owl. The Region developed a compromise approach in cooperation with the Audubon Society and the Western Timber Association. It entailed the establishment of a system of Spotted Owl Management Areas (SOMAs) across the national forest lands in the occupied range of the northern spotted owl. The wildlife staff of Pacific Southwest Region met personally with Deputy Regional Forester Jim Torrence of the Pacific Northwest Region to explain the approach and urge a common policy throughout the northern spotted owl's range. The Pacific Northwest Region turned down the approach because officials believed the impact on the timber program would be too severe.

19. Mark L. Shaffer, "The Metapopulation and Species Conservation: The Special Case of the Northern Spotted Owl," in *Ecology and Management of the Spotted Owl in the Pacific Northwest*, Ralph J. Gutierrez and Andrew B. Carey, eds., General Technical Report PNW-185 (Portland: USDA, Forest Service, Pacific Northwest Forest and Range Experiment Station, September 1985), pp. 86-98.

20. Andy Stahl, "Draft Summary Report on Management for the Conservation of the Northern Spotted Owl," September 6, 1984, File: 2670 Spotted Owl, Region 6, Forest Service, Portland.

21. USDA Forest Service, "Planning for Management of Spotted Owl Habitat in the National Forests of the Pacific Northwest: Summary of the Supplement to the Final Environmental Impact Statement for an Amendment to the Pacific Northwest Regional Guide," Portland, Oregon, May 1988, pp. 5-6, File: 2670 T&E□Birds□Spotted Owl FY89, Research, Development, and Application, Pacific Northwest Regional Office, Portland, Oregon. The Forest Service's preferred alternative was to designate Spotted Owl Habitat Areas containing a variable amount of suitable habitat depending on the physiographic province, the location of the owl pairs, and the location of habitat in lands unsuitable for timber production. Areas of habitat ranged from 1,000 acres in the Klamath Mountains to 2,700 acres on the Olympic Peninsula. The preferred alternative stated that "habitat shall occur as one contiguous stand if possible or, as a 300 acre stand containing the known or suspected nest site with the remaining habitat as contiguous as possible. Each stand shall be larger than 60 acres in size."

22. Senate Subcommittee on Environmental Protection of the Committee on Environmental Protection and Public Works, *Conservation of the Northern Spotted Owl*, p. 133.

23. Senate Subcommittee on Environmental Protection of the Committee on Environmental Protection and Public Works, *Conservation of the Northern Spotted Owl*, pp. 133, 156.

24. Yaffee, *The Wisdom of the Spotted Owl*, pp. 112-113.

25. Senate Subcommittee on Environmental Protection of the Committee on Environmental Protection and Public Works, *Conservation of the Northern Spotted Owl*, p. 137.

26. Senate Subcommittee on Environmental Protection of the Committee on Environmental Protection and Public Works, *Conservation of the Northern Spotted Owl*, pp. 137-138.

27. Thomas interview; J.W. Thomas, et al., *A Conservation Strategy for the Northern Spotted Owl*, report prepared by the Interagency Scientific Committee, Portland, Oregon, 1990.

28. Subcommittee on Environmental Protection of the Committee on Environmental Protection and Public Works, *Conservation of the Northern Spotted Owl*, p. 138.

29. Quoted in Senate Subcommittee on Environmental Protection of the Committee on Environmental Protection and Public Works, *Conservation of the Northern Spotted Owl*, pp. 139-140.

30. Senate Senate Subcommittee on Environmental Protection of the Committee on Environmental Protection and Public Works, *Conservation of the Northern Spotted Owl*, pp. 139-140.

31. Quoted in Senate Subcommittee on Environmental Protection of the Committee on Environmental Protection and Public Works, *Conservation of the Northern Spotted Owl*, p. 139.

32. Quoted in Casey, "The Bird of Contention," pp. 65-66.

33. Thomas interview.

34. USDA Forest Service et al., *Forest Ecosystem Management: An Ecological, Economic, and Social Assessment*, Report of the Forest Ecosystem Management Assessment Team, July 1993, p. i.

35. Statement by the Honorable James R. Lyons, Under Secretary Natural Resources and Environment, U.S. Department of Agriculture, Regarding the Retirement of Jack Ward Thomas as Chief of the U.S. Forest Service, October 10, 1996, in authors' possession.

36. Thomas interview.

37. F. Dale Robertson, "The 1990 RPA: A Forest Service Pathway through the 1990s and Beyond," *Journal of Soil and Water Conservation* 45 (November/December 1990):626-627.

38. Hal Salwasser, "Gaining Perspective: Forestry for the Future," *Journal of Forestry* 88 (November 1990):35.

39. Salwasser, "Gaining Perspective," p. 32.

40. *The Missoulian* (Missoula, Montana), September 8, 1991.

41. Win Green, comments to authors, November 1997.

42. Quoted in Hirt, *A Conspiracy of Optimism*, pp. 283-284.

43. *Inner Voice*, vol. 3, no. 5 (Fall 1991), p. 1.

44. Alexander Cockburn, "Mumma's Fate," *The Nation* 257 (September 6/13, 1993):235.

45. Letter printed in *Inner Voice*, vol. 3, no. 5 (Fall 1991), p. 1.

46. Hirt, *A Conspiracy of Optimism*, pp. 285-286.

47. *The Missoulian* (Missoula, Montana), September 7 and September 8, 1991.

48. *High Country News*, vol. 23, no. 18 (October 7, 1991), p. 10.

49. Jeff R. Jones and E.T. Bartlett, eds., "The Many Faces of New Perspectives: Strategies in Natural Resource Management," *College of Natural Resources Report No. 101* (Fort Collins: Colorado State University, 1993), passim. An important precedent for this wave of organizational introspection was the so-called Sunbird conference. In 1989, forest supervisors from the Northern, Rocky Mountain, Southwest, and Intermountain Regions convened to discuss these issues and sent a message to the chief afterward. The forest supervisors attributed the Forest Service's problems to intraorganizational rifts, undue meddling by the administration and Congress, and changing values of the public. They proposed to work more closely with outside publics and elected officials, recognize and respond to changing values, involve the public more effectively in the review process, and change internal management processes to alter behavior. Yaffee, *The Wisdom of the Spotted Owl*, p. 301.

50. Paul Mohai, et al., *Change in the USDA Forest Service: Are We Heading in the Right Direction?* General Technical Report NC-172 (USDA Forest Service, North-central Forest Experiment Station: 1994), pp. 20-24.

51. J.J. Kennedy and T.M. Quigley, "Evolution of Forest Service Organizational Culture and Adaptation Issues in Embracing Ecosystem Management," in M.E. Jensen and P.S. Bourgeron, eds., *Eastside Forest Ecosystem Health Assessment: Principles and Applications* (Portland: USDA Forest Service, Pacific Northwest Research Station, 1994), pp. 19-21.

52. *The Next 100 Years of National Forest Management*, pamphlet, USDA Forest Service, 1991. Others had the same idea. Regional Forester Bill Hurst of the Southwest Region distributed the same book to his forest supervisors in 1970 and made reading it a part of their personnel performance requirements. John Mumma assigned the text to all biologists in the Intermountain Region around 1977 or 1978.

53. Merrill R. Kaufmann et al., *An Ecological Basis for Ecosystem Management*, General Technical Report RM-246 (Fort Collins: USDA Forest Service, Rocky Mountain Forest and Range Experiment Station and Southwestern Region, 1994), p. 1.

54. USDA Forest Service, "Ecosystem Management Strategies for Northeastern and Midwestern National Forests: A Report to the Chief of the Forest Service," prepared by Eastern Region, Northeastern Forest Experiment Station, and North-central Forest Experiment Station, September 4, 1992, pp. 9-11.

55. USDA Forest Service, "Ecosystem Management Strategies for Northeastern and Midwestern National Forests," p. 20.

56. Kaufmann et al., *An Ecological Basis for Ecosystem Management*, p. 3.

57. Kaufmann et al., *An Ecological Basis for Ecosystem Management*, p. 2.

58. Kaufmann et al., *An Ecological Basis for Ecosystem Management*, p. 4.

59. Kaufmann et al., *An Ecological Basis for Ecosystem Management*, pp. 9-11.

60. Larry D. Harris and Patrick Kangas, "Reconsideration of the Habitat Concept," in *Transactions of the 53rd North American Wildlife and Natural Resources Conference* (Washington, D.C.: Wildlife Management Institute, 1988), p. 141.

61. Larry D. Harris, "Edge Effects and Conservation of Biotic Diversity," *Conservation Biology* 2 (December 1988):330.

62. Harris, "Edge Effects and Conservation of Biotic Diversity," p. 330.

63. Fragmentation was only one pervasive change in the environment that extended across political boundaries. An important part of ecosystem management was to foster interagency cooperation and partnerships between public and private land managers. See Jack Ward Thomas and Susan Huke, "The Forest Service Approach to Healthy Ecosystems," *Journal of Forestry* (August 1996), pp. 14-18.

64. Harris and Kangas, "Reconsideration of the Habitat Concept," pp. 137-142; Leonard F. Ruggiero, et al., "Ecological Dependency: The Concept and Its Implications for Research and Management," *Transactions of the 53rd North American Conference on Wildlife and Natural Resources*, 1988, pp. 115-126.

65. See, for example, Timothy A. Nigh, et al., *The Biodiversity of Missouri: Definitions, Status, and Recommendations for its Conservation* (Jefferson City, Missouri: Conservation Commission of the State of Missouri, 1992). This report was prepared by a Biodiversity Task Force composed of six biologists in the Missouri Department of Conservation, three public and private universities in Missouri, and the Forest Service.

66. Dennis Drabelle, "Obey the Law and Tell the Truth," *Wilderness* 58 (Fall 1994):29; William Burbridge, interview by Theodore Catton, October 28, 1996.

67. Paul Raeburn, "Can This Man Save Our Forests?" *Popular Science* 244 (June 1994):81; Thomas interview.

68. Drabelle, "Obey the Law and Tell the Truth," p. 30; Thomas interview.

69. Senate Subcommittee on Environmental Protection of the Committee on Environmental Protection and Public Works, *Conservation of the Northern Spotted Owl*, p. 59.

70. E. Thomas Tuchmann, Kent P. Connaughton, Lisa E. Freedman, and Clarence B. Moriwaki, *The Northwest Forest Plan: A Report to the President and Congress* (U.S. Department of Agriculture, Office of Forestry and Economic Assistance, Pacific Northwest Research Station, 1996), p. 136.

71. USDA Forest Service, *The Forest Service Ethics and Course to the Future* (Washington, 1994), p. 2.

72. Thomas interview.

73. Ecological Stewardship Workshop, "Interim Report: Toward a Scientific and Social Framework for Ecologically Based Stewardship of Federal Lands and Waters," December 4-14, 1995.

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75. Thomas interview.

76. Ecological Stewardship Workshop, "Interim Report: Toward a Scientific and Social Framework for Ecologically Based Stewardship of Federal Lands and Waters," December 4-14, 1995.

77. Drabelle, "Obey the Law and Tell the Truth," p. 30.

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APPENDIX

APPENDIX

USFS Wildlife Staff (National and Regional Offices)*

Name	Position	Tenure
INTERMOUNTAIN REGION (4)		
Barry Locke	Wildlife Specialist	29-31
LAKE STATES REGION (9)		
Acquisition and Game		
John McLaren	Senior Regional Forest Inspector	31-32
Public Relations, Acquisition, Exchange, Game		
William L. Barker, Jr.	Senior Administrative Assistant	33-32
Public Relations, Wild Life		
William L. Barker, Jr.	Senior Administrative Assistant	34
NORTH PACIFIC REGION (6)		
Range Management		
Edward N. Kavanagh	Assistant Regional Forester	34
Edward P. Cliff	Game Studies	34
Division of Wildlife Management		
Homer L. Shantz	**Chief**	**36-44**
John H. Hatton	Administrative Assistant	36
	Assistant Chief	37-41
Lloyd W. Swift	Assistant Chief	42-44
Maxine Gardner	Clerk	39
Madeline F. Knotts	Secretary	40-44

* This listing was compiled from USFS directories and a personnel history provided by the USFS. Because some USFS directories were not available (for years 1947, 1955-1957, 1959-1964, 1967, 1969, 1971, 1973-1975, 1996, and 1997), this compilation is not inclusive of all USFS wildlife, fish and rare plant employees. Positions listed may not reflect all jobs held by an individual during his or her tenure, and dates of tenure are sometimes approximate and may not represent an employee's full career on the USFS Wildlife, Fish and Rare Plant Staff.

** Prior to 1935, there was no wildlife staff in the national office. The Division of Wildlife Management was created within the national office in 1935, one of six National Forest Divisions (comprised of Timber Management; Range Management; Recreation and Lands; Engineering; and Fire Control and Improvements).

Name	Position	Tenure
Elsie F. Chapman	Mail and Files	41-42
Ellen L. Collins	Mail and Files	41-42
NORTHERN REGION (1)		
Range Management		
Glen A. Smith	Assistant Regional Forester	35-36
J. K. Dwinelle	Game Studies	35-36
Wildlife and Game Management		
Percy E. Melis	In Charge	37
Justin K. Dwinelle	Assistant	37
David J. Maclay	Junior Biologist	37
Bertha M. Heinemeyer	Clerk	37
Wildlife and Range Management		
Earl D. Sandvig	Assistant Regional Forester	38
Percy E. Melis	Fish and Game Management	38
David J. Maclay	Fish and Game Management	38
Wildlife Management		
Percy E. Melis	Assistant Regional Forester	39
Albert N. Cochrell	Acting Assistant Regional Forester	40
I. V. Anderson	Acting Assistant Regional Forester	40-44
David J. Maclay	Assistant	39-40
	Technician	40-41
Raymond M. West	Technician	41-42
Bertha M. Heinemeyer	Clerk	39-40
Helen V. Hager	Clerk	40-42
ROCKY MOUNTAIN REGION (2)		
Range Management		
Lynn H. Douglas	Assistant Regional Forester	35-36
A. Allen McCutchen	Game and Fish Management	35-36
Wildlife and Range Management		
Lynn H. Douglas	Assistant Regional Forester	37-38
Glen A. Smith	Assistant Regional Forester	39-42
Edward E. Birkmaier	Assistant Regional Forester	43-44
A. Allen McCutchen	Game and Fish Management	37-38
Cleland N. Feast	Game and Fish Management	38

Name	Position	Tenure
Lloyd W. Swift	Game and Fish/Wildlife Management	39-42
Barry C. Park	Wildlife/Game and Fish Management	43-44
SOUTHWESTERN REGION (3)		
Range Management		
D. A. Shoemaker	Assistant Regional Forester	35-36
R. P. Boone	Game Management	35-36
D. M. Gorsuch	Game Management	36
Wildlife and Range Management		
D. A. Shoemaker	Assistant Regional Forester	37-38
Phillip V. Woodhead	Assistant Regional Forester	40-44
R. P. Boone	Game Management	37-39
D. M. Gorsuch	Game Management	37-39
Fred W. Johnson	Game/Wildlife Management	39-43
Merle A. Gee	Wildlife Management	41-42
INTERMOUNTAIN REGION (4)		
Range Management		
Ernest Winkler	Assistant Regional Forester	35
Orange A. Olsen	Fish and Game	35
Wild Life and Range Management		
Ernest Winkler	Assistant Regional Forester	36
Orange A. Olsen	Fish and Game	36
Wildlife Management		
Orange A. Olsen	In Charge	37
Laurence H. Smith	Assistant Range Examiner	37
R. J. Costley	Junior Range Examiner	37
Wildlife and Range Management		
Glen A. Smith	Assistant Regional Forester	38
Clarence E. Favre	Assistant Regional Forester	39-44
Orange A. Olsen	Assistant in Wildlife Management	38-44
Laurence H. Smith	Fish and Game Management	38-39
Richard J. Costley	Fish and Game/Wildlife Management	38-42

Name	Position	Tenure
CALIFORNIA REGION (5)		
Wildlife and Range Management		
Fred P. Cronemiller	Assistant Regional Forester	35-44
Fred W. Johnson	Game and Fish Management	37-39
Ivan Sack	Fish and Game/Wildlife Management	39-41
NORTH PACIFIC REGION (6)		
Wildlife and Range Management		
Edward N. Kavanagh	Assistant Regional Forester	35-38
Lynn H. Douglas	Assistant Regional Forester	39-44
Edward P. Cliff	Game Studies	35-37
	Game and Fish Management	38-39
Glenn E. Mitchell	Wildlife Management	40-44
EASTERN REGION (7)		
Timber, Range and Wildlife Management		
Howard Hopkins	Assistant Regional Forester	35
M. A. Mattoon	Assistant Regional Forester	36-44
Barry C. Park	Wildlife and Range Management	37-41
T. C. Fearnow	Wildlife and Range Management	42-44
SOUTHERN REGION (8)		
Range and Wildlife Management		
Arnold C. Shaw	Assistant Regional Forester	36-38
Timber, Range and Wildlife Management		
Arnold C. Shaw	Assistant Regional Forester	39-43
Loren L. Bishop	Assistant Regional Forester	44
Erwin A. Schilling	Range and Wildlife Management	39-43
F. J. Ruff	Range and Wildlife Management	39-42
Floyd M. Cossitt	Range and Wildlife Management	44
NORTH CENTRAL REGION (9)		
Wildlife and Range Management		
R. R. Hill	Assistant Regional Forester	36-43
Winston A. Elkins	Junior Biologist	37
	Assistant in Wildlife Management	38-40
Herman F. Olson	Assistant in Wildlife Management	42-43

Name	Position	Tenure
Recreation Lands, Wildlife and Range Management		
R. R. Hill	Assistant Regional Forester	44
ALASKA REGION (10)		
Wildlife and Range Management		
Wellman Holbrook	Assistant Regional Forester	38-44
J. P. Williams	Fish and Game Management	39
Oliver T. Edwards	Junior Biologist	40
Division of Wildlife Management		
Lloyd W. Swift	**Chief**	**44-54**
	Director	**55-63**
James N. Templer	Assistant Chief	45
Richard J. Costley	Assistant Chief	46-49
Merle A. Gee	Assistant Chief	50-53
Everett Doman	Assistant Chief	54-57
David M. Gaufin	Assistant Director	58-60
Ralph Hill	Assistant Director	60-63
Eleanor C. Campbell	Secretary	45-46
Juliette Knape	Secretary	48
Edith M. Griffith	Secretary	49-54
Rachel L. Osborn	Secretary	58-63
NORTHERN REGION (1)		
Range and Wildlife Management		
Charles A. Joy	Assistant Regional Forester	45-46
Paul H. Roberts	Assistant Regional Forester	48-51
Floyd Iverson	Assistant Regional Forester	53-54
Wilfred W. Dresskell	Assistant Regional Forester	58-6?
Fred W. Johnson	Wildlife Management	48-6?
ROCKY MOUNTAIN REGION (2)		
Wildlife and Range Management		
Earl D. Sandvig	Assistant Regional Forester	45-51
Fred H. Kennedy	Assistant Regional Forester	52-54
Basil K. Crane	Assistant Regional Forester	58-6?
Barry C. Park	Game and Fish Management	45-46
Ralph R. Hill	Game and Fish/Wildlife Management	48-59

Name	Position	Tenure
Dale Jones	Wildlife Biologist	61-63
Richard Moore	Fisheries Biologist	61-63
SOUTHWESTERN REGION (3)		
Wildlife and Range Management		
Phillip V. Woodhead	Assistant Regional Forester	45
Arthur A. McCutchen	Assistant Regional Forester	46
Erwin A. Schilling	Wildlife Management	46
Wildlife Management, Recreation and Lands		
Erwin A. Schilling	Assistant Regional Forester	48-53
Allan G. Watkins	Forester, Wildlife	51
Floyd M. Hodgin	Forester, Wildlife	52
Wildlife and Range Management		
Clifford E. McDuff	Assistant Regional Forester	58-6?
Robert E. Latimore	Wildlife Management	58-63
John M. Hall	Wildlife Management	58-63
Nathan Snyder	Wildlife Management	58-6?
Hank McCurdy	Fisheries	60-63
Doug Morrison	Wildlife Liaison	60-62
INTERMOUNTAIN REGION (4)		
Range and Wildlife Management		
Clarence E. Favre	Assistant Regional Forester	45-46
Edward P. Cliff	Assistant Regional Forester	48-50
Irvin M. Varner	Assistant Regional Forester	51-53
Orange A. Olsen	Wildlife	45
D. Irvin Rasmussen	Wildlife	46-53
Everett R. Doman	Wildlife	50-51
David M. Gaufin	Wildlife	52
Robert E. Latimore	Wildlife	53
Wildlife Management		
D. Irvin Rasmussen	Assistant Regional Forester	54-63
Carl J. Baird	Assistant	58-6?

Name	Position	Tenure
CALIFORNIA REGION (5)		
Wild Life and Range Management		
Fred P. Cronemiller	Assistant Regional Forester	45-46
Wildlife Management		
Fred P. Cronemiller	Assistant Regional Forster	48-54
Marcelline M. Singiser	Clerk	53-54
Range and Wildlife Management		
Reginald M. DeNio	Assistant Regional Forester	58-6?
William P. Dasmann	Wildlife	58-63
NORTH PACIFIC REGION (6)		
Wildlife and Range Management		
Lynn H. Douglas	Assistant Regional Forester	45-48
Fred H. Kennedy	Assistant Regional Forester	49-51
Earl D. Sandvig	Assistant Regional Forester	52
Avon Denham	Assistant Regional Forester	53-63
Glenn E. Mitchell	Wildlife Management	45-50
William W. Huber	Wildlife Management	51-54
Walter O. Hanson	Wildlife Management	58-61
Jack Swartz	Wildlife Management	62-63
EASTERN REGION (7)		
Timber, Range and Wildlife Management		
M. A. Mattoon	Assistant Regional Forester	45-51
T. C. Fearnow	Range and Wildlife Management	45-51
Resource Management		
M. A. Mattoon	Assistant Regional Forester	52-54
Byron B. Beattie	Assistant Regional Forester	58-6?
T. C. Fearnow	Range and Wildlife Management	52
	Range, Wildlife and Recreation	53-54
Samuel P. Shaw	Range and Wildlife	58-6?

Name	Position	Tenure
SOUTHERN REGION (8)		
Timber, Range and Wildlife Management		
Loren L. Bishop	Assistant Regional Forester	45
Arnold C. Shaw	Assistant Regional Forester	46
Philip H. Bryan	Assistant Regional Forester	48
Floyd M. Cossitt	Range and Wildlife Management	45
Frederick J. Huff	Wildlife and Range Management	48
Lands, Recreation, Wildlife, Range and Watershed Management		
Frank A. Albert	Assistant Regional Forester	49-50
Philip H. Bryan	Assistant Regional Forester	51-54
Frederick J. Ruff	Wildlife, Range and Watershed Mgmt.	49
	Wildlife and Range	50-51
Lawrence S. Newcomb	Wildlife, Range and Watershed Mgmt.	52
Watershed, Wildlife and Range Management		
Leon R. Thomas	Assistant Regional Forester	58-??
Glen Thompson	Assistant Regional Forester	??-63
Howard A. Miller	Wildlife and Range Management	57-63
Duff Holbrook	Regional Wildlife Biologist	58-63
Monte Seehorn	Fish/Wildlife Biologist	58-63
NORTH CENTRAL REGION (9)		
Recreation, Lands, Wildlife and Range Management		
R. R. Hill	Assistant Regional Forester	45
James N. Diehl	Assistant Regional Forester	46
Chester L. Van Giesen	Assistant Regional Forester	48-49
Herman F. Olson	Wildlife	46-49
Recreation, Lands, Wildlife, Range and Water Management		
Chester L. Van Giesen	Assistant Regional Forester	50
Donald R. Ball	Assistant Regional Forester	51
Harold A. Svensen	Assistant Regional Forester	52-63
Herman F. Olson	Wildlife	50-54
	Wildlife and Range Management	58-63

Name	Position	Tenure
ALASKA REGION (10)		
Wildlife and Range Management		
Wellman Holbrook	Assistant Regional Forester	45
Timber, Wildlife and Range Management		
Charles G. Burdick	Assistant Regional Forester	46
Recreation, Lands, Information and Education, Wildlife and Range Management		
Wm. A. Chipperfield	Forester for Wildlife and Range Management	48-49
	Forester for Lands, Wildlife and Range Management	50
John H. Brillhart	Forester for Lands, Wildlife and Range Management	50
Wildlife Management		
Jack Schwartz	Branch Chief	60-61
Sigurd Olson	Assistant Branch Chief	60-61
	Branch Chief	62-63
Mike Perensovich	Wildlife Biologist	60-61
William Sheridan	Fisheries Leader	60-63
Division of Wildlife Management		
D. Irvin Rasmussen	**Director**	**64-67**
Walter O. Hanson	Assistant Director	64-67
Rachel L. Osborn	Secretary	64-67
NORTHERN REGION (1)		
Range and Wildlife Management		
Howard R. Foulger	Assistant Regional Forester	64-67
Merle A. Gee	Wildlife Management	64-67
Nate Snyder	Wildlife Biologist	64-67
Chuck Witt	Fish Program Manager	64-67
Norm Howse	Fish Program Assistant	64-67
Jim Cooper	Fish Program Assistant	64-67

Name	Position	Tenure
ROCKY MOUNTAIN REGION (2)		
Range and Wildlife Management		
George L. Burnett	Assistant Regional Forester	64-67
Pete Greene	Wildlife Management	64-67
Dale A. Jones	Fish and Wildlife Management Biologist	64-67
Richard L. Moore	Fisheries Management Biologist	64-66
SOUTHWESTERN REGION (3)		
Range and Wildlife Management		
Frank J. Smith	Assistant Regional Forester	64-67
John M. Hall	Wildlife Management	64-67
Hank McCurdy	Fisheries	64-67
INTERMOUNTAIN REGION (4)		
Wildlife Management		
David M. Gaufin	Assistant Regional Forester	64-67
Ina L. Lindstrom	Clerk	64-67
Floyd C. Noel	Cooperative Relations, Training, Studies	64-67
Donald K. Dunham	Aquatic Habitat Management, Fisheries	64-67
CALIFORNIA REGION (5)		
Range and Wildlife Management		
Everett R. Doman	Assistant Regional Forester	64-67
Wm. P. Dasmann	Wildlife Management	64-66
Albert E. Hall, Jr.	Fisheries	66
PACIFIC NORTHWEST REGION (6)		
Range and Wildlife Management		
Avon Denham	Assistant Regional Forester	64-67
John E. Schwartz	Wildlife Management	64
Ray West	Wildlife Management	64-67
Rod Canutt	Animal Damage Control	66-67
EASTERN REGION (7) [Region 7 ceases to exist in 1966]		
Resource Management		
Samuel P. Shaw	Range and Wildlife	64-65

Name	Position	Tenure
SOUTHERN REGION (8)		
Watershed, Wildlife and Range Management		
Glenn A. Thompson	Assistant Regional Forester	64-65
Wayne J. Cloward	Acting Assistant Regional Forester	66-67
Howard A. Miller	Wildlife Management	65-66
Duff Holbrook	Regional Wildlife Biologist	64-67
Paul Schrauder	Regional Wildlife Biologist	66-67
Don Strode	Regional Wildlife Biologist	66-67
Monte Seehorn	Fish/Wildlife Biologist	64-67
NORTH CENTRAL REGION (9) [merges with EASTERN REGION (7) to become EASTERN REGION (9) in 1966]		
Recreation, Range and Wildlife Management		
Harold A. Svensen	Assistant Regional Forester	64-67
Herman F. Olson	Range and Wildlife Management	64-66
Robert E. Radtke	Range and Wildlife Management	66-67
Don Hagar	Wildlife Biologist	66-67
Harold McReynolds	Fisheries Biologist	64-67
ALASKA REGION (10)		
Resource Management		
John B. Smith	Assistant Regional Forester	64-67
Sigurd T. Olson	Wildlife Management	64-67
William L. Sheridan	Wildlife Management	64-67
Division of Wildlife Management		
Walter O. Hanson	**Director**	**67-70**
Rachel L. Osborn	Secretary	67-70
Donald D. Strode	Assistant Director, Wildlife	70
Phil Summers	Assistant Director, Fisheries	70
NORTHERN REGION (1)		
Range and Wildlife Management		
Howard R. Foulger	Assistant Regional Forester	67-70
Merle A. Gee	Wildlife Management	67-68
Roger S. Bumstead	Wildlife Management	70
Nate Snyder	Wildlife Biologist	67-70

Name	Position	Tenure
Chuck Witt	Fish Program Manager	67-70
Norn House	Fish Program Assistant	67-70
Jim Cooper	Fish Program Assistant	67-70
ROCKY MOUNTAIN REGION (2)		
George L. Burnett	Assistant Regional Forester	67-70
Pete Greene	Wildlife Management	67-70
Richard L. Moore	Fishery Management Biologist	67-70
James C. Cruse	Wildlife Management Biologist	67-70
SOUTHWESTERN REGION (3)		
Range and Wildlife Management		
Frank J. Smith	Assistant Regional Forester	67-70
Dale A. Jones	Wildlife Management	67-70
Hank McCurdy	Fisheries	67-69
INTERMOUNTAIN REGION (4)		
Wildlife Management		
David M. Gaufin	Assistant Regional Forester	67-70
Ina L. Lindstrom	Clerk	68-69
Kathleen M. Atkinson	Clerk	70
Floyd C. Noel	Cooperative Relations, Training, Studies	67-69
	Wildlife Habitat	70
Donald K. Dunham	Aquatic Habitat Management, Fisheries	67-70
CALIFORNIA REGION (5)		
Range and Wildlife		
Everett R. Doman	Assistant Regional Forester	67-70
Wm. P. Dasmann	Wildlife Management	67-68
Ed Scheegas	Wildlife Management	69
Paul W. Shields	Wildlife Management	69-70
Albert E. Hall, Jr.	Fisheries	67-70
PACIFIC NORTHWEST REGION (6)		
Range and Wildlife Management		
John S. Forsman	Assistant Regional Forester	67-70
Leon W. Murphy	Wildlife/Fish Management	67-70

Name	Position	Tenure
Ray West	Wildlife Management	67-70
Robert Nelson	Wildlife Program	70
Rod Canutt	Animal Damage Control	67-70
SOUTHERN REGION (8)		
Wildlife and Range Management		
Wayne J. Cloward	Assistant Regional Forester	68-70
Donald D. Strode	Wildlife Management	68
Paul A. Shrauder	Wildlife Management	68-70
Wm. D. Zeedyk	Endangered Species	68-70
Herman L. Holbrook	Wildlife Management	68-70
Monte Seehorn	Wildlife Management	67-70
EASTERN REGION (9)		
Recreation, Range and Wildlife Management		
Harold A. Svensen	Assistant Regional Forester	68-69
John O. Wernham	Assistant Regional Forester	70
Robert E. Radtke	Range and Wildlife Management	67-70
Donald C. Hagar, Jr.	Wildlife Biologist	67-70
Harold E. McReynolds	Fisheries Biologist	67-70
ALASKA REGION (10)		
Recreation, Lands, Wildlife and Watershed Management		
George F. Roskie	Assistant Regional Forester	68-70
Sigurd T. Olson	Wildlife Management	67-70
Wm. L. Sheridan	Fisheries Management	67-70
Division of Wildlife Management		
Everett R. Doman	**Director**	**71-73**
Donald D. Strode	Assistant Director, Wildlife	71-73
Phillip B. Summers	Assistant Director, Fisheries	71-73
Rachel L. Osborn	Secretary	71-73
NORTHERN REGION (1)		
Range and Wildlife Management		
Howard R. Foulger	Assistant Regional Forester	71-73
Roger S. Bumstead	Wildlife Management	71-73
Floyd W. Pond	Ecosystems Analysis	71-73

Appendix

Name	Position	Tenure
ROCKY MOUNTAIN REGION (2)		
Range and Wildlife Management		
William L. Evans	Assistant Regional Forester	71-73
Pete Greene	Wildlife Management	71-73
James C. Cruse	Wildlife Management Biologist	71-73
Richard L. Moore	Fishery Management Biologist	71-73
SOUTHWESTERN REGION (3)		
Range and Wildlife Management		
Willard R. Fallis	Assistant Regional Forester	71-73
Dale A. Jones	Fish and Wildlife Management	71-73
John Mumma	Wildlife Program Leader	71-72
Chuck Kennedy	Threatened and Endangered Species	71-73
INTERMOUNTAIN REGION (4)		
Wildlife Management		
David M. Gaufin	Assistant Regional Forester	71-73
Kathleen M. Atkinson	Clerk	71-73
Floyd C. Noel	Wildlife Habitat	71-73
Donald K. Dunham	Aquatic Habitat Management, Fisheries	71-73
Robert Metzker	Fish Biologist	71-73
CALIFORNIA REGION (5)		
Range and Wildlife		
Robert E. Latimore	Assistant Regional Forester	71-72
Robert D. Nelson	Assistant Regional Forester	72-73
Edward R. Schneegas	Wildlife Management	71-72
Paul W. Shields	Wildlife Management	71-73
Albert E. Hall, Jr.	Fisheries	71-72
Willis A. Evans	Fisheries	73
PACIFIC NORTHWEST REGION (6)		
Range and Wildlife Management		
John S. Forsman	Assistant Regional Forester	71-73
Frederick C. Hall	Ecology and Studies	71-73
Leonard A. Volland	Ecology and Studies	71-73
Leon W. Murphy	Fish and Wildlife Habitat Manage.	71-73

Name	Position	Tenure
Robert Nelson	Wildlife Program	71-72
Paul R. Canutt	Wildlife Program	72-73
John C. Capp	Animal Damage Control	71-73
SOUTHERN REGION (8)		
Wildlife and Range Management		
Robert N. Gashwiler	Assistant Regional Forester	71-73
Herman L. Holbrook	Wildlife Management	71-73
Paul A. Shrauder	Wildlife Management	71-72
Monte E. Seehorn	Fisheries Biologist	71-73
Malcolm Edwards	Wildlife Management	72-73
Jim Byrne	Ecologist	72-73
EASTERN REGION (9)		
Recreation, Range, Environmental and Wildlife Management		
John O. Wernham	Assistant Regional Forester	72
Robert E. Radtke	Range and Wildlife Management	72
Donald C. Hagar, Jr.	Wildlife Biologist	72
Harold E. McReynolds	Fisheries Biologist	72
ALASKA REGION (10)		
Recreation, Lands, Wildlife and Watershed Management		
George F. Roskie	Assistant Regional Forester	71-73
Joseph Zylinski	Watershed and Multiple Use Mgmt.	71-73
Sigurd T. Olson	Wildlife Management	71-72
William L. Sheridan	Fisheries Management	71-73
Wildlife Management Staff		
Merrill L. Petoskey	**Director**	**74-76**
Ruth Ann Craig	Secretary	74-76
Donald D. Strode	Assistant Director, Wildlife	74-76
William D. Zeedyk	Threatened and Endangered Species	74-76
Phillip B. Summers	Assistant Director, Fisheries	74-76

Appendix

Name	Position	Tenure
NORTHERN REGION (1)		
Wildlife and Fisheries		
Edward R. Schneegas	Director	74-76
Christine G. Purdy	Clerk	74-76
Roger S. Bumstead	Wildlife Management	74-76
Henry J. McKirdy	Fisheries Management	74-76
ROCKY MOUNTAIN REGION (2)		
Range and Wildlife Management		
W. B. Gallaher	Director	74-76
Robert F. Buttery	Ecology	74-76
Pete Greene	In Charge, Wildlife Management	74-76
Dale L. Wills	Wildlife Management	74-76
Richard L. Moore	Fishery Management	74-76
SOUTHWESTERN REGION (3)		
Wildlife Management		
Dale A. Jones	Director	74-76
Sherry S. Jones	Secretary	74-76
Jack Adams	Wildlife Program Leader	75-76
Chuck Kennedy	Threatened and Endangered Species	74-76
INTERMOUNTAIN REGION (4)		
Wildlife Management		
David M. Gaufin	Director	74-76
Glenna S. Wright	Clerk/Secretary	74-76
Paul W. Shields	Wildlife Habitat Management	74-76
Donald K. Dunham	Aquatic Habitat Management, Fisheries	74-76
CALIFORNIA REGION (5)		
Fisheries and Wildlife Management		
Robert D. Nelson	Director	74-76
David J. Dunaway	Wildlife Management	74-76
Jerry P. McIlwain	Threatened and Endangered Species	74-76
Albert E. Hall	Fisheries Management	74-76
Willis A. Evans	Fisheries Management	74-75
	Wildlife and Fisheries Planning	76

Name	Position	Tenure
PACIFIC NORTHWEST REGION (6)		
Fish and Wildlife		
Leon W. Murphy	Director	74-76
Gertrude C. Dunn	Business Management	74-76
Paul R. Canutt	Wildlife Habitat	74-76
Keith Guenther	Wildlife Damage Control	74-76
Leon Murphy	Fisheries	74-75
Robert W. Phillips	Fish Habitat	75-76
SOUTHERN REGION (8)		
Range, Timber and Wildlife		
James S. Sabin, Jr.	Director	74-76
Robert N. Gashwiler	Wildlife and Range	74-76
Herman L. Holbrook	Cooperative Wildlife Relations	74-76
Malcolm G. Edwards	Wildlife Management	74-76
Levester Pendergrass	Regional Botanist	74-76
Monte E. Seehorn	Fisheries	74-76
EASTERN REGION (9)		
Recreation, Range, Wildlife and Landscape Management		
Norman P. Weeden	Director	74-76
Robert E. Radtke	Range and Wildlife Management	74-76
Donald C. Hagar, Jr.	Wildlife Biologist	74-76
Harold E. McReynolds	Fisheries Biologist	74-76
ALASKA REGION (10)		
Fisheries and Wildlife Management		
Wm. L. Sheridan	Director	74-76
***Wildlife Management Staff* [becomes *Wildlife and Fisheries Staff* in 1981]**		
Dale A. Jones	**Director**	**77-84**
Ruth Ann Craig	Secretary	77
Martha Baumes	Secretary	79-82
Carol Harrison	Secretary	82-84
Robert D. Nelson	Deputy Director	81-84
Donald D. Strode	Wildlife Program	77-81
Wm. R. Burbridge	Wildlife Program	81-84

Name	Position	Tenure
Hugh C. Black	State and Private Forestry	
	Wildlife Coordination	80-84
	Wildlife Program	84
Randy Long	Wildlife and Fish Coordination	84
William D. Zeedyk	Threatened and Endangered Species	77
Jerry P. McIlwain	Threatened and Endangered Species	78-81
Jay Gore	Owl Team	81
Barbara Holder	Threatened and Endangered Species	82-84
Kirk Horn	Threatened and Endangered Species	84
Phillip B. Summers	Fisheries Program	77-83
Paul Brouha	Fisheries Program	84
Robert W. Phillips	Program Planning	77-80
Hugh Black, Jr.	Program Planning	81-84
Karl Siderits	Program Planning	84
John Wolfe	Program Planning Assistant	81
Jim McDivott	Economist	81-84
Cindy Hartmann	Economist Assistant	83
Deloris Hauther	Systems	84
Hal Salwasser	Wildlife Ecologist	82
	Wildlife Ecologist, Fish and Wildlife Relationships	84
NORTHERN REGION (1)		
Wildlife and Fisheries		
Edward R. Schneegas	Director	77-84
Barbara L. Holder	Director	84
Christine G. Purdy	Clerk	77-78
	Program Assistant	79-84
Dorothy Wages	Program Assistant	83-84
Judith Y. Fitzpatrick	Secretary	81-82
Donna G. Huguet	Secretary	84
Roger S. Bumstead	Wildlife Management	77-78
Wm. R. Burbridge	Wildlife Management	79-81
Karl Siderits	Wildlife Management	81-84
David P. Garber	Wildlife Management	84
Robert M. Gale	Threatened and Endangered Species Specialist	79-84
Henry J. McKirdy	Fisheries Management	77-81
Paul Brouha	Fisheries Management	82-84
Don K. Bartschi	Fisheries Management	84
Ron Escano	WFHR Coordinator	84

Name	Position	Tenure
ROCKY MOUNTAIN REGION (2)		
Range and Wildlife Management		
Wallace B. Gallaher	Director	77-82
Pete Greene	Wildlife Management Group Leader	77-80
John C. Capp	Wildlife Habitat Management	81-82
Dale L. Wills	Wildlife Management	77-80
	Wildlife Programs/T&E Species Mgmt.	81-82
Judy L. Sheppard	Wildlife Programs/T&E Species Mgmt.	81-82
Leonard Hendzel	Range/Wildlife Habitat Improvement/Development	78-79
Robert P. Newlin	Range/Wildlife Habitat Improvement/Development	81-82
Richard L. Moore	Fisheries	77-80
	Fish Habitat Management	81-82
Robert F. Buttery	Ecology	77-82
Barry C. Johnston	Ecology	81-82
Range, Wildlife, Fisheries and Ecology		
Wallace B. Gallaher	Director	82-83
John W. Mumma	Director	84
John C. Capp	Wildlife and Fish Habitat Management	82-84
Melanie Malespin	Terrestrial Wildlife Habitat Management	84
Judy L. Sheppard	Wildlife Programs/T&E Species Mgmt.	82
Dale L. Wills	Wildlife Programs/T&E Species Mgmt.	82
	Wildlife Habitat Relations/T&E Species Habitat/T&E Species/ Animal Damage Control	83-84 84
Robert P. Newlin	Range /Wildlife Habitat Improvement/ Development	82
Robert J. Wintersteen	Range /Wildlife Habitat Improvement and Budget	84
Richard L. Moore	Fish Habitat Management	82
Leon Fager	Fish Habitat	83-84
Albert Collotzi	Aquatic Habitat Management	84
Mit Parsons	Fish Biology	84
Robert F. Buttery	Ecology	82
Barry C. Johnston	Ecology	82
Leonard Hendzel	Ecologist	83-84
Barry Johnston	Forest and Rangeland Ecology	84
Hal Salwasser	Wildlife and Fish Ecology	84
Dick Holthausen	Ecology	84

Appendix

Name	Position	Tenure
SOUTHWESTERN REGION (3)		
Wildlife Management		
Wm. D. Zeedyk	Director	78-84
Sherry A. Jones	Secretary	77-84
Roger S. Bumstead	Wildlife Management Biologist	79-84
Arthur P. Renfro	T&E Species Biologist	81-83
Leon Fisher	T&E Species Biologist/	
	Animal Damage Control	84
	Fisheries Program	84
Charles E. Kennedy	Fisheries Biologist/T&E Species	78-79
Reggie Fletcher	Rare Plant Leader	77-84
John F. Lehmkuhl	Run Wild Biologist	81-82
	Wildlife Biologist	82-83
Gary Bell	AZ Zone Biologist	79-84
Jerry Stefferud	NM Zone Biologist	82-84
Rick Wadleigh	Wildlife Habitat Coordinator	84
INTERMOUNTAIN REGION (4)		
Wildlife Management		
John Mumma	Director	77-83
Wm. R. Burbridge	Director	84
Glenna S. Wright	Secretary	77-84
Paul W. Shields	Wildlife Habitat Management	77-84
Pat Hurt	Wildlife Biologist	81
David Winn	Habitat Typing Classification	81-84
Win Green	Endangered and Threatened Species	76-78
Phil Janik	Endangered and Threatened Species	79-83
Glen Conteras	Endangered and Threatened Species	84
Donald K. Dunham	Aquatic Habitat Management, Fisheries	77-81
Donald Duff	Aquatic Habitat Management, Fisheries	81-84
Fred Mangum	Macroinvertebrate Program	77-84
Al Collotzi	Idaho Anadromous Fish Program	81
John Adams	Programs and Plans/Budget/Appeals	78-84
Ronald E. Burraychak	Programs and Plans	84

Name	Position	Tenure
CALIFORNIA REGION (5) [becomes PACIFIC SOUTHWEST REGION IN 1979]		
Fisheries and Wildlife Management		
Robert D. Nelson	Director	77-79
Win Green	Director	81-82
Joseph H. Harn	Director	83-84
Nancy Graveson	Administrative Technician	78-80
Marcia L. Dumpit	Business Management Assistant	81-84
John C. Capp	Wildlife Management/Budget	77-79
Herman D. Avant	Wildlife Management	79-84
Jerry P. McIlwain	Threatened and Endangered Species	77
David J. Dunaway	Wildlife Management	77
	Threatened and Endangered Species	78-80
Dean Carrier	Threatened and Endangered Species	81-84
Lowell E. Horton	Regional Botanist	77-83
Albert E. Hall	Fisheries Management	77-79
Dave R. Gibbons	Fisheries Management	80-82
Debby Stefan	Fisheries Biologist	80-82
	Resident Fisheries Program Manager	82-84
Randy Bailey	Anadromous Fisheries Program Manager	82-84
Willis A. Evans	Wildlife and Fisheries Planning	77-82
Harold J. Salwasser	Ecologist, Wildlife Ecology	79-82
Janet F. Hurley	Systems, Wildlife Ecology	79-80
Tom Hanley	Systems, Wildlife Ecology	80-81
Bill Laudenslayer	Systems, Wildlife Ecology	80-82
	Wildlife Ecology	82-84
Hugh C. Black	Animal Damage Control	78
	Animal Damage and Timber Coord.	79
John E. Borrecco	Animal Damage and Timber Coordination	81-84
PACIFIC NORTHWEST REGION (6)		
Fish and Wildlife		
Leon W. Murphy	Director	77-83
Hugh Black, Jr.	Director	84
Donna M. Everett	Business Management	77-78
Marjorie A. Landreville	Secretary	80-81
Barbara K. Arthur	Office Assistant	82-83
Pat Markham	Office Assistant	84
Robert A. Hribernick	Budget Analysis and Planning	81-84

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Name	Position	Tenure
Paul R. Canutt	Wildlife Habitat	77-84
	Planning and Budget	84
Keith Guenther	Wildlife Damage	77-78
Kirk M. Horn	Wildlife Damage	79-84
Barbara L. Holder	Threatened and Endangered Species	79-81
Richard J. Pederson	Threatened and Endangered Species	82-84
	WFHR/Training	84
Gordon Haugen	Fish Habitat/ Regional Fisheries	77-84
Roberts W. Phillips	Fish and Wildlife Habitat/ TE&S Species/NEPA	84
SOUTHERN REGION (8)		
Range, Timber and Wildlife		
James S. Sabin, Jr.	Director	77
William J. Bryan	Director	78-81
Robert N. Gashwiler	Wildlife and Range	77-80
Herman L. Holbrook	Cooperative Wildlife Relations	77-81
Malcolm G. Edwards	Wildlife Management	77-81
Randall C. Long	Endangered Species	78-81
Levester Pendergrass	Regional Botanist	78-81
Monte E. Seehorn	Fisheries	77-81
Fisheries, Wildlife and Range		
Jerry P. McIlwain	Director	81-84
Herman L. Holbrook	Cooperative Wildlife Relations	81-83
Malcolm G. Edwards	Wildlife Management	81-83
Tom Darden	Wildlife Habitat Relationships	84
Randall C. Long	Threatened and Endangered Species	81-83
	Wildlife Management	84
Arthur P. Renfro	Threatened and Endangered Species	84
Levester Pendergrass	Regional Botanist	81-84
Joan Walker	Regional Ecologist	81-84
Monte E. Seehorn	Fisheries	81-84

Name	Position	Tenure
EASTERN REGION (9)		
Recreation, Range, Wildlife and Landscape Management		
H. Peter Wingle	Director	77-82
Bruce Hronek	Director	83-84
Robert E. Radtke	Wildlife	77-84
Donald C. Hagar, Jr.	Wildlife Biologist	77-84
Robert W. Hollingsworth	Widlife	78-80
	Fisheries Biologist	81-84
Harold E. McReynolds	Fisheries Biologist	77-84
ALASKA REGION (10)		
Fisheries and Wildlife Management		
Wm. L. Sheridan	Director	77
Tamra Taylor	Fisheries Biologist	77
Wildlife and Fisheries		
Sig Olson	Director	78-80
Robert W. Phillips	Director	81-83
Philip J. Janik	Director	84
Sarah Notestine	Clerk	79
Jan Albayalde	Clerk	80-81
Molly Windred	Unit Clerk	81
Tricia Parr	Unit Clerk	82
Janie B. Powell	Unit Clerk	82-83
LaVine W. Warren	Unit Clerk	84
Linda Koloski	Unit Clerk	84
Mark Voight	Planning and Budget	81
Ronald E. Burraychak	Wildlife	79
Lew Jurs	Wildlife	80
David J. Dunaway	Wildlife/ Regional Wildlife Biologist	79-84
Chuck Sundstrom	Wildlife Habitat Relationships	81-82
Winnie Kessler	Wildlife Habitat Relationships	83-84
Mary Stensvold	Regional Botanist	78-82
Wm. L. Sheridan	Fisheries	77-82
Tamra Taylor	Fisheries	79-81
Robert D. Dewey	Fisheries	79-82
	Fisheries Habitat Improvement Coordinator	83-84
	Wildlife and Fisheries Planning	84
Henry W. Newhouse	Fisheries	81
	Planning and Budget/RPA Coordinator	82-84

Name	Position	Tenure
David R. Gibbons	Regional Fisheries Biologist	81-84
Winifred B. Sidle	Wildlife and Fisheries Habitat Relationships	84
Norman R. Howse	Subsistence Progrm Coordinator	84
Wildlife and Fisheries Staff [becomes ***Wildlife, Fish, and Rare Plants Staff*** in 1994]		
Robert D. Nelson	**Director**	**85-97**
Carol Harrison	Secretary/Office Manager	85-91
	Program Analyst	92-95
	Procurement/Staff Budget	96-97
Felicia Lockhart	Procurement/Staff Budget	96-97
Lara Kimbrell	Secretary	91-94
Lara O'Connor	Secretary	95
Mike Weland	Assistant to Director	89-90
Hal Salwasser	Deputy Director	85-88
	Assistant Director, Planning	89
Stephen P. Mealey	Assistant Director, Planning	90
Phil Janik	Assistant Director, Programs	91-94
Hugh C. Black	Wildlife Program	85-88
Terri Raml	Wildlife Program	88
Tom Darden	Wildlife Program Manager	90-95
Shelly Witt	Wildlife Program	90
Debbie Pressman	Wildlife Program	91-95
Tom Bandolin	Wildlife Program	
	T&E Species Program Manager	94-95
Kirk Horn	T&E Species Program Manager	85-86
Glen Contreras	T&E Species Program Manager	87-89
Kathy Johnson	TE&S Species Program Manager	90-92
Gail Tunberg	TE&S Species Program	90
Timm Kaminski	TE&S Species Program	91
Jay Gore	TE&S Species Program	92-95
Stacy Lemieux	TE&S Species Program	93
Ron Escano	TE&S Species Program Manager	94-95
Valerie Guardia	TE&S Species Program	94-95
Chris Topik	National Botanist	92-95
Paul Brouha	Fisheries Program Leader	85-86
Mike Dombeck	Fisheries Program Manager	87-89
Leslie Weldon	Fisheries Program	88-89
Jim Lloyd	Fisheries Program Manager	90
Debbie Pressman	Fisheries Program	90
Harv Forsgren	Fisheries Program Manager	92-95
Cindy Deacon-Williams	Fisheries Program	92-94

Name	Position	Tenure
Laurie Fenwood	Fisheries Program	94
	Program Marketing	95
	TE&S Species Program Manager	96-97
Rick Swanson	Fisheries Program	95
Mary Knapp	Fisheries Program	95
Phil Janik	Assistant Director, Programs	89-90
Janice McDougle	Assistant Director, Planning	92-94
Karl Siderits	Budget Coordinator	85-88
Gordon Haugen	Budget Coordinator	
	Budget/Riparian Area Program	89-90
John McGee	Budget	91-95
Robert Randall	Economist	85-89
	RPA Coordinator/Economist	90-92
Cindy Swanson	RPA Coordinator/Economist	93-95
Lori Walsh	Systems Coordinator	87-89
	Program Analyst	90
Randy Long	Planning	85
Jack Capp	Planning	87-89
Janice McDougle	Planning and Appeals	90
	Planning	91
Jim Fenwood	Planning	93-95
John McGee	Appeals Program Coordinator	89-90
Teri Raml	Appeals	89-90
Glen Contreras	Appeals Program Coordinator	91-97
Gail Tunberg	Appeals	91-92
Valerie Guardia	Appeals	92-93
Christine Jauhola	Information Coordinator	89
	Information Manager	90
Teri Raml	Information Manager	91-92
Beth Pendleton	Partnership and Communications Manager	92
	Information Manager	93-94
Laurie Fenwood	Partnership and Communications Manager	93
Antoinetta Grant	Program/Computer Analyst	91-95
Jerry Fernandez	Computer Analyst	94-95
	Procurement/Staff Budget	96-97
Nancy Green	Wildlife Habitat Relationships	86
	Program Management	95
Wini Sidle	Wildlife Habitat Relationships	87-89
Dean Carrier	Old Growth Habitat Coordinator	90
Richard Holthausen	Wildlife Habitat Relationships	92-93
	Terrestrial Habitat Ecology	94-95

Name	Position	Tenure
Cynthia Leonard	Terrestrial Habitat Ecology	94
Mit Parsons	Fish Habitat Relationships	86-87
Jeff Kershner	Fish Habitat Relationships	88-93
	Aquatic Habitat Ecology	94-95
Glen Chen	Aquatic Habitat Ecology	94-95
Shelly Witt	Continuing Education	91-95
NORTHERN REGION (1)		
Wildlife and Fisheries		
Barbara L. Holder	Director	85-86
Kirk M. Horn	Director	87-96
Martin Prather	Director	97
Donna G. Huguet	Secretary	85-91
C. Diane Mouritsen	Program Assistant	89
Cynthia R. Krueger	Program Assistant	90-91
Elaine J. Poser	Program Assistant	93-95
Dani Hegwood	Office Automation Assistant	93
Carole Schuft	Office Automation Assistant	95
Robert M. Ralphs	Appeals and Special Projects Coordinator	88-90
	Planning, Appeals and Litigation/ FOIA Coordinator	91-95
Kathryn E. Torquemada	Special Wildlife Programs	91
	Appeals Assistant	92-94
	Appeals Assistant, Partnerships, Continuing Ed.	95
Cindy Swanson	Wildlife Economist	89-91
	Wildlife Economist/Watchable Wildlife	92
David P. Garber	Wildlife Management	85-86
	Wildlife Program Manager/ Budget Coordinator	87
Alan G. Christensen	Wildlife Program Manager/ Budget Coordinator	88-91
	Wildlife Program Leader	92-95
Sue Reel	Wildlife Biologist	86-87
Leslie A. C. Weldon	Staff Biologist	90
Arlene T. Doyle	Wildlife Ecologist	90
Fred Samson	Wildlife Ecologist	91
	Ecology Program Leader	92-97
Deborah Richie	Wildlife Interpretive Specialist	93-95
Christine Paige	Neotropical Migratory Bird Coordinator	93-95
William C. Ruediger	T&E Species Specialist	86-89
	TES Species Program Manager/Leader	90-97

Name	Position	Tenure
Mary Maj	T&E Species Program Assistant	91-94
James J. Claar	Special Projects Biologist	89-94
	Special Projects/	
	T&E Species Program Assistant	95-96
	Wildlife Program Manager	97
Steve Shelly	Regional Botanist	93-97
Angie Evenden	Regional Botanist	96-97
Ron Escano	WFHR Coordinator	85-86
Nancy M. Warren	WFHR Coordinator	87-89
James W. Caslick	National Animal Damage Mgmt. Coord.	87
John Weaver	National Grizzly Bear Habitat Coord.	85-88
Rodd E. Richardson	National Grizzly Bear Habitat Coord.	89-92
Tom Puchler	National Grizzly Bear Habitat Coord.	93-96
Jay Gore	National Grizzly Bear Habitat Coord.	96-97
Gerald (Skip) Kowalski	Special Programs (Grizzly Bear)	91
	Budget Coordinator/	
	Grizzly CEM Coordinator	92-93
	Budget Coordinator	94
	Administration and Planning	95
Don K. Bartschi	Fisheries Program Manager	85-90
Rick Stowell	Fisheries Program Manager/Leader	91-97
David B. Johnson	Fisheries Biologist	89-90
Rich Torquemada	Fisheries Assistant	91-97
Linda Ulmer	Fisheries Assistant	97

ROCKY MOUNTAIN REGION (2)

Range, Wildlife, Fisheries and Ecology [becomes *Renewable Resources Staff Unit* in 1991]

Glen E. Hetzel	Director	85-95
Dave Anderson	Director	96-97
Robert J. Wintersteen	Range /Wildlife Habitat Improvement	
	and Budget	85
John C. Capp	Terrestrial Wildlife Habitat Management	85-86
Melanie Woolever	Terrestrial Wildlife Habitat Management	85-86
	Wildlife Habitat Coordinator	87-90
	Wildlife Partnerships Coordinator	92-93
	Assistant Wildlife Program Manager	94-95
	Program Manager	96-97

Name	Position	Tenure
Dale L. Wills	Habitat/T&E Species/ Animal Damage Control	85
	T&E Species/Animal Damage Control/ Budget	86
	Wildlife Program/Budget	87-88
	Wildlife Program/T&E Species	89
Larry Mullen	Wildlife Planning/Special Projects	88
	Wildlife Planning/Budget Coordination	89-90
	Wildlife Program Manager	91-95
Susan Sharpley-Evans	T&E Species	90-91
Joan Friedlander	T&E Species	92-97
Jon Verner	T&E Species Assistant	96-97
Andy Kratz	Botanist	93-95
Dick Roth	Neotropical Migratory Bird Program Mgr.	91-95
David L. Wheeler	Computer Specialist	90
Kimberly Anderson	National Nature Watch Coordinator	95-97
Albert Collotzi	Aquatic Habitat Management	85-86
	Aquatic Program Management/FHR Coord.	87-88
Mit Parsons	Wildlife and Fish Ecology	85-86
Gordon Sloane	Aquatic Program Management/FHR Coord.	89-90
	Fisheries Program Manager	91-97
Robert Schmal	Region Fish Habitat Relationships Coord.	91-95

SOUTHWESTERN REGION (3)

Wildlife Management [becomes *Wildlife and Fisheries Management* in 1992]

Wm. D. Zeedyk	Director	85-90
James R. Lloyd	Director	92-97
Sherry S. Jones	Secretary	85-89
Dee Driscoll	Secretary	90-92
	Office Manager	93-97
Roger S. Bumstead	Wildlife Management Biologist	85
Jerry Stefferud	NM Zone Biologist	85-86
Gary Bell	AZ Zone Biologist	85-86
E. Leon Fisher	T&E Species/Animal Damage Control	85-90
	TES Program Manager	91-93
	Wildlife Program Manager	94-97
Leon Fager	Wildlife Program Manager	92-93
	TES Program Manager	94-95
Keith W. Fletcher	TES Spotted Owl Program Manager	92-97
Heather Hollis	Assistant, Spotted Owl Program	92-97
	Rare Plant Leader	96-97

Name	Position	Tenure
Sandy Knight	TES Assistant/WL Program	89-97
Richard Wadleigh	Wildlife Habitat Coordinator	85-90
Bryce Rickel	Habitat Coordinator	91-97
Reggie Fletcher	Rare Plant Leader	85-89
Rene Galeano-Popp	Rare Plant Leader	90-93
Teresa Prendusi	Rare Plant Leader	93-96
James L. Cooper	Fisheries Biologist	88-91
	Fisheries Program Manager	92-97
Derrick C. Cooke	Sikes Act Coordinator	91
	Budget, Planning, Game/Fish Coord.	92-94
Helen Hamilton	Appeals/Lit. Coordinator	92-97
Douglas (Sandy) Boyce	Special Projects Coordinator	94-97
Gary Bell	AZ Zone Fisheries Biologist	85-87
Jerry Stefferud	NM Zone Fisheries Biologist	85-87

INTERMOUNTAIN REGION (4)

Wildlife Management [becomes *Fisheries and Wildlife Management* in 1987]

Wm. R. Burbridge	Director	85-97
Glenna S. Wright	Secretary	85-96
Ralene Maw	Computer Assistant/Data Base Mgmt.	85-97
Ronald E. Burraychak	Programs and Plans/Budget/Appeals	85-93
Kris Lee	Programs, Plans and Appeals/Budget	91-96
Tina C. Lanier	Appeals and Litigation	95
	Regional T&E Species Biologist	90-97
David Winn	Habitat Typing Classification	85-88
	Wildlife Habitat Relationships	89-91
Monica Schwalbach	Wildlife Habitat Relationships	94-95
Paul W. Shields	Wildlife Habitat Management	85-94
Frank Gunnell	Wildlife Habitat Management	95
Larry Richards	Wildlife Biologist	91-97
Glen P. Conteras	T&E Species/Animal Damage Control	83-87
Michael L. Rath	T&E Species/Animal Damage Control	88-94
Jay Gore	Regional TES/ADC Biologist	95-96
Duane Atwood	Regional Botanist/Rare Plant Specialist	87-96
Donald Duff	Aquatic Habitat Management, Fisheries	85-93
Harv Forsgren	Aquatic Habitat Management, Fisheries	88-91
Don Bartschi	Aquatic Habitat Management, Fisheries	92-92
	Regional Fisheries Program Manager	93-95

Name	Position	Tenure
Seona Brown	Assistant Fisheries Program Manager	93-97
Dan Duffield	Regional Fisheries Biologist	97
Lynn Decker	Regional Fisheries Biologist	97
Fred Mangum	Macroinvertebrate Program	85-97
Jim Cole	National Viewing Guide Coordinator	90-94
	Intermountain West Joint Venture	95-97
PACIFIC SOUTHWEST REGION (5)		
Fisheries and Wildlife Management		
Joseph H. Harn	Assistant Regional Forester	85
Randall C. Long	Assistant Regional Forester	86-88
	Director	89-90
Christine A. Janhola	Director	91-93
Kathy Clement	Assistant Regional Forester	95-97
Myrenia A. Harris	Business Management Assistant	89-91
Pat Harrigan	Support Services	92-93
Ann Marie Cooper	Support Services	92-93
Marie Moreno	Support Services	92-94
Jane Lee	Support Services	94-95
Mary Sue Fisher	Budget Program Manager	91-97
Lori Walsh	Program Analyst	91-92
Carol Demuth	Planning and Appeals Assistant	89-90
Keith Guenther	Planning and Appeals Program Manager	91-96
Anne Bradley	Assist. Planning and Appeals Program Mgr.	91-96
Herman Dale Avant	Wildlife Management	85-88
	Wildlife Program Manager	89-91
Joelle Buffa	Wildlife Habitat Relationships	89-91
	Wildlife Program Manager	92-96
Diana Craig	Wildlife Program Manager	97
Susan Sharpley-Evans	Neotropical Migratory Bird Specialist	93-95
W. Dean Carrier	Threatened and Endangered Species	85-86
	Trinity River Habitat Improvement Coord.	86-88
Nancy F. Green	Threatened and Endangered Species	87-88
Donald Delorenzo	T&E Species Program Manager	89-91
Linda Parker	T&E Species Program Manager	92-96
	Fish Program Manager	97
Ann H. Huffman	T&E Species Program Assistant	90-91
Diane Macfarlane	T&E Species Program Assistant Mgr.	91-97
Terri Simon-Jackson	Spotted Owl Coordinator	89-91
David Solis	Spotted Owl Program Manager	91-96
John C. Robinson	Assistant Spotted Owl Program Manager	91-96
	Avian Coordinator	97

Name	Position	Tenure
James R. Shevock	Regional Botanist	89-97
Anne Bradley	Planning Botanist	96-97
Debby Stefan	Resident Fisheries Biologist	85
Michael P. Dombeck	Anadromous Fisheries Biologist	85
	Fisheries Management	86-87
Charles M. Holstine	Fisheries Management	85-88
	Fisheries Program Manager	90
Lynn Decker	Fisheries Program Manager	91-97
Bill Laudenslayer	Wildlife Ecologist	85-86
	Wildlife Biologist (WHR)	87-88
John E. Borrecco	Animal Damage and Timber Coord.	85-86
	Budget/Animal Damage and Timber Coordination	87-89
Pat Manley	Regional Wildlife Ecologist	91-97
Carlos Davidson	Biological Systems Analyst	94-95
Colleen Pelles	Liaison with CA Dept. Fish and Game	90-93
Mike Chapel	Liaison with CA State Board of Forestry	91-95
PACIFIC NORTHWEST REGION (6)		
Fish and Wildlife		
Hugh Black, Jr.	Director	85-94
	Deputy Director, Natural Resources	94-97
Bob Devlin	Director, Natural Resources	94-97
Ron Escano	Group Leader, WFW	96-97
Pat Markham	Administrative Assistant	85-86
	Management Assistant	87
Laura Little	Management Assistant	88
Kay Pennell	Management Assistant	89-93
Tonya Henderson	Management Assistant	94
Bernie Rios	Deputy Director	89-95
Richard J. Pederson	Regional Wildlife Program Manager	85-88
	Wildlife/Silviculturist Program Manager	89-95
Lisa Norris	Regional Wildlife Program Manager	89-97
Robert W. Phillips	TE&S Species/NEPA	85
Kathy Johnson	TE&S Species/NEPA	85-87
Grant Gunderson	TE&S Species Program Manager	89-97
Gordon Haugen	Regional Fisheries Program Manager	85-88
	CO Basin and Fish Coordinator	91-97

Name	Position	Tenure
David Heller	Regional Fisheries Program Manager	89-97
Richard S. Holthausen	Regional Wildlife Ecologist(WFHR)	85-91
Bruce Marcot	Old Growth Development Coordinator	88
Philip L. Lee	Planning and Budget Program Manager	85-88
	TE&S Species Program Manager	87-89
Randy Hickenbottom	Budget Coordinator	92-93
	Regional T&E Species Biologist	97
SOUTHERN REGION (8)		
Fisheries, Wildlife and Range		
Jerry P. McIlwain	Director	85-94
David W. Wilson	Wildlife Program Manager	85-86
Tom L. Darden	Wildlife Habitat Relationships	85-86
	Wildlife Program Manager	86-89
	FWR Unit Leader	97
Ellen Goetz-Campbell	Wildlife Biologist/Appeals	85-86
Stephen R. Rickerson	Wildlife Program Manager	89-97
Jimmy C. Huntley	Wildlife Habitat Relationships	86-88
Gordon Sloane	Wildlife Habitat Relationships	87-88
James D. Fenwood	Wildlife/Fish Habitat Relationships	88-92
Christopher E. Frye	Wildlife/Fish Habitat Relationships	88-90
Marilyn Robertson	Wildlife/Fish Habitat Relationships	91-97
Scott Klinger	Wildlife/Planning Biologist/Fish Habitat	91-92
Glenn Gaines	Wildlife/Planning Biologist/Fish Habitat	93-97
John M. Edwards	National Coodinator,	
	Making Tracks Program	90-97
Bernie Rios	T&E Species Program Manager	85-86
Ronald E. F. Escano	T&E Species Program Manager	86-91
Marc L. Bosch	Endangered Species Assistant	88-90
	T&E Species Program Manager	91-95
Dennis Krusac	Endangered Species Assistant	91-95
Levester Pendergrass	Botanist/Range and Botany Program Mgr.	85-97
Joan Walker	Regional Ecologist	85-92
Susan L. Hooks	Regional Ecologist	92-97
Monte E. Seehorn	Fisheries	85-89
	Zone Fisheries Biologist	90-92
	Regional Fisheries Improvement Coord.	93-95

Name	Position	Tenure
James C. Lloyd	Fisheries Program Manager	87-89
Danny J. Ebert	Fisheries Program Manager	89-92
Cindy A. Williams	Fisheries Program Manager	92-96
Kelly Russell	Fisheries Program Manager	97
Veronica Sailor	Computer Programer Analyst	91-95
Marilyn J. Robertson	Regional Wildlife Ecologist	93-95
EASTERN REGION (9)		
Recreation, Range, Wildlife and Landscape Management		
Bruce Hronek	Director	85-88
Robert P. Spivey	Director	90-92
Robert E. Radtke	Wildlife	85-90
Donald C. Hagar, Jr.	Wildlife Biologist	85-88
Gaylord (Eddie) Morris	Wildlife Habitat Biologist/T&E Species	87-89
Allan Boss	Fish, Wildlife, and T&E Group Leader	89-92
Steve Mighton	Wildlife Habitat Relationships/ T&E Species	91-92
Muriel Poindexter	WI Wildlife Viewing Guide	92
Robert W. Hollingsworth	Fisheries Biologist	85-92
Harold E. McReynolds	Fisheries Biologist	85
Ecosystem Management		
Ken Holtje	Operational Leader	93-95
Al Boss	Wildlife Group Leader	93-97
Steve Mighton	T&E Species	93-97
Larry Stritch	Botany	93-94
Bob Hollingsworth	Fisheries Biologist, Aquatic Ecosystems	93-97
Harry Parrott	Hydrology and Water Quality	93-95
Bonnie Ilhardt	Riparian and Watershed Improvement	93-95
ALASKA REGION (10)		
Wildlife and Fisheries		
Philip J. Janik	Director	85-89
John C. Capp	Director	90-97
Linda Koloski	Unit Clerk	85-87
Mona Macias	Unit Clerk	88
Wilma Bennett	Unit Clerk	89-90
Mary Lou Peterson	Administrative Support Unit Clerk	91-95

Appendix

Name	Position	Tenure
Henry W. Newhouse	Program Planning, Budgeting, Implementation, and RPA Coordinator/ Fisheries	85-87
David J. Dunaway	Regional Wildlife Biologist	85-87
Fred Samson	Regional Wildlife Biologist	86-90
	TES/Ecology Program Manager	90-92
Robert D. Dewey	Regional Wildlife and Fisheries Planning and Fisheries Habitat Improvement Coord.	85-87
	Regional Fisheries Habitat Coordinator	88
	Regional WLF Planning Coordinator	89-90
	Regional WLF Planning and Budget Coordinator	91
	Regional WLF Planning, NEPA and Budget Coordinator	92-96
Winifred B. Sidle	Wildlife and Fisheries Habitat Relationships Coordinator	85-86
Lowell Suring	Wildlife and Fisheries Habitat Relationships Coordinator	87-93
Gene DeGayner	Wildlife and Fisheries Habitat Relationships Coordinator	94-97
Ellen Campbell	Regional Wildlife Program Leader	91-97
Nancy Andison	Biological Technician	91-93
Steve Zemke	Assistant Planning Coordinator	91
Cynthia Ragland	National Taking Wing Program Coord.	93-97
David R. Gibbons	Regional Fisheries Biologist	85-90
Don Bartschi	Regional Fisheries Program Leader	90-92
Calvin Casipit	Regional Fisheries Program Leader	92-97
Ron Dunlap	Assistant Fisheries Program Leader	88-94
	Fish Habitat Relationship Coordinator	95-97
Chris Iverson	Regional Ecology and TES Program Leader	92-97
Jon Martin	Regional Ecologist	87-92
Greg Nowacki	Regional Ecologist	93-97
Mary Muller	Regional Botanist	92-94
Mary Stensvold	Regional Botanist	91-97
Norman R. Howse	Subsistence Program Coordinator	85-87
	Subsistence Program Leader	91-96
Ken Thompson	Subsistence Management	91-97
Rod Kuhn	Subsistence IDT Leader	91-92
	Subsistence Planning	93-97

Name	Position	Tenure
Steve Zemke	Subsistence Planning Coordinator	92
Carol Jorgensen	Regional Advisory Council Coordinator	92-95
Fred Clark	SE Council Coordinator	95-97
Max Copenhagen	Watershed Group Leader	95
Mike Kuehn	Regional Hydrologist	95
Terry Brock	Regional Soil Scientist	95

TIMELINE OF EVENTS RELATING TO WILDLIFE AND FISH MANAGEMENT IN THE FOREST SERVICE

1891	Forest Reserve Act authorized the establishment of forest reserves in the public domain.
1894	Yellowstone Park Protection Act prohibited hunting within the park boundaries, except for hook and line fishing.
1896	In *Geer v. Connecticut*, the Supreme Court ruled that wildlife was the property of the state in which it was found.
1897	Sundry Civil Appropriations Act (Organic Act) specified watershed protection and timber production as the primary purposes for the establishment of forest reserves.
1898	Gifford Pinchot became Chief of the Division of Forestry.
1900	Lacey Act prohibited interstate transportation of illegally killed game.
1901	The Division of Forestry changed to the Bureau of Forestry in the Department of Agriculture.
1905	Gifford Pinchot becomes Chief of the Forest Service.
	Congress gave itself and the President the right to create game preserves.
	Forest Reserve administration transferred from Department of the Interior to the Department of Agriculture.
	The Bureau of Forestry changed to the U.S. Forest Service.
	The Forest Service's *Use Book* outlined the chief purposes of the National Forests as timber production and watershed protection.
1906	Bird hunting prohibited on wildlife refuges except under Secretary of Agriculture regulations.
1910	Henry S. Graves appointed to replace Pinchot as Chief of the Forest Service.
1911	Weeks Act authorized the purchase of land to protect watersheds of manageable streams. The act resulted in the purchase of eastern lands for National Forest purposes.
1913	The Weeks-McLean Migratory Bird Act brought migratory birds under the protection of the Department of Agriculture.

1916 Wild Game Refuges Act authorized the President to designate areas purchased under the Weeks Act to be set aside for the protection of game animals, birds, or fish.

1917 Fish and Game Division established within the Grazing Department of the Forest Service.

1918 Migratory Bird Treaty Act authorized coordination of hunting laws for migratory birds between the United States and Canada.

1920 William B. Greeley succeeded Graves as Forest Service Chief.

1924 Clark-McNary Act revised the Weeks Law to expand the purchasing power of the federal government for National Forest purposes and provide for cooperative programs with private and state agencies.

Gila National Wilderness Area established.

1928 McSweeney-McNary Act authorized interagency research on life histories and habits of forest animals.

Greeley replaced by Robert Y. Stuart as Chief of the Forest Service.

1929 Migratory Bird Conservation Act provided for the acquisition of refuge lands for migratory birds.

Barry Locke hired in the Intermountain Region as the first designated wildlife specialist in the Forest Service.

1930 Knutson-Vandenberg Act authorized reforestation funding.

1931 Aldo Leopold published his *Report on a Game Survey of the North Central States*, which provided a factual basis for regional wildlife management. In 1933, his text *Game Management* became the first in the field to be published.

1933 Ferdinand A. Silcox appointed as Chief of the Forest Service.

1934 National Forest Refuge Act authorized the establishment of wildlife refuges within the national forests, contingent on state approval.

Fish and Wildlife Coordination Act provided for federal, state, and private cooperation in the development of a wildlife conservation program. The Act also provided that any lands acquired for such purposes within exterior boundaries of national forests would become national forest lands.

The Forest Service issued Regulation G-20A, authorizing the establishment of hunting seasons and bag limits by the Forest Service, under orders from the Secretary of Agriculture.

1936	Division of Wildlife Management created within the Forest Service, independent of the Grazing Division. The agency initiated studies of carrying capacity, range rehabilitation, grazing competition, life history of deer, and deer census methods on the Kaibab Plateau.
	Homer L. Shantz named first Director of Wildlife in the Forest Service.
1937	Pittman-Robertson Federal Aid to Wildlife Restoration Act provided funds for wildlife restoration projects. States benefitting from those funds were required to establish professional wildlife commissions.
1939	Following Silcox's death, E.H. Clapp named Acting Chief of the Forest Service.
1940	Bald and Golden Eagle Protection Act gave protection to the threatened bald eagle.
1941	Regulation W-2 replaced G-20A, heralding a new era of state and federal cooperation on wildlife issues.
	As a result of the war effort, timber management took precedence over other resource management divisions in the Forest Service.
1943	Lyle F. Watts appointed Chief.
1944	Sustained-Yield Forest Management Act established sustained-yield units on federal and cooperatively managed lands, and heralded the era of intensive forest management.
	Lloyd Swift succeeded Shantz as Director of Wildlife and Fish Management Division.
1948	Wildlife Division reduced to skeletal organization after Congress eliminates wildlife funds from Forest Service appropriations.
1950	Cooperative Forest Management Act strengthened the authority of federal land managers to cooperate with the states and private land owners on forestry issues.
	Dingell-Johnson Sport Fishing Restoration Act provided federal funding to states for fisheries management and restoration.
1952	Richard E. McArdle succeeded Watts as Chief of the Forest Service.
1960	Multiple-Use Sustained-Yield Act required the Forest Service to consider equally all the resources of the forests, establishing a definite policy and additional funding for wildlife management.

1962	Edward P. Cliff named Chief of the Forest Service.
	Rachel Carson's *Silent Spring* publicized the hazards of pesticides, marking the beginning of the environmental movement.
1964	Wilderness Act established a national wilderness system that included Forest Service, National Park Service, and Fish and Wildlife Service jurisdictions.
	D.I. Rassmussen chosen as Director of Wildlife and Fish Management.
1965	Condor Survey Committee conducted first annual survey of California condors.
1966	Endangered Species Preservation Act initiated a federal effort to acquire critical habitat areas through the Land and Water Conservation Fund.
1967	Walt Hanson replaced Rassmussen as Director of Wildlife and Fish Management.
1968	Wild and Scenic River Act ensured free-flowing waters, helping to maintain habitat for fisheries.
1969	Endangered Species Protection Act strengthened the 1966 law.
1970	National Environmental Policy Act ensured consideration of environmental effects for federal actions.
	Everett Doman named Director of Wildlife and Fish Management.
1971	Inception of the "Featured Species" program in the Southern Region, whereby different areas were managed for different species. This program required increased coordination between timber and wildlife managers.
1972	John R. McGuire succeeded Cliff as Chief Forester.
1973	Endangered Species Act radically strengthened the Acts of 1966 and 1969.
	Wildlife Management Institute published *North American Wildlife Policy*, marking the change from game management to wildlife management.

1974	Forest and Rangeland Renewable Resources Planning Act enacted to ensure adequate provisions and funding to meet immediate and future forest research needs. The Act greatly stimulated Forest Service planning activity and brought considerable encouragement to all users of the National Forests.
	Sikes Act provided direction for wildlife habitat planning and management on federal lands in cooperation with the States.
	Merrill Petoskey appointed Director of Wildlife and Fish Management.
1975	Symposium on Management of Forest and Range, Habitat for Nongame Birds took place in Tucson, Arizona.
1976	National Forest Management Act required that the Forest Service manage the national forests in a manner that ensured biodiversity.
	Federal Land Policy and Management Act recognized state authority over wildlife on federal lands.
1977	Dale Jones chosen as Director of Wildlife and Fish Management.
1978	Wildlife Management Institute Study offered recommendations for improved effectiveness of wildlife management in the Forest Service.
1979	*Wildlife Habitats in Managed Forests: The Blue Mountains of Oregon and Washington* published by the Government Printing Office. Emphasizing the importance of species diversity, the book became the model for wildlife management in all Forest Service regions.
1980	Interior Department Appropriations Act included a RPA Statement of Policy that gave greater emphasis to rangeland data collection and improvement.
	R. Max Peterson replaced McGuire as Forest Service Chief.
	Sensitive Species Policy implemented.
1982	Wildlife and Fish Habitat Relationships (WFHR) program initiated.
1983	Interagency Grizzly Bear Committee formed to coordinate and implement a conservation strategy for the grizzly bears.
1985	Robert D. Nelson promoted to Director of Fish and Wildlife.
1986	The Challenge Cost-Share program established to facilitate cooperative agreements between other wildlife management agencies.

1987	F. Dale Robertson appointed as Chief of the Forest Service.
	"Rise to the Future" program initiated to increase the agency's emphasis on fisheries management within the national forests.
1989	North American Wetlands Conservation Act encouraged partnership among public agencies for the restoration of wetland habitats.
	Interagency Scientific Committee formed to develop a conservation strategy for the northern spotted owl.
1990	"Every Species Counts" program developed to profile all rare animal and plant species.
1992	"Ecosystem Management" committed the Forest Service to manage vigorously for "diverse, healthy, productive, and sustainable ecosystems."
1993	Jack Ward Thomas named Chief of the Forest Service.
	The Forest Ecosystem Management Assessment Plan Team (FEMAT) formed.
	The President's Northwest Forest Plan produced.
1997	Michael Domeck named Chief of the Forest Service.

NATIONAL FOREST SYSTEM LANDS
AS OF SEPTEMBER 30, 1996

FOREST SERVICE REGION	# OF NFs[1]	ACRES OF NF LANDS	#NFS UNITS[2]	ACRES OF NFS UNITS
REGION 1 - Northern	15	24,134,226	11	1,261,151
REGION 2 - Rocky Mountain	17	19,993,106	8	2,104,559
REGION 3 - Southwestern	12	20,338,557	12	365,513
REGION 4 - Intermountain	18	31,811,149	2	103,386
REGION 5 - Pacific Southwest	18	19,999,289	27	33,211
REGION 6 - Pacific Northwest	21	24,521,844	13	116,353
REGION 8 - Southern	35	12,681,248	26	229,382
REGION 9 - Eastern	17	11,830,655	32	149,956
REGION 10 - Alaska	2	21,971,245	0	0
TOTALS	**155**	**187,281,319**	**131**	**4,363,617**

TOTAL NATIONAL FOREST SYSTEM (NFS) LANDS **191,644,936 acres**

NATIONAL FOREST LANDS IN DIFFERENT CATEGORIES

Wilderness Areas	43,734,776 acres
Primitive Areas	173,762 acres
Scenic-Research Areas	6,630 acres
National Scenic Areas	125,835 acres
Wild & Scenic Areas	933,179 acres
National Recreation Areas	2,679,824 acres
Game Refuge & Wildlife Preserves	1,218,953 acres
National Monuments	3,267,373 acres
National Volcanic Monuments	167,415 acres
National Historic Areas	6,540 acres
Research Natural Areas	435,542 acres
TOTAL	**43,750,029 acres**

[1] National Forests (NF) that are managed jointly are counted separate forests.

[2] National Forest System (NFS) Units = 51 purchased Units, 20 National Grasslands, 8 Land Utilization Projects, 20 Research and Experimental Areas, and 33 other areas.

Note on the Authors

NOTE ON THE AUTHORS

Theodore Catton received his Ph.D. from the University of Washington, with a specialty in environmental history. He is the author of *Inhabited Wilderness: Indians, Eskimos, and National Parks in Alaska* (University of New Mexico Press, 1997), and administrative histories of Glacier Bay National Park and Preserve, Mount Rainier National Park, Nez Perce National Historical Park, and Big Hole Battlefield. In his seven years with HRA, he has researched land management issues involving numerous public agencies.

Lisa Mighetto received her Ph.D. from the University of Washington, with a specialty in environmental history. She has published two books, *Wild Animals and American Environmental Ethics* (University of Arizona Press, 1991), and *Muir Among the Animals: The Wildlife Writings of John Muir* (Sierra Club Books, 1986). Her articles on wildlife and fisheries issues have appeared in *Harper's*, *Sierra*, *Pacific Historical Review*, *Environmental Review*, *The Alaska Journal*, *Columbia*, and *The Public Historian*. Currently she serves on the editorial board of *Pacific Northwest Quarterly* and as secretary of the American Society for Environmental History. She has worked in HRA's Seattle office since 1991.

Historical Research Associates, Inc. (HRA) has provided cultural and environmental resource consulting services to public and private clients since 1974. Based in Missoula, Montana, HRA also maintains offices in Seattle and Washington, D.C.