

Aldo Starker Leopold : wildlife biologist and public policy maker
by Carol Henrietta Leigh Rydell

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Arts in History
Montana State University
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Abstract:
Aldo Starker Leopold (1913-1983), the eldest son of conservationist Aldo Leopold (1887-1948), played during his life, a crucial role in forming wildlife management policy at both state and federal levels; Trained as a zoologist at the University of California in Berkeley, Leopold spent his early years as a wildlife biologist working on such issues as heritable wildness in turkeys and cataloging the wildlife of Mexico. From his position as professor of zoology at the University of California in Berkeley, however, he quickly became embroiled in wildlife controversies with policy implications. In the late 1940s and throughout the 1950s, for example, Leopold worked on deer management issues with California's Fish and Game Department. In 1962 then Secretary of the Interior Stewart Udall appointed Leopold to head a special advisory board on wildlife management. As chairman of that board, Leopold authored at least three important reports on wildlife management in the National Parks, predator and rodent control and the national wildlife system. By the end of the 1960s, Leopold had carved a niche in wildlife management circles separate from his father's. This thesis is an intellectual biography of Aldo Starker Leopold. It is based on research into his published and unpublished writings and his personal papers.

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MONTANA STATE UNIVERSITY
Bozeman, Montana

April 1993

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To Alexander and Henrietta Leigh

and

Bob, Claire and Johanna Rydell

ACKNOWLEDGEMENTS

This project would not have been possible without the help of numerous individuals and institutions. I am grateful to the Department of History and Philosophy at Montana State University for underwriting many of my research expenses. I also wish to thank the library staff at the Bancroft Library and the Museum of Vertebrate Zoology at the University of California, Berkeley.

This project took much longer than expected. During the five years it took to finish the thesis Professors Pierce Mullen, Gordon Brittan and Billy Smith gave me support and encouragement but most of all time and space to do things at my own pace. I am very grateful to them for this. Nina Leopold Bradley spent an afternoon with me talking about her brother, and provided me with a copy of the Sierra Club Oral History of Starker Leopold. I am grateful to her for trusting me with the story of someone she loved very much. I also wish to thank her husband, Charles Bradley, and his daughter, Dorothy Bradley, for their patience and encouragement. Professor A. Hunter Dupree read my thesis and shared his memories of Starker. Richard Wojtowicz generously and patiently helped with the computer. Claire and Johanna Rydell let their mother go upstairs to work on her thesis. In their own small ways they supported my work. Most of my gratitude, however,

they supported my work. Most of my gratitude, however, goes to my husband, Bob Rydell, who encouraged me at every step of the way. He read this thesis and never stopped believing in the project and me.

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ABSTRACT

Aldo Starker Leopold (1913-1983), the eldest son of conservationist Aldo Leopold (1887-1948), played during his life, a crucial role in forming wildlife management policy at both state and federal levels. Trained as a zoologist at the University of California in Berkeley, Leopold spent his early years as a wildlife biologist working on such issues as heritable wildness in turkeys and cataloging the wildlife of Mexico. From his position as professor of zoology at the University of California in Berkeley, however, he quickly became embroiled in wildlife controversies with policy implications. In the late 1940s and throughout the 1950s, for example, Leopold worked on deer management issues with California's Fish and Game Department. In 1962 then Secretary of the Interior Stewart Udall appointed Leopold to head a special advisory board on wildlife management. As chairman of that board, Leopold authored at least three important reports on wildlife management in the National Parks, predator and rodent control and the national wildlife system. By the end of the 1960s, Leopold had carved a niche in wildlife management circles separate from his father's. This thesis is an intellectual biography of Aldo Starker Leopold. It is based on research into his published and unpublished writings and his personal papers.

INTRODUCTION

In conservation circles the name Aldo Leopold calls forth more than the image of a poetic observer of woodcocks gracefully performing their annual spring dance, of oak trees marking time and keeping track of history in their wood, and of the sandy but intellectually fertile counties of Wisconsin. The name signifies the very essence of conservation, of conserving a balance in nature by living in accordance with a land ethic. Aldo Leopold (1887-1948) was one of America's foremost conservationists; he was a proponent of scientific wildlife management and of wilderness preservation. Leopold's importance in American conservation and environmental history has done nothing but grow since his untimely death in 1948.

Born in Burlington, Iowa and trained at the School of Forestry at Yale, Leopold began his career as a forester working in the Southwest. It was in the fragile ecosystems of the southwestern deserts that Leopold first toyed with ideas about the delicate balance in nature between the land and its inhabitants, and there that he first realized the need for sound wildlife management practices and wilderness preservation. These ideas, so crucial to the birth of the environmental and wilderness

movements of the second half of the twentieth century, were further developed and refined by Leopold as he moved from the Southwest to the sandy counties surrounding Madison, Wisconsin. There he shifted his intellectual focus from the field of forestry to game--or as it is now known, wildlife--management.

Leopold came into the conservation movement on the heels of forester Gifford Pinchot and preservationist John Muir. Their turn-of-the-century ideas regarding the development of America's wild lands and natural resources--Gifford Pinchot's "wise use" doctrine and John Muir's spiritual plea for resource preservation--were competing for influence when Leopold entered the picture. Leopold's scientific ideas about land and wildlife management and his philosophy of living in ecologic balance with nature provided the synthesis of these antithetical beliefs. His scientific and philosophic ideas found their final expression in the collection of essays he is best remembered for, his posthumously published A Sand County Almanac (1949).

Historians and philosophers are still trying to define and describe the contours of Aldo Leopold's legacy in the areas of wildlife management, wilderness preservation, and environmental philosophy. One important facet of his legacy which has not been fully appreciated is his family. Leopold and his wife of Spanish and

Italian descent, (Maria Alvira) Estella Bergere, had five children, all of whom have become expert naturalists and prominent figures in their respective scientific fields. Four members of the Leopold family became professional scientists--Aldo Starker became a zoologist, Luna Bergere a hydrologist, Aldo Carl a plant physiologist, and Estella Bergere a paleobotanist--while the fifth, Nina Leopold Bradley, is Co-Director of Research at the Leopold Memorial Reserve and is doing important research of her own on prairie restoration. Three of these Leopold-family scientists have been elected to the National Academy of Sciences.[1] Gifted observers of nature like their father, Aldo's children have also taken up his torch of environmental and public policy activism. This study is concerned with the intellectual biography of one of Aldo's children--Aldo Starker Leopold.

When Aldo Leopold, died in 1948, his son, Aldo Starker Leopold, stood poised to take up where his father left off. On the zoology faculty at the University of California in Berkeley, Starker Leopold (1913-1983) was like his father in many ways. Not only did they share an intense and professional interest in wildlife management, but both were avid hunters and keen observers of the relationship between wildlife species and their environments. Both were highly recognized and influential

leaders in conservation. And both, especially later in life, became philosophical about ways to improve the relationship between humans and nature.

Starker Leopold did have much in common with his father and he did carry on much of his father's work in the area of wildlife management. That alone is enough to make him important for the history of American conservation science. But Starker's importance in American conservation history extends beyond following in his father's footsteps. By amending and extending his father's ideas to fit the particular conditions of the 1950s and 1960s, the younger Leopold had the opportunity to affect national conservation policy. For example, he served on Secretary of the Interior Stuart Udall's Advisory Board of Wildlife Management. Indeed he was an active participant in what Udall has called "the quiet conservation crisis of the 1960s."

Like his father, Starker Leopold stepped beyond scientific research to making conservation policy. But whereas Aldo Leopold's contribution was largely philosophical, Starker Leopold's was political. The younger Leopold transformed a deep love and respect for the natural world into conservation policy by using the skills and talents he had inherited or acquired. A keen observer of nature and powerful communicator, he changed the way Americans regarded and lived with nature just as

much as his father.

This thesis is organized chronologically. Chapter one deals with Starker Leopold's youth--his years of study both under his father's tutelage and under the direction of professors at the University of California. Chapter two examines his first thirteen years (1947-1960) as a wildlife biologist and explores Leopold's transitional period as he moved from scientist to policy maker. Chapter three shows how Leopold's attempts in the 1960s to remain in the scientific arena were doomed. He simply had too many irons in the public policy fire to be able to concentrate on science. And chapters four and five develop the high point of Leopold's career as an advisor to the federal government. Chapter six takes Leopold's career through the 1970s to his death in 1983. If the 1960s were the pinnacle of Leopold's achievement, the 1970s were the years to wax in the glory of a productive and valuable career.

INTRODUCTION ENDNOTES

1 Luther J. Carter, "The Leopolds: A Family of Naturalists," Science 207 (1980): 1051.

CHAPTER 1

THE APPRENTICESHIP YEARS

Aldo Starker Leopold, the eldest of Aldo and Estella's children, was born on October 22, 1913 in Burlington, Iowa at the home of his paternal grandparents. His father was recuperating from an attack of acute nephritis which he had contracted while working as forest supervisor of the Carson National Forest in New Mexico.[1] The news of the birth of the first grandchild brought joy to both sides of the family.[2] Shortly after Starker was born, his father wrote to Herman Chapman--an old professor of his at Yale's Forestry School--that a "brand new Forest Supervisor arrived here."[3] While Aldo had the profession wrong, he seemed to sense that this son would follow the trail he had blazed.

When physically able to resume work, Aldo moved his new family back to New Mexico where he took a desk job with the Forest Service in Albuquerque.[4] Young Starker spent the first twelve years of his life in Albuquerque in a house with backyard access to the Rio Grande River.[5] Not surprisingly, his interest in animals and the out-of-doors developed at an early age. When Starker was just over one year old, his father wrote to his grandfather, Carl Leopold Sr.: "He's a wonder at interpreting pictures. Knows all the prints on the wall and what kind

of critters are depicted in each one."[6] His father obviously inspired him and encouraged his interest. From about the age of five, Starker "sort of became [Aldo's] companion and tagged along" on hunting and fishing trips.[7] When a younger brother, Luna, also became old enough to accompany Aldo on hunting trips, but when only one child could tag along, Starker would work hard to be the chosen one. The draw of a straw would determine the young hunter's luck. "If I won, fine," Starker later recalled. "If Luna won, then I would trade him out of it with one thing or another. Every damned thing I had except my pocket knife." "So," Starker concluded, "I had the advantage of sitting around campfires with dad most of my life."[8] According to Luna Leopold's recollection, the exchange of privileges did not always proceed smoothly. There were times when if Luna won the luck of the draw, "Starker went into a crying fit that subsided only after he had bargained away his finest pencil in exchange for Luna's hunting privileges." That Starker did not take lightly the loss of an opportunity to hunt with his dad is evidenced by the fact that "Luna soon owned all of Starker's pencils."[9]

Starker clearly learned a lot from even these early outings with his father. "I don't remember talking land ecology at the age of 5," he told an interviewer in the

1970s, "but it wasn't very damned long after that he would stand out on the hillside and talk about why quail were in one place and not another, or why ducks preferred a particular pond because of some food he recognized in the water."[10] Aldo's ponderings on ecological questions roused the young Starker. "[S]aw a chimney swift," the curious youngster reported in a diary he kept, "and where it came from, I don't know."[11] In 1921 Aldo joined the Tome Gun Club a short way downriver from Albuquerque. The club provided an additional opportunity for his boys to "learn about woodsmanship and the ways of wildlife."[12]

Hunting and nature study were closely intertwined in the young Leopold. It seemed the development of the one depended on the development of the other. In 1923 for his 10th birthday, Starker received his first .22 gauge shot gun, and ever after combined a deep-seated love for hunting with as passionate a love for wildlife.[13] "I became interested in the out-of-doors really as a hunter and a fisherman with my father," he later reminisced, "and this continued all through the rest of our life together."[14]

When Starker turned 12, his family moved to Madison, Wisconsin, where Aldo took a job as assistant director of the Forest Service's Forest Products Laboratory. Starker, his father, his brother Luna and younger siblings continued their hunting, fishing and camping escapades. Aldo had started to keep a hunting journal in 1917.[15] He

instilled that sense of order and accurate record keeping in his children. From the age of 11, Starker kept his own hunting journal in which he recorded such information as the weather, the wind direction, his companions and the catch or bag of the day. He showed an early interest in such characteristics of game species as their size, weight, number, and location. No doubt his father's concerns for game numbers and health rubbed off on Starker. He expressed, for example, a real awareness of the shortages of game, especially waterfowl, during the dry spells of the 1930s. "First real cold day we've had this fall," he reports on 18 October 1930. "This noon we decided that there ought to be some ducks in the country so we went to Cedar and spent the afternoon over the decoys." The hunters--Luna, Starker and a friend--did not bag any ducks, but Starker felt pleased with the day for a different reason. "It was nice, though, to see some ducks in the country for a change," he concluded.[16] When later that year, the eager hunters bagged only one rabbit, Starker seemed more pleased than disappointed. "It was encouraging to see some game anyway," he wrote.[17]

Starker also exhibited at an early age the Leopold family concern for ethical hunting. He could not abide crippling animals and not making every effort to procure the creature and put it out of its misery. "I got a

passing bird," he wrote the October before his twelfth birthday, "but missed the other shots because I was wet and cold. Then we went over to the big marsh and I crippled one bird which I procured after quite a race."[18] Later in life on a hunting trip with his father, the taste for hunting was spoiled by crippling and not retrieving some partridges. "In five hours we flushed 9 [partridges]," he wrote, "of which I knocked down three but only retrieved one. The loss of 2 successive cripples, both hard hit and one actually down in plain sight, almost took the `hunt' out of me."[19] And the young hunter never failed to be moved by the beauty of the natural world around him. "They surely were beautiful," he wrote about a flock of ducks spotted early one morning.[20]

When neither his father, mother nor brother shared the desire to hunt, Starker did not hesitate to go alone. "Our whole family went on a picnic today," he wrote on 26 September 1930. "Daddy and Mother only took their bows, and Luna, though he had his gun, didn't feel like walking to the marsh a mile and a half away, so I hunted alone. The marsh was full of snipe," he continued, "and I hunted until I had all the birds I wanted...I could easily have killed my limit today, but" Starker concluded thoughtfully and in keeping with the teaching of his father and grandfather, "I decided that nine birds were enough." He

ended on an empirical, almost professional note he could have picked up from his father: "Saw around fifty birds."[21]

Aldo resigned from the Forest Products Laboratory in May 1928 when it appeared that advancement to the directorship would continue to elude him. His interest moreover had shifted by then to questions of game management. He accepted a job in July 1928 as overseer of a regional survey of game conditions with the Sporting Arms and Ammunition Manufacturing Institute.[22] When funds from the institute dried up in the middle of the depression Aldo was left without steady employment. From spring of 1932 until the summer of 1933 Aldo acted as a consultant for different state game departments, signed up as a Civilian Conservation Corps worker in New Mexico, and continued writing.[23]

When Aldo's classic text Game Management was published in 1933, he gave Starker a copy for Christmas and inscribed it with these words acknowledging his close outdoor relationship with his son: "The materials for this book were gathered from the four winds, but the conviction that it should be written comes largely out of our trips together on the Rio Grande. The greatest fortune I can wish you is that you and your son may someday find such a river, and that there may still be

mallards to fly when the dawn wind rustles in its cottonwoods."[24] In 1933 Aldo also found permanent employment at the University of Wisconsin where he became the first instructor in the country with the title "Professor of Game Management."[25]

During the early thirties, Starker Leopold was finding himself and his professional interests by means of a circuitous route of fun and employment. In the fall of 1931, he had enrolled at the University of Wisconsin--Madison only to "flunk out" in the spring of 1932. Apparently, his grades were affected by the gregarious lifestyle he pursued during his freshman year.[26] For a year and a half after leaving college, Leopold worked at a State Game Farm in Poynette, Wisconsin and as an apprentice biologist for the Soil Conservation Service in La Crosse, Wisconsin.[27] He returned to the university in the spring of 1934 after "[finding] out how much [he] didn't know" and graduated in Soils and Agronomy in 1936.[28] Perhaps these years as an apprentice convinced Leopold that he ought to pursue a career in wildlife biology.[29]

In the summer of 1936 Leopold followed in his father's footsteps to New Haven, where he attended Yale Forestry School's summer camp. He attended Yale as he remembered "because that's where my dad went to school, so I had to go to Yale Forestry School too."[30] In the fall

of 1936, he continued in the forestry curriculum, but in January 1937, having firmly decided on a career in "game management," he made plans to leave the forestry program. To work toward his career goal, he planned on obtaining an advanced degree in either plant or animal ecology. He also envisioned "a life history study of the Merriam's turkey," that he would fashion into a doctoral dissertation.[31] He considered remaining at Yale for graduate work and studying plant ecology. But the adventurous Leopold preferred to branch out, leave Yale, and go to work under the University of California's premier zoologist, Joseph Grinnell, who, according to Leopold, "was one of the outstanding naturalists and conservationists in this country," and whose writings had "intrigued" the budding wildlife biologist.[32]

An important neo-Darwinian biologist around the turn of the century, Grinnell had set up the Museum of Vertebrate Zoology at Berkeley with the support of funds from Annie M. Alexander.[33] Grinnell was a keen naturalist, known for his "patient, scrupulous recording of facts seen in nature."[34] At a time when "the vogue of experimentation was in its most rapid ascendancy," Grinnell stood fast in his belief that "exhaustive observation of nature [was] the foundation of evolutionary study."[35] For example, when Leopold asked for Grinnell's

advice as to the necessary course to follow to prepare him for "game management work in the Southwest," Grinnell advised Leopold to "get some experience in collecting vertebrate specimens in the field" as "about the best way to gain personal knowledge of species."[36] He also believed strongly that environmental factors limited the distribution of animals, an idea which Leopold would later seize and expand on in his own work. A staunch "neo-Darwinian in theoretical outlook," Grinnell was committed to the notion that the environment--through selection--shaped the "characters of races of animals."[37] Leopold would be greatly influenced by Grinnell's neo-Darwinian ideas.

When Leopold began corresponding with Grinnell, he still had to finish his year at Yale. The poor showing of his first year at University of Wisconsin was no longer an issue. Although he struggled in a curriculum not of his first choice, he did very well at Yale, so well in fact that he received the Charles Lathrop Pack Forestry Fellowship to pursue further graduate study for his turkey project.[38] Grinnell supported Leopold's proposal to study zoology at the University of California, and in March 1937 Leopold made definite plans to go to Berkeley.[39]

In the summer of 1937, Leopold worked for the Forest Service, assisting biologist D.M. Gorsuch with the beginnings of "an investigative program on the Merriam

turkey" in the Southwest.[40] The budding wildlife biologist wrote enthusiastically about the project and what he was learning about "turkey country," turkeys themselves, and trapping procedures.[41] By now Leopold was using his hunting journal for more than just a description of bag count. He recorded more pertinent game related information and he also raised ecological questions. Before his work began with the Forest Service he spent a few days familiarizing himself with the Southwest and its flora and fauna. When he and his companion on the trip--his brother Luna--spotted many birds on ponds in the arid sagebrush country around Saguache, Colorado, Leopold wrote in his journal: "Principal observation--remarkable drawing power of water in semi-arid region."[42] And he could no longer fish without a "professional" observation: "Noticed little additional feeding toward evening," he reports when fishing near Vallecitos, New Mexico. "All feeding seemed to cease just before dark."[43]

After his first term at Berkeley, Leopold took what was to be one of the most important field trips of his life. For a month in the winter of 1937, he hunted in the Mexican wilderness of the Rio Gavilan area with his father, two of his father's friends and his father's brother, Carl. Leopold and his father chose to hunt only with bow and arrows, an avocation the whole family had

developed when Starker still lived at home. The trip was not memorable for a display of hunting prowess or for the quarry, however. In fact Leopold and his father had no luck with their bows and arrows. "Once more the deer have evaded our arrows," Leopold wrote in his journal, "and we took time as we rode along to try and analyze why we had failed and what to do next time. It's a great game."[44]

The arrows may have missed their target but the eyes of the hunters did not miss a thing. They appreciated the beauty of the wild country around them. Leopold expressed his appreciation in poetic terms. "While taking an evening walk below camp," he wrote on 3 January 1938, "I saw an otter. From a little cliff above the stream I watched him slide across a deep, still pool far below and then shoot a rapids to disappear around the bend."[45] Even predators, such as the wolf, did not escape Leopold's appreciation. "There are fresh wolf tracks on the trail down the river," he penned after an evening walk. "We wish they would give us a concert some evening."[46]

The trip was perhaps most important, however, for the role it played in Leopold's wilderness and wildlife ecology education. "[The trip] gave me my first real look at an honest-to-god wilderness, an ecosystem completely unaltered by any livestock or people," he commented forty-five years later. He was especially taken with the role fire played in keeping the land "healthy." "It began to

dawn on me that fire was a perfectly normal part of that sort of semi-arid country, and might even be an essential part of it."[47] His father, was also undergoing a conversion of sorts. Trained in the Forest Service, Aldo had been taught to perceive fire as an undesirable. Now he, too, began to ponder the idea that fire could be beneficial.[48]

Leopold was also struck by the natural and apparently beneficial role predators played in this healthy landscape. "There was a tremendous crop of deer," he remembered later, "but not too many because there was also a big crop of mountain lions and wolves, both of which were killing the deer."[49] In 1938 neither predators nor fire had yet found recognition as integral parts of natural ecosystems. It was significant that Leopold was questioning established theory and practice and suspecting that both fire and predators were essential to a healthy ecosystem.

Leopold returned to Berkeley in January 1938, determined to "go back and study this whole relationship: deer, lions, wolves, gramma grass, the whole thing." To his way of thinking the Rio Gavilan area seemed "like a fantastic place to go and see a real, honest-to-goodness virgin country and how everything worked together, including this whole business about fire."[50] Although it

would be ten years before he would return, and although much in both the Mexican wilderness and in Leopold would change by then, Leopold had started on a course of thought essential to his later science and policy studies.

Leopold returned to Berkeley, brimming with ideas, to resume his studies in zoology under Grinnell. His curriculum emphasized studies in vertebrate embryology, experimental zoology, heredity and evolution, general parasitology, comparative anatomy of vertebrates, and advanced vertebrate zoology.[51]

As his father had done before him, Leopold, in the summer of 1938, acquired Forest Service experience in the Southwest. He was toying with the idea of pursuing his turkey study in the Carson National Forest in New Mexico where his father had worked as a young man. While tending his forest lookout tower in Arizona, he kept a list of observed birds, studied German for his qualifying exams the following year, and composed a rough draft of the proposal for his study of the Merriam turkey.[52] He intended with his study to "learn as much as possible of the habits and life history of the Merriam wild turkey, and how the welfare of this species is affected by land use."[53] To pursue his project he would among other things return to the Upper Gavilan River in Mexico--the wilderness area that had so impressed him the year before--to compare game abundance, predator relations, and

food and cover preference data with the Carson Forest figures.[54] Study arrangements with the Carson National Forest did not materialize, however, and after his final year of course work at Berkeley, Leopold made plans to work for the Missouri State Conservation Commission on a project to reintroduce the wild turkey into the state.

In 1937 through the Federal Aid in Wildlife Restoration Act--better known as the Pittman-Robertson Act--money from an excise tax levied on the sales of sporting arms and ammunition became available for states to use for research projects in wildlife science.[55] According to Leopold, Missouri was one of the "first states to take advantage of this [act] and put together a really remarkable program of wildlife biology."[56] But before he left for Missouri, Leopold had to pass his Ph. D. qualifying exams and participate in a specimen collection mission to the Mojave Desert.

Leopold did not pass his first attempt at the exams in the Spring of 1939.[57] In particular he had to "demonstrate before the whole committee a better grounding in general botany, general zoology, and vertebrate zoology...[and] the evolutionary aspect" of the field "heredity and evolution."[58] Leopold expressed his frustration at not passing the exams the first time in a letter to one of his professors, E. Raymond Hall. "I was

disappointed," he wrote, "that I did not completely hurdle this barrier last spring, but next time I hope to be better prepared."[59] He was better prepared in April 1941, and passed his exams without a problem.

Between May 15th and June 7th 1939, Leopold accompanied University of California zoologist Alden H. Miller and fellow graduate students on a collecting expedition through the Mojave Desert.[60] Apparently Leopold was not keen on the idea of the collecting mission, but as he later concluded, he learned a great deal from the trip. "I cannot cease to express my enthusiasm for the valuable experience which all of us gained on the field trip this summer," he wrote to Miller when he arrived in Missouri. "Looking back now I can see that it is an essential part of the training of a field zoologist, and I must admit I underestimated the values to be gained until I was actually on the trip."[61]

In the middle of the trip, the collectors heard of Grinnell's death. "We were all stunned to hear of Dr. Grinnell's passing," Leopold wrote to Miller in June, "I personally am only thankful that I had the opportunity to know Dr. Grinnell before this untimely end to his teaching career."[62] Alden Miller took over as director of the Museum of Vertebrate Zoology and as chair of Leopold's graduate committee. Through the years that they worked together in the professional arena, Alden Miller and

Leopold would grow very close. When he finally finished his dissertation in Spring of 1944, Leopold wrote to Miller and thanked him for his support. "I shall always remember," he wrote, "...your patient guidance in nursing me through this long process. You have been very kind."[63]

In the summer of 1938, Leopold married Elizabeth Weiskotten, who was working at the time on a master of fine arts degree at Berkeley.[64] In June 1939, the Leopolds moved to West Plains, Missouri where Starker settled into his job as biologist with the state conservation commission. He was pleased from the beginning with the situation in Missouri. "I am most delighted with the game set-up here in Missouri," he wrote to Miller, "and feel that I could not have drawn up a more ideal situation than that in which I find myself today. Everyone in the Department is cooperative and most up to date in their outlook on game problems, and I shall have to hump some to catch up on botany, management techniques and current game literature."[65]

Leopold worked for the Commission for five years, from 1939 to 1944. His job was "in the field of experimental and demonstrational turkey and deer management." Most specifically he was assigned to improve "the management and administration of the state game

refuge system."[66] Essentially he saw his task--the reintroduction of deer and, especially, the wild turkey into Missouri--as an matter of public relations. As he explained the situation many years later:

> [T]he Ozark people--the people that had colonized and lived there--were mostly [of] English descent, really all related to Daniel Boone in one way or another, great hunters. And they'd killed all the deer out of the Ozarks. There wasn't a deer left except in one area down in Taney County, where there was a fenced, private enclosure. And they'd killed most all the turkeys. So the problem was one of public relations more than biology, really, to get the Ozark people interested in conservation and to work with us. They took delight in circumventing the game wardens. They just loved that. Nothing would be more fun than to kill a gobbler and then go in and brag about it, and nobody could arrest you.[67]

At a very early stage in his career, Leopold was showing both an ability to understand the human factor involved in wildlife management issues and an interest in working with such policy matters.

By the early twentieth century, the wild turkey (Meleagris gallopavo) had reached dangerously low population levels not only in Missouri but throughout its range. Originally abundant, the turkey was hunted and trapped for food in the eighteenth and nineteenth centuries "with heedless abandon."[68] The "clearing of land for agriculture, extensive logging, as well as...the introduction of a protozoan parasite common to the domestic chicken (called blackhead disease), [also] served

to sharply decrease wild turkey populations and their distribution."[69] Restrictions on hunting began as early as 1708, when New York prohibited the killing of turkeys between April 1 and August 1 in three counties.[70] These restrictions had minimal effect, however, until they were practiced and enforced more widely. Once the decline of the turkey was stemmed by means of legal limits on numbers of turkeys taken per season, restoration efforts began in several states. Restocking programs like early efforts in Missouri failed at first, however, because as it turned out most of the states--like Missouri--were restocking with game-farm strains of turkeys.

Leopold discovered that Missouri's restocking efforts were unsuccessful because the game-farm turkeys artificially propagated for release were ill-adapted for survival in the wild. As an alternative management strategy he advocated reintroducing wild turkeys--not domestic or hybrid turkeys--onto turkey refuges, such as the one in the Caney Mountain region of Missouri. As Leopold put it, on the refuges, he could practise "natural management" techniques, thereby "supplant[ing] the system of artificial propagation in use" at the time.[71]

While working on the project of reintroducing and managing wild turkeys, Leopold began to ask himself whether the hybrid birds were "really wild turkeys at all?"[72] He chose to address this issue and investigate

the essential differences between hybrid and wild turkeys in his dissertation. To accomplish this, he focussed on behavioral and physiological differences between the native birds reestablished on the Caney Mountain refuge and the hybrid birds propagated by the state in the Blue Spring area. He found for example that the gobbling behavior differed significantly. "The hybrid birds...started gobbling fully twenty days in advance of the native turkeys...and subsequently ceased gobbling when activity on the Caney Mtn. area was just reaching a peak. I presume that this discrepancy will hold throughout the latter stages of the reproductive cycle," he wrote to Miller. To Leopold this discrepancy meant a "clear cut case of alteration of the timing mechanism in the hybrid birds, which of course might have profound effects on the success of reproduction."[73]

Leopold also discovered that hybrid birds were very different physiologically from wild turkeys. To secure young wild birds, he had to steal the eggs from a wild turkey's nest--no easy task he discovered--then incubate them at a game farm and hatch, rear, and dissect the poults.[74] He was particularly interested in investigating the endocrine glands of the two strains--the wild and the hybrid--after "accidentally" stumbling upon the idea in a discussion with a physician about endocrine problems in

humans.[75] The results of the physiological "phase of the study" were "quite startling" to Leopold. He reported on his findings to Miller:

> Examination of the bar graph suggests very strongly that "wildness" in turkeys is associated with superior development of the endocrine and central nervous systems. In each organ examined the difference between the wild (Caney Mtn.) and domestic strains is clearly apparent, and the intermediate character of the game farm birds is of added interest. This correlates very nicely with observations on field behavior, and incidentally suggests a plausible explanation for the differential juvenile mortality among poults of different types.[76]

Leopold found sufficient data to substantiate the physiological and behavioral differences between the wild turkey, Meleagris gallopavo silvestris, and domestic or hybrid turkeys. He developed his ideas in his well-received dissertation "The Nature of Heritable Wildness in Turkeys." "It is concluded," he wrote, "that wildness and domesticity in turkeys are heritable, physiological complexes, which stem primarily from differences in the form and function of the nervous and endocrine systems in the individual birds."[77] Since the anatomical features he compared are "parts of the body control mechanism that controls behavior," Leopold could conclude that the anatomical differences he discovered were responsible for the differences observed in behavior.[78] He also found that "[t]he degree of wildness in heterozygous hybrid populations may be altered in a very few generations by

the influence of selective factors in the environment."[79]

Ever eager to emphasize the practical side of his work--an inclination he would develop throughout his career--Leopold argued that his study had both theoretical and practical importance.

> The problem is of practical importance in wild turkey management because the intermixing of the domestic strain with wild populations has had certain adverse effects upon the hardiness of the native turkeys of Missouri. It is of theoretical importance in offering an opportunity better to understand the nature of "wildness" in a locally adapted, indigenous race of birds.[80]

Even with his first scientific work, Leopold was showing that his interests lay on the management side of wildlife management. He was already opting for applied science in a field that was becoming ever more committed to pure science.

There are no records of what Leopold thought of Darwinian theory per se. But indications in his dissertation show that he was a practicing Darwinian--that he was a true student of Grinnell. For example, after connecting wildness--or its counterpart, domesticity--to heritable physiological complexes, he proceeded to argue that the resultant differences in behavior affected the "survival" of both young and adult turkeys. "[T]hese distinctions are therefore of adaptive significance," he wrote in his conclusion.[81] His writing, moreover, is replete with references to "survival" and "selection."[82]

He spoke of a "selective force" which favored either domesticity or wildness depending on the environmental demands placed on the bird. "All the evidence presented here," he concluded, "has suggested that wildness is strongly adaptive under natural conditions, and we can safely assume that as an inherited condition it is favored by the forces of selection."[83]

Leopold collected his data on the inherent wildness in turkeys while working for the state of Missouri on the turkey management issue. When his obligations to the commission were met in mid-July 1943, he moved his family--now with offspring--to Madison where he could live frugally with his parents while he wrote his dissertation. His parents' place was the ideal location to work on his thesis, he felt, because there he had "a situation conducive to steady work,...access to a library, and...[his] father's guidance."[84]

Leopold wrote his dissertation in the fall of 1943 and he successfully completed his thesis defense in April 1944, thus concluding an important phase in his life. Although faced with an unknown future, Leopold felt nothing but relief when his degree was in hand. "It is a wonderful feeling to have that degree behind me," he wrote to his mentor. "Not for years have I enjoyed such a feeling of inner contentment. I really was unaware of how

that unfinished business weighed on my mind during the past five years until the burden was removed. Now I sit down to read in the evening feeling as free as a school girl. It is a very satisfactory state of mind."[85]

In July 1944 the journal Condor, a magazine of western ornithology edited by Leopold's mentor, Alden Miller, published an article by Leopold, drawn from his dissertation, entitled "The nature of heritable wildness in turkeys."[86] Since its publication, this article has been cited by biologists in an extensive range of journals and texts.[87] According to Lovett E. Williams, author of The Book of the Wild Turkey, Leopold's "excellent study on the turkey's heritable wildness...said that the wildness inherited by turkeys enables them to live in their natural environment but that such wildness is a serious handicap to life in the captivity of man." "Research and management experience since then have repeatedly supported that concept," he concluded.[88]

Although it was generally very well received, Leopold's work on heritable wildness did find at least one critic in the person of an ex-student and soon-to-be colleague of Leopold's father, Joseph Hickey. Hickey, a writer and ornithologist from New York, corresponded with Leopold in June and July, 1944 about the behavioristic aspects of Leopold's work on turkeys. "Starker, I find the behavior discussions unbalanced and disappointing,"

Hickey began. "Your original premise is that wildness is an innate set of reactions; you leave no room for learning, and you ignore any and all possibilities that the responses of young turkeys can ever be conditioned." "Hereditary wildness could, I think, be safely recognized in very young birds," he continued, "under carefully controlled conditions."[89] Leopold countered this five-page diatribe--cloaked euphemistically in the garb of "constructive criticism"--with a terse one-page response in which he argued that contrary to Hickey's contention, he had employed carefully controlled conditions:

> I compared behavior in two genetic strains of birds existing as established populations under virtually identical conditions. The free-living hybrid stocks which I had under observation were several generations removed from their pen-reared ancestors. I followed them through 3 more generations. They had equal opportunity with the native birds to "acquire" wildness. Yet there remained certain differences in behavior. I ascribed these to the genetic differences between the strains.[90]

He ended his explanation with an implicit criticism of his own: "This procedure, Joe, is among the oldest and the most useful of experimental techniques in biology. I might add, facetiously, that the well rounded biologist should be familiar with it."[91]

Hickey, it turned out, was mostly bothered by Leopold's lack of "scientific writing."[92] Instead of reporting precisely how many times he had observed such-

and-such behavior, Leopold had merely described the behaviors observed. "What is disappointing to me," complained Hickey,

> is the bold way you describe the difference [in behavior between the hybrid and wild birds.] It was thus and so. The wild ones did this, the hybrids did that. This is not scientific writing as I now see it. It is a generalization given without proof. It contains no hint as to whether the observer took careful notes in the field, and to a critical reader it might just as well stand as something the author recollected as he was writing up his report. Now, Stark, this isn't meant to be personal. What I'm kicking against are the bald generalizations of naturalists from Wilson and Audubon down...Validity now rests more and more on a statistical basis.[93]

Like other life sciences, wildlife biology in the 1940s was under pressure to become a more rigorous discipline--a hard science. This, according to the likes of Hickey, meant leaving the realm of the naturalist behind and entering that of the statistician. The University of Chicago, where Hickey held a position, especially favored this change and the school was known as a proponent of rigorous quantitative analysis. Leopold's mentor, Miller, picked up on this part of Hickey's criticism. "[T]here seems to be some of the skepticism of the Chicago school represented that focuses on the naturalist," he wrote to Leopold in defense of the latter's position. "Somehow the reduction of data to figures as in counts of peck-dominance reactions seems, in

their minds, to surpass similarly careful observations of critical type made by a naturalist in the field."[94] Leopold took no heed of Hickey's criticism of his writing style and he never would belong to the group of wildlife biologists calling for rigorous quantitative analysis to replace factual descriptive writing.

The fall of 1943 turned out to be the last opportunity for Leopold to spend an extended period of time with his father.[95] While working on his dissertation, Leopold took each weekend to hunt with his dad. They usually would use "the shack"--the chicken-coop-turned-cabin Aldo and his family had bought in 1935 in the sandy country close to Baraboo, Wisconsin--as base. Leopold could now converse with his father about wildlife matters on an equal basis. On one hunting trip, after a day of rain and few game sightings and after returning two of Aldo's hunting friends, Philo Buck and Ray Roark, to Madison, Leopold and his father took the opportunity to share ideas on wildlife biology. "Dad and I drove [Ray and Philo] in," Leopold wrote in his diary, "and had dinner in town, returning to camp to sit by the fire and speculate long and seriously about game cycles before turning in."[96]

While in Missouri Leopold became involved in another project directly related to his week-end hunting excursions. He loved to hunt quail, and went out just

about every weekend during the hunting season to satisfy his sporting urge. "This afternoon the weather looked pretty mean," he penned one gloomy Saturday in November 1942, "but being Saturday I felt obliged to chase the quail around a little."[97] By keeping exact track of his and accompanying hunters' kill from each of these hunting excursions between 1938 and 1941, he began to notice trends in the data collected. "This is a very much higher percentage of immature birds than the average for the Ozark region this year, indicating a good crop of young last spring in this locality," he noted on the last day of bird season (31 December) in 1941.[98] Aware now of differences in sex and age ratio of the quail killed, he began to question the cause of such differences. "What factors determine such local differences in reproductive success in any given season, I cannot say," he wrote in 1941.[99] While unable at that time to determine the cause of the differences noted in reproductive success, he decided to continue work on the project.

In 1942 he composed a memorandum to his father, Alden Miller and Rudolf Bennitt, Leopold's supervisor at the Missouri Commission, in which he tabulated and discussed his data on bobwhite quail sex and age ratios. He assumed in his discussion that "[h]unting success, indicated by [the] figure `Birds per gun hour,' is probably more or

less closely correlated with quail density."[100] In short, he accepted the idea that a hunter's bag count accurately sampled a quail population, an issue which would be later taken up by a critic of the study. Proceeding from that premise Leopold hypothesized that differentials in the age and sex ratios of quail killed reflected actual differences in the regional populations. He started to define reasons for the differences. "It is worthy of note, I think," he speculated to Miller, Bennitt and his father,

> that among immature birds the sex ratio always approximates 50-50, whereas among the adults the cocks always considerably outnumber the hens. This probably means that the hens run a much greater risk during the breeding season than the cocks, or that they suffer higher winter mortality (less likely), or perhaps both.[101]

Leopold realized that his "material [was] too scant to mean a great deal" at that point. But as he wrote in the memo, "I am by now thoroughly convinced that this little study has possibilities, and I intend to stay with it, and to obtain larger samples of birds in the future."[102] Leopold continued to hunt quail on the weekends, in the evenings and during any free time, and he continued to collect and interpret his data. He even began to apply his theory to other species. "Of the nine birds, only 2 were squabs," he jotted in his diary after a hot, September dove hunt in 1942. "Most of them were adult males. Is this another instance of sexual

segregation?"[103]

Early in 1944, Leopold sent out to his father and other wildlife specialists copies of a paper he intended to publish on "Sex and Age Ratios among Bobwhites in the Missouri Ozarks."[104] The paper compiled the data on the age and sex of thousands of quail killed by Leopold and other Missouri hunters between 1939 and 1943. Citing the classic study of bobwhite quail by Herbert Stoddard, a colleague and friend of Leopold's father and a pioneer in wildlife management working in the 1920s and 1930s for the Biological Survey (a precursor to the Fish and Wildlife Service) and the work of John T. Emlen on the California quail, Leopold again took as premise that hunters' bags accurately sampled sex and age groups.[105] "The present samples are...assumed to reflect the actual sex and age composition of the quail populations during the hunting periods," he wrote.[106]

M. O. Steen, a federal aid inspector for the United States Fish and Wildlife Service in Minneapolis, took issue with Leopold's assumption that bag count reflected population status. "I note your reference to Emlen and his conclusions that hunters' bags accurately sample sex and age groups in California quail," Steen wrote to Leopold in May 1944. "This may have been Emlen's experience, but it has <u>not</u> been my experience...."[107] Steen thought that for bag count to reflect actual

population statistics, the "average" quail hen would have to successfully raise eight young per season. "We know that quail broods are large," he conceded to Leopold, "but even so, an average of 8 young per breeding pair seems a bit high to me."[108] Leopold was not moved by Steen's point. "I still retain my faith in the reproductive ability of the "average" hen quail," Leopold retorted, "in other words, I am not conceding you the major point in our argument."[109]

After three heated--but friendly--exchanges of letters, Leopold and Steen could not resolve the matter. "You can, of course, only write about what you find, and I can only tell you what my experience has been," Steen concluded. "We could carry this discussion on indefinitely, but if I were writing the paper you have in mind, I would be inclined to soft-pedal any statements to the effect that the hunter's bag is an accurate reflection of the actual age-ratios that exist in the field." Steen then laid the holy cloak of experience around his conclusions when he told Leopold: "Twenty-five years of experience with upland game has led me to the inescapable conclusion that there are some things about this subject that need further study and clarification."[110] The younger and less experienced Leopold was not to be moved by Steen's plea for respect clothed in his claim on

experience. "It is evident that we are not settling the matter," he agreed with Steen. "With each exchange of letters, we have raised more questions than we answered." The young biologist's confidence shone through his respectful acknowledgement of Steen's position when he concluded: "The discussion has been most stimulating--I have enjoyed every bit of it. We should indulge in this sort of foolishness much more often."[111]

Later that summer, Leopold had another--this time more lighthearted--exchange with a more experienced biologist. Ben Glading of the California Fish and Game Department, who had also read Leopold's quail paper, did not agree with Leopold's way of reporting his data. Leopold had used percentages to illustrate his sex and age ratios. Glading thought this manner of reporting data less illustrative and thus less useful, than using ratios. When he said as much to Leopold and Leopold refused to budge, Glading returned the volley with a ball Leopold could not handle. "I was about to bow my head in shame at the reactionary display of my Missouri colleague and observe, "Well, if he wants to be stuffy---," when I made a discovery," Glading wrote good-naturedly to Leopold.

> Coming across the Bay in the train...I turned to that oft neglected page, the back cover [of the Journal of Wildlife Management]. Lo and behold, under "Suggestions to Authors" I saw a statement which gave me a beller that shook the Bay Bridge. The statement? "Give sex ratios in the standard form of males : 100 females for ready comparison,

> and not as percentages." Need I say more? Why sure...If you read that one population is 75% young and another is 90% young, your mind goes back to when you were in knee pants and got similar grades on your history exams...My point is that while you apparently simplify your data by putting it in a standard, well used form (percentages), you are actually making it more obscure, in that percentages, while they are mathematically the same as ratios, are not usually used to express the relation between two things. Knee pants: you got 90%. Did you say I was 9 parts right, 1 part wrong? I'll take one free beer at our next meeting in full payment for converting your reactionary, fuzzy, obscure knee pants percentages to the lucid, graphic form recommended by Emlen, Glading, and the Journal of Wildlife Management.[112]

Leopold could conceal neither his capitulation to Glading's point, nor his delight with Glading's humorous approach. "Your recent letter is a classic," he responded to Glading. "I shall preserve it for posterity. I suppose I should feel a deep humility, but somehow my whole reaction has been one of delight."[113] While Leopold did not change his percentages to ratios because he was "trying to analyze the interrelationships between sex and age ratios in a population composed of four sex and age groups" and for his purposes percentages were less confusing, he was persuaded by Glading's argument.

In this fashion Leopold responded with confidence and poise to the critics of his work on the bobwhite quail. The criticism flowing from his father's pen was mostly editorial in nature. Aldo was an excellent writer and a rather heavy handed editor. His changes either

strengthened or clarified a point Starker was trying to make. "This is one of those...papers which one can sweat over for weeks after it is 90% OK," father wrote to son after marking up his copy with red and filling three legal-sized pages with notes. "I am not at all sure my comments are all valid...I didn't mean to write the paper for you but had to illustrate to make my point clear."[114]

Leopold incorporated his father's changes and those substantive ones from other outside readers that he felt were useful, and sent his paper off to the Journal of Wildlife Management for consideration. In January 1945 his "little study" based on his weekend hunting results was published.[115] The paper is a prime example of how successfully Leopold could blend the two sides of his character. In this study as in most of his future scientific work, the passion of the hunter was combined with the skill of the biologist. The paper also marked the successful passage of the apprenticeship phase of Leopold's career. He showed that he could now correspond with, and afford to dispute, established wildlife biologists. He was now "one of them."

The second world war interfered minimally with Leopold's work in Missouri and with his studies. He hoped to stave off serving in the military until he finished his thesis, as he mentioned to Miller in a letter on 12

October 1943: "So far I have not been threatened with induction into the Army, but I expect to hear from my local draft board sooner or later. When I am called I am going to use every possible influence to be given deferment until this thesis is done; after that I won't mind entering at all."[116]

He did manage to postpone work with the armed services until he had completed his thesis and he faced more than a few options for employment once he was finished. He could have returned to work on the Missouri State Conservation Commission and there was talk of a teaching position at the University of Missouri.[117] He was more interested, however, in serving with the navy "in a specialized activity." He had heard of a "plan afoot...to teach all naval Pre-Flight Cadets something about `living off the land,' in anticipation of forced landings on uninhabited shores." He described the project enthusiastically to Miller and in passing referred to two brothers who would surface later in Leopold's career in the midst of a controversy regarding grizzly bears: "Two graduates from the Michigan School of Forestry and Conservation by the name of Craighead (twin brothers) have been busy for some time preparing a manual as a text for teaching this subject. Sometime in the fall they will assemble a staff, and I have already filed an application for one of the positions...."[118]

When this possibility fell through, because of "health reasons"--he had "violent allergies to ragweed"[119]--he found a position as director of Field Research with the Conservation Section of the Pan American Union in Mexico. He was enthusiastic about the position at first, as he told Miller: "Naturally, I will find it more interesting [than a commission with the navy] and in a sense it is as great a contribution to the national welfare as I could make running a landing barge. At least my training will be put to use."[120] To Ben Glading of the Department of Fish and Game in San Francisco, he expressed his delight with the Mexican project as follows: "I'm not going into the Navy after all, Ben, but am embarking on a very interesting new venture. Next week I am moving to Mexico city to begin a survey of the wildlife resources of Mexico...It really sounds like a swell set-up...."[121]

In the beginning, Leopold considered his position an "enviable one." His assignment was to survey in two years time the wildlife resources of Mexico and to prepare a "comprehensive (though necessarily general) report of the status of important game species in Mexico with recommendations for a future program of management and protection."[122] He worked under an acquaintance of his father, Bill Vogt, an ornithologist and editor of Bird Lore, who "spent the war years in Latin America as chief

of the conservation Section of the twenty-one nation Pan American Union...survey[ing] the natural resources and wartime social conditions across Latin America."[123] Vogt was seriously distressed by resource degradation, poverty, unabating population growth and unresponsiveness of the governing bodies which he observed during the war years and he was well on his way to becoming the impassioned conservationist of his book Road to Survival (1948).[124]

Vogt's mounting concern for conservationist issues--especially soil erosion--interfered with the clarity of Leopold's project as he perceived it. "Bill is obsessed with the idea that Latin America is all eroding away into the sea (which it definitely is) and that not a moment should be lost in bringing this message to the attention of the various authorities in each country," he lamented to his father in April 1945. "I agree wholeheartedly," he continued, "But since Bill's job is to propagandize this fact he has lost interest in technical work as such but thinks of all studies and projects (including mine) in terms of their `advertising value.'"[125] Vogt wanted Leopold to prepare a report in Spanish--"the longer the better"--to convince the commission furnishing the Mexican funds of the value of the project.[126] Leopold was not enthusiastic about the report, which he considered both not part of his job and something for which he was not qualified. "Well I'm no

damned fool," he wrote to his father,

> and I can grasp the value of that sort of thing for purposes of education and propaganda but that's not what I came down here to do. Getting together the simple facts about their game resources is in itself a staggering task for two years and I have lost sleep worrying about how it could be done. Now my time is being hacked up by reports that I don't feel ready to write by any means. Really Dad, there are periods of days on end when I feel like a mouse in a maze--I don't know whether I'm coming or going.[127]

When Vogt suggested a way to remedy Leopold's predicament--for Leopold to continue on the project after the two year stint was finished--Leopold "told him outright Hell no, that two years under this goddam organization was more that enough for me."[128]

What upset Leopold most about the project was the feeling of an opportunity being wasted. He felt stymied in his efforts to accomplish something worthwhile. "This turned out to be quite an assignment as you may have gathered from some of my gloomier letters to Dad," he wrote to Bob McCabe, an associate of his father in Wisconsin. Then in language reflecting Leopold's facility with words, he declared:

> It really makes you writhe to have such a glorious opportunity for original work dangled in front of you and then be stymied over and over again in trying to get rolling on the job. My principal occupation is a game of hide and seek with OPPORTUNITY, who hides cleverly behind 8-balls and under great stacks of official documents. Now and then on moonlit nights I see her clearly and she is a beauty, but when I make a pass she leaps

> behind an expired permit and there I am trapped again in Mexico City for another week. It is a great chase though, but leaves me with a most profound sympathy for such unfortunates as the half-back without any blockers, the pitcher whose infield is shot to hell, etc. I don't mean to give the impression that the project is a total loss--it will get done and be duly reported, but it will be a sketchy job whereas it could have been a barn-burner.[129]

Leopold persevered and worked for two years collecting essential field data on Mexican birds and game for the report he was obligated to prepare and for the book he planned to write. "As I see it, the book that is needed here most is a simple (but absolutely accurate and authoritative) volume listing all the game species under their proper names, giving the distribution of each, something on food habits and life history, and ecologic status in relation to land use. It should have colored plates of all important species so that it may serve as a guide and handbook, for game wardens as well as hunters. Two of three chapters should be devoted to land use in general and conservation of game along with forests, soils, etc."[130]

Leopold thoroughly enjoyed the field work for the project, which often consisted of month-long treks into the Mexican backcountry. The beauty of the surrounding land never ceased to amaze him. "[B]oyohboy what wonderful country there is scattered around down here," he wrote enthusiastically to his Wisconsin-bound readers.

"Some of the mountain regions in particular are enough to make your mouth water."[131] He was tremendously excited by the opportunity to document what he felt was scientifically untrammeled country and his observational skills were finely honed by the challenges of unknown territory. "Our last camp after we left Monterey was one of the most interesting we have had," he wrote to Miller in August 1945, shortly after VJ day. "It was in the Sierra de Tamalpais...Two entirely distinct floras and their associated faunas are thrown together here--never mixed, but occurring in juxtaposition."[132]

As he had always done in the past and would continue to do in the future, Leopold combined in Mexico his love for hunting with his professional work as a naturalist. "That area in San Luis is a honey," he wrote to Bob McCabe in March 1946, as his work in the field was winding down. "I had visited it before but was skunked on the turkeys so I naturally felt impelled to give it another whirl. Dad's brother Carl and I got four turkeys in four days--they're a cinch at this time of year."[133] On another trip into the desert with friends, Leopold bagged a deer. "This little animal, which is classified as Odocoilius virginianus just like a real deer, it reminds you more of a plump jack-rabbit. Since I was after carne and not trophies I selected a yearling doe and rolled her end over

end like a bunny rabbit with a load of 2's from the old 20 ga. She weighed 31 lbs. dressed, perhaps 36 lbs. whole. Some beast, verdad? But damn fine eating."[134]

After two years in the field "free of office work" Leopold wanted to spend six to eight months at an American university writing the report he envisioned materializing from his Mexican experience. He and Vogt were looking into the prospect of arranging an appointment with the University of Michigan when Alden Miller of the University of California enticed Leopold back to his old stomping grounds in Berkeley.[135] Leopold was not only looking for a place to write up the results of his two-year research project, he was also looking for "an institution where I will later be retained."[136] Initially Miller offered Leopold the "honorary designation" of research associate at the Museum of Vertebrate Zoology along with additional research perquisites if Leopold would let the museum sponsor his project.[137] In November 1945, however, Miller wrote to Leopold "purely informally" about the possibility of an instructorship in wildlife conservation or management with the Museum of Vertebrate Zoology at the University of California. "The position," Miller wrote to Leopold, "would be intended to serve the obviously very considerable group of students in this field which we will have as we get farther into the post-war period."[138] Miller was correct in anticipating an influx of students

in wildlife management programs after the war. Many students took advantage of the opportunities offered by the G. I. Bill to study the relatively new discipline, Wildlife Management.[139]

At the time Berkeley had no specialist in wildlife conservation science and Miller, as director of the Museum of Vertebrate Zoology, sought to establish a position in the museum to develop the field more fully. Leopold would be hired to develop special courses at the graduate level in Wildlife Management and to provide "leadership in research and public relations in this field for the Museum."[140] Leopold's ideas on how to develop the university's curriculum in "Wild Life Conservation" must have impressed Miller. In April 1945, he had written the following to Miller about the museum's program:

> Your undergraduate curriculum in Wild Life Conservation is one of the soundest I have seen. My only suggestion to strengthen it would be a little rounding out in the practical aspects of conservation, <u>not</u> in the form of a string of "technique" courses but in contact of some sort with the administrative field. Perhaps one senior course with plenty of off-campus trips to study the functioning of the Fish and Game Department and some of the federal bureaus would do it. A demonstration area might be developed in cooperation with the Agriculture and Forestry groups where students could study a piece of land that is actually under intensive management. I am rather strong on this type of training but maybe it is more appropriately reserved for graduate work.[141]

If Leopold was "strong on this type" of practical training

as he was beginning his teaching career, he would continue to emphasize practical training in wildlife education throughout his career as a professor. Furthermore he would show himself to be "strong" on this type of practically-minded research as he developed his reputation throughout the 1950s and 1960s in the wildlife conservation field.

In April 1946, Leopold received word that he was awarded a Guggenheim Fellowship for a project "on the gallinaceous game birds in Mexico from the point of view of wildlife preservation."[142] Leopold expressed his pleasure to Miller in a letter of gratitude for the recommendation Miller made to the Guggenheim committee. "Of course I am very happy to have the grant," he wrote, "and let me take this occasion to thank you for your letter of recommendation which I am sure had an influence on the decision of the committee."[143] Miller was thrilled with Leopold's fellowship. "This is a nice feather in your cap and a very pleasant thing for the University. You see, in my own mind I already count you a member of our group," he responded to Leopold's letter of gratitude.[144] Leopold did not immediately publish the book for which he received the fellowship, but in 1959 when the study which incorporated his Mexican research, his Wildlife of Mexico: The Game Birds and Mammals,

appeared, it won the Wildlife Society award for best wildlife publication of the year.[145]

After two years on a difficult yet exciting project, Leopold left Mexico for Berkeley with mixed feelings. "I have only one trip left before we move back to Berkeley," he wrote to McCabe. "Then begins the old grind of library work and preparing my report. But by way of a change that will be fun too, though there will doubtless be days when I'll yearn for the clear air of Mexico and a beltful of shotgun shells."[146] He returned to Berkeley for the rest of his life--a busy life professionally, but one in which he always managed to combine his love for hunting with his expertise as a wildlife biologist.

CHAPTER 1 ENDNOTES

1 Curt Meine, Aldo Leopold: His Life and Work (Madison: University of Wisconsin Press, 1988), 128.

2 Ibid.

3 As quoted in Meine, 129.

4 Meine, 103-31.

5 Ibid., 157.

6 Ibid., 133.

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CHAPTER 2

ENTERING THE FRAY: STARKER LEOPOLD AND THE WILDLIFE MANAGEMENT CONTROVERSIES OF THE 1950S

Throughout the late 1940s and 1950s Starker Leopold was involved with numerous scientific projects which directly tested the wildlife management principles of the past. The role he played in testing these scientific principles, however, was becoming more political and less scientific. He was clearly in the process of choosing the public policy arena above the scientific laboratory. By the early 1960s his choice would be made. But the work that he accomplished in the fourteen years between 1948 and 1962 would help place him squarely in the political arena. A few of the controversies in which he became embroiled in the 1950s stand out as most important: questions of deer management, the role played by fire and predators in a healthy ecosystem, and the question of wilderness preservation.

What helped transform Leopold from a wildlife biologist with a practical bent into a prominent political figure was his expertise in what one observer called "human affairs" and his ability to synthesize scientific ideas and then translate them into political and lay terms.[1] Leopold's supervisor recognized these traits and emphasized them when he argued for Leopold's promotion. A

few years after his arrival in Berkeley, Leopold was promoted from an adjunct position with the Museum of Vertebrate Zoology to assistant professor. He was again promoted in 1952,this time to associate professor of zoology. Alden Miller, director of the Museum of Vertebrate Zoology and Leopold's supervisor, wrote a letter recommending promotion, in which he argued that Leopold's strengths lay not only--or necessarily--in the area of biological research. An able biologist, Leopold was also an expert in, what Miller referred to as, "human affairs." "Dr. Leopold," Miller wrote,

> is an expert in wildlife conservation and management teaching three courses in this field, supervising the Wildlife Conservation curriculum of the College of Letters and Sciences, and engaging in the public service and wildlife consultative work of the Museum on a year-round (11 months) basis. These functions demand, in our view, a thorough grounding in the basic sciences of zoology and botany, especially the ecologic aspects, and a talent for understanding and taking part in the affairs of human society. In short, a man in this field must be not only a sound biologist, but also to a degree, an economist and political scientist, with a practical bent. We believe that Dr. Leopold successfully combines these qualities as do few other persons in this country. It is certain that most of his colleagues in biology do not have his ability to translate their biological findings into action in human affairs. Such dual capacity should be measured in judging the man, and not solely his biological work, important as that may be.[2]

When in 1957, Leopold was again up for promotion--this time to professor of zoology and conservation--Miller again stressed Leopold's practical

skills. "He is not only a sound biologist," he wrote, "but he combines this capability, as few do or can, with practical application of his knowledge to the political and economic affairs of man. His competence and attainments should be viewed in this context."[3] As is clear from all indications, Miller and Leopold got along very well and in 1958 Leopold was made assistant director of the Museum of Vertebrate Zoology.[4]

Early in the decade Leopold had been tempted to leave Berkeley because of, what he referred to as, "inadequate financial arrangements."[5] When Dr. Joseph Linduska of the U.S. Fish and Wildlife Service approached Leopold for a position with the government as Assistant Chief of Management, Leopold had at first appeared interested. He later withdrew his "hat from the ring of candidates" for several reasons. He preferred the intellectual freedom of academic life to being "part of a government machine where some, at least, of your thinking is done for you," and while he recognized that he had "some administrative ability," he chose to remain in the field--literally--where wildlife investigation was actually done.[6] Leopold, moreover, had received "strong indication" the financial problem he had complained of earlier would be addressed "in the near future."[7] It was not going to be easy to draw Leopold away from Berkeley as

Linduska recognized. The promise of a salary increase would not do it; neither would the prospect of bureaucratic power.[8] Leopold liked academic life, field work and living in the west. Once a mid-westerner transplanted to the West, Leopold by 1952 had sunk strong roots in his new home and he was not eager to leave.[9] He had become a westerner.

Leopold's tenure at Berkeley began well and he quickly settled into a routine of teaching and wildlife work which would occupy him for the rest of his days. In the spring of 1947, Leopold presented his first paper at the North American Wildlife Conference. He took the material for his paper "Status of Mexican Big-game Herds" from research done while in Mexico.[10]

In March 1948 he again presented a paper at the North American Wildlife Conference in St. Louis.[11] He made a detour at that time to visit his parents in Madison where his father was suffering from "eye trouble."[12] Father and son made plans to hunt grouse together that fall, an event which would not come to pass, however, as Aldo died in April from a heart attack suffered while fighting a fire on a neighbor's property.[13] The death was a terrible blow to Starker. He had lost not only his father, but his first mentor and teacher. While it could never soften the blow, it meant a great deal to the younger Leopold to inherit his father's library, a large collection of

classic books on wildlife biology and conservation.[14] The torch was passed. Now it was up to the younger Leopold to carry it forward.[15]

Soon after his father's death, Leopold took a trip that would provide him with food for thought for the work he was to accomplish throughout the 1950s and into the 1960s. In the summer of 1948, Leopold returned to the Mexican wilderness of the Rio Gavilan area with Bob McCabe, his father's colleague from the University of Wisconsin and Alden Miller and Ward Russell of the Museum of Vertebrate Zoology. Expecting to find wilderness, Leopold and his colleagues found that "'progress' had arrived with a vengeance."[16] They had planned to collect specimens and "initiate some long-term studies of the native fauna under virgin conditions." But instead they found lumber trucks, new roads and grazing stock. "We knew then that instead of initiating an era of renewed acquaintance with the wilderness, we had come to witness its passing," Leopold wrote in a piece for the popular journal Pacific Discovery. As it turned out, they were able to collect some specimens--"[a]ll told we collected over 900 specimens of vertebrates," Leopold wrote--but more importantly they were led to speculate on areas of particular concern to Leopold.[17] As part of the mental baggage Leopold took home with him were several questions

he would work on for decades.

The first question concerned the need to preserve wilderness. "Must there be a cow on every hill," he asked, and "a road in every valley?"[18] The Rio Gavilan encounter with vanishing wildness brought him face to face with the issue of wilderness. To what extent, he wanted to know, was wilderness essential to society?

> Though I lament the passing of the wilderness, I mean to pick no quarrel with civilization as a whole; automobiles, modern houses, and beef-steaks are as much appreciated by me as by anyone else. I question merely its universal spread. The Gavilan can offer little to the "good life." It will produce some beef and some lumber and then probably be left stripped and gutted to its basaltic core. Might it not have yielded more the way it was?[19]

He left the 1940s with this question about wilderness--a question he would try to answer in the ensuing decades.

The second area of interest for Leopold was the predator-prey relationship. Just how much should predators be controlled? Was there "a natural balance between predator and prey"?[20] He would write and think a great deal more about these issues--wilderness and predators--later in the 1950s and throughout the 1960s. But with his popular piece for Pacific Discovery, he had let it be known that he was entering the fray.

Perhaps the most pressing issue for Leopold when he returned to Berkeley was the question of deer management. In the Gavilan he had witnessed the last remnants of a

healthy relationship between deer and their environment and he could contrast this situation with that of California, where deer populations were not in a healthy balance with available food resources.[21] Irruptions--unhealthy increases--in deer populations were imminent if not already occurring.

Deer Management in California

Leopold had been involved with deer research in California, specifically with the Fish and Game Department, since 1947. After prodding the department to become more involved with deer research "before the incidence of irruptions [became] critical," Leopold was given the task of directing all deer research in California.[22] In later reminiscences, Leopold called the deer management project a "hot item." Because of the controversy surrounding deer management research, he recalled in 1983, "the Department of Fish and Game pawned it [the research] off on us on a contract."[23] Leopold's job in 1947 was clearly defined as he saw it and described it to his father. "I will hire the men and assume responsibility for the final result," he wrote. He envisioned two projects: one "an intensive local study of a single irruptive deer herd;" the other, a more extensive

study over the whole state whereby more general data would be compiled "with the idea of anticipating where other irruptions [were] liable to develop."[24] Leopold had the four men who would collect the data over a period of three years, but he needed help finding a project director. "All four of these men will be answerable to the project head, and I sit up here and run the whole works. Now all I lack is that project director. Can you give me any help?," he asked his father.[25]

Leopold did not only want his father's help when it came to choosing a project leader. The younger Leopold felt strongly and intuitively about the deer management problem in California, but he also recognized that he lacked both experience and knowledge. In the 1930s and 1940s, Aldo had been "caught up in a deer management controversy" in Wisconsin. According to one historian of the family, he "was called `Bambi killer' and worse by Wisconsin hunters because of his efforts to have the state conservation commission...permit controlled shooting of does and thus reduce the deer herd to a sustainable level."[26] "I have had so little deer experience and you and your boys have had so much that I turn immediately to you for advice on the whole problem--not just finding a man," he wrote. "Sometime within a year or so I hope you will get to California so that we can look this over out in the woods together."[27] Aldo would not get out to

California before he died in 1948, and as it turned out Leopold could manage well without his father's assistance. With the help of Raymond F. Dasmann, one of Starker's graduate students, Thain Riney, Randal McCain, William M. Longhurst, and L. Tevis, Jr.--all capable wildlife biologists--Leopold headed up a well-respected project that would influence deer management in particular and wildlife management in general for the foreseeable future.[28]

Leopold viewed the deer management problem in ecological terms. "Since deer populations may be influenced for better or for worse by almost all other uses to which forest lands are put, the game manager of necessity must understand the ecology of the forest as a whole," he wrote in a paper presented at the United Nations Scientific Conference on the Conservation and Utilization of Resources in August 1949, a conference at which Leopold's father had been invited to present a paper.[29] According to Leopold, deer populations appeared to "thrive best in the sub-climax stages of vegetational succession which follow such land disturbances as cultivation, logging, fire or grazing" and appeared to decrease "as climax vegetation is restored."[30] "Thus," he wrote, "the second-growth following logging or fire in coniferous forests generally supports much denser

populations of both small and large game than did the virgin forest."[31] Because in California so much of the climax vegetation was being replaced with sub-climax types as logging and grazing occurred, deer populations were increasing. Deer irruptions--increases in numbers "beyond the stage of moderate or balanced range use"--were occurring, according to Leopold, because not enough of the deer were being harvested.[32] "A deer irruption often follows insufficient harvest of the deer during the upswing of a successional cycle," he continued in his paper.

> Excessive use of the forage by too many deer may stimulate the browse plants to produce more and more sprouts, temporarily raising the volume and nutritive quality of the forage to an abnormal level but ultimately causing physiological exhaustion and even death of the plants. During irruptive peaks, fawn production and fawn survival often remain high, which would indicate adequate nutrition for the does. But when the volume of food falls off because of overbrowsing, or when the food is rendered temporarily unavailable by deep snow, the deer herd is left literally in excess of its food supply. At this point the herd inevitably suffers mortality--sometimes wholesale starvation, at other times gradual decrease following lowered reproductive success.[33]

The first recorded deer irruption occurred on the Kaibab Plateau in Arizona in the 1920s. While some accounts consider the increase in deer numbers which occurred on the Kaibab to have been a normal population fluctuation, most wildlife biologists have called the Kaibab situation irruptive.[34] According to these latter

accounts, the mule deer population of the Kaibab Forest profited greatly from the removal of its predators--wolves and mountain lions--and protection from shooting. The unrestrained population exploded from 4000 in 1905 to 100,000 in 1924. Its food supply could not keep pace, leaving the herd completely unprepared for harsh conditions. All that game managers at the time could do was sit and watch as sixty percent of the herd starved to death in two winters. The population declined from its boom state of 100,000 in 1924 to 10,000 by 1940.[35] The cause of the problem according to most accounts was rooted in management. The herd had been overprotected initially and then left to self-destruct as it sought a renewed balance with its environment.

The deer irruptions which Leopold observed in California in the 1940s and early 1950s were also the result of poor management. "Chronic undershooting, often coupled with unnecessary predator control, has permitted countless local irruptions of varying degrees of severity--an unexcusable waste of game and range resources as well," Leopold concluded in his paper for the United Nations Conference.[36] He blamed the buck law especially.

> During the game "restoration" era of the recent past, most deer states adopted legislation permitting only bucks to be killed; yet it is impossible to regulate deer numbers unless some females can be harvested as well. Under the buck law, yields will vary from 2 to 10 per cent of the

> herd per year, whereas annual production in a healthy herd on good range is usually 20 to 25 per cent.[37]

Just as the problem with irruptions lay with wildlife and range management, Leopold saw the remedy for irruptions as also having a management solution. "The most immediate objective in the field of American deer management is to work out more flexible hunting regulations so that the full annual crop can be harvested," he wrote.[38] Besides advocating changes in the "legal machinery" which would allow for full harvesting of the annual deer "crop," Leopold also recommended "[d]eliberately and purposefully manipulat[ing] plant successions to maintain high range capacities for deer." Such land-clearing activities as "controlled burning, chemical plant poisoning or mechanical brushcutting, [would] stimulate deer food production on critical sites not adapted to timber production."[39] Thus at this stage of Leopold's career he was advocating active and intensive habitat management to produce maximum wildlife populations. "[O]nly by such intensive and deliberate ecological controls can the maximum potential crop of deer be produced on forest lands," he stipulated at the conclusion of his paper in 1949.[40] Leopold and other wildlife biologists would modify their outlook on producing maximum populations of game to producing optimum populations--a concept which

implied more concern for "other animals in the community" and other "needs of society"--but this conceptual change would have to wait twenty years or so.[41]

In November 1948 Leopold published the "Preliminary report on the problems of deer management in California," a report based on the data and conclusions of Randal McCain and William M. Longhurst, and in 1951 and 1953 the deer project, under Leopold's leadership and authority, produced the two well-known reports on deer management, entitled respectively "The Jawbone deer herd" and "A survey of California deer herds, their ranges and management problems."[42]

Because Leopold had not collected the data for the reports, but was largely responsible for writing up the results and for conceptualizing the ecological and management issues, there was some disagreement with respect to the reports' final versions. Randal McCain, for example, wrote to Leopold after carefully going over the Jawbone report. While "well pleased with the report as a whole," McCain took issue with parts of Leopold's analysis. In particular he was bothered by "speculations not warranted by the data at hand."[43] "I am unable to support your contention that there is some mysterious factor at work in a hunted herd that is not present in the unhunted herd," he wrote to Leopold in December 1950.

This sort of speculation, however interesting,

> detracts from the remainder of the report...I see no harm in stating that the hunted herds almost universally showed the best fawn survival, but your attempt to promote the theory of inversity in deer with the data at hand leaves me more than cold.[44]

Leopold carefully considered the points made by his staff of biologists and checked off those suggestions he decided to take. But he took little notice of McCain's criticism. He was drawn to the notion of "inversity in deer"--whereby a hunted population increases in size because of the concomitant increase in birth rate and decrease in death rate which result from a decreased competition for resources--and was disinclined to be bothered by the lack of evidence to prove the notion.[45] It is now an accepted concept in wildlife biology, according to biologist William Robinson, that "harvesting reduces the population size, but this reduction results in an increase in the growth rate of the population."[46] And while the data Leopold was provided with may not have directly implied this rule, his intuition about the concept's validity was accurate.

In the second paper on the deer management issue, "A survey of California deer herds, their ranges and management problems," Leopold repeated his conclusion that deer ranges in California were overstocked. In the report's summary, he recommended that "[r]egulations and management tools appropriate to the past...be re-evaluated

and discarded or supplanted by techniques designed to meet present needs, which are: To harvest a maximum annual crop of deer from existing breeding populations; and, to preserve and improve the ranges with a view to supporting the largest possible breeding population in future years."[47] The management solutions Leopold offered were similar to those he presented at the United Nations conference: managing the land more in keeping with sub-climax vegetative growth through "[c]ontrolled burning and reseeding in chaparral, regulated livestock grazing..., regulated logging..., and other special procedures...useful in increasing range capacity for deer without undue sacrifice to other forms of land use," and liberalizing hunting regulations--also to include the harvesting of does--to permit the taking of "two to three times the present kill."[48]

To accomplish his revised management goals, Leopold realized that at least three factors were necessary: "a staff of trained field men, a sympathetic and cooperative attitude among all Fish and Game personnel, and an enlightened public."[49] He also recognized that achieving the last factor would be a "painful, upstream process."[50] Reeducating a public that had been trained for years to consider the buck law of the deer restoration era as sacrosanct, humane and the right and only way to hunt,

would not be an overnight affair. Leopold had recognized the immensity of such a reeducation process in 1947 when he accepted the project directorship. In the letter to his father asking for help with the selection of a project leader, Leopold had commented: "One other thing Dad. Whatever the final conclusions of the deer project will be, they are sure to involve some concepts new to Calif. sportsmen (doe shooting for example) and I anticipate the need for a widespread campaign of education and publicity."[51]

To convince the public that it was necessary to change their view to allow doe hunting, he published a number of articles in leading popular, yet scientific, journals such as the Sierra Club Bulletin, and Scientific American, and delivered various talks at sportsmen's groups with such suggestive titles as "Deer management or deer politics?".[52] He knew he had to address the issue head on. "The center of the tempest hinges on a seemingly simple point--should we legalize the killing of female deer as well as bucks?," he asked rhetorically in a piece called "Too many deer."[53] "Arguments in favor of doe hunting are all based on technical and biological grounds," he responded to his own question. "The contrary view is not so simply defined--it springs from tradition, sentiment, and fear...."[54] After reiterating the ecological reasons for liberalized hunting regulations,

Leopold called on Americans, "as conservationists and sportsmen...to take a realistic view toward regulating deer numbers," and, by accepting doe hunting, to put reason before sentiment and tradition.[55]

The proposal to open the deer season on antlerless deer was made to the California Fish and Game Commission in 1948. In 1956, after eight years of intensive study and the publication of Leopold et al.'s reports, the first general doe season was held. The controversy again exploded in 1957 when the Fish and Game Department came under attack for its "either-sex" deer policy. At a presentation before the Associated Sportsmen of California, Leopold commented on the political nature of the attack on a scientific practice. "Controversy is fuel for the political engine," he noted. "[I]t is inevitable that legislators, county supervisors and even some members of the executive branch of government have entered the fray...."[56] Underscoring the scientific coherence of the doe-hunting policy, Leopold attacked the political motives of the nay-sayers. "Let me make this clear at the outset," he argued forcefully, "there is no controversy over deer management among those who have studied the animals in the field. The controversy is among those who study the problem beside a pot-bellied stove or in a smokey conference room."[57] He again explained, tirelessly

it seems, the biological and ecological reasons for herd reduction: to prevent depletion of the carrying capacity of the range, and to promote a healthy, productive breeding stock, "not run-down by competition and hence not subject to the losses that go with hunger and weakness."[58] In his popular writing style, Leopold could make his point clear as day. "Good ranges, with abundant food, carry many deer; poor ranges carry few deer. There is nothing new in this idea--every experienced deer hunter since Davy Crockett has known it."[59]

The controversy and Leopold's part in defending the Fish and Game Department's policy received wide coverage in the press. Grant Matthews, author of "The Boondocks" column in the San Francisco Chronicle, reprinted in a January 1957 column, parts of Leopold's speech delivered to the Associated Sportsmen of California.[60] Then in February, Matthews again touched on the controversy in a column reiterating the stand of the Modoc County Council of Natural Resources. Modoc county had been hard hit by either-sex hunters in the 1956 season and had every reason to disagree with the Fish and Game Department's policy. Instead the Council came out in favor of either-sex hunting and in support of Leopold's position. "It seems to me," argued the council member responsible for evaluating the situation, "that most of your writers, with the exception of Dr. Starker Leopold of the University of

California, attack this problem from an emotional and unreasoning standpoint instead of from a factual standpoint...."[61]

Leopold's position on deer management and maintaining herd size in accordance with an area's carrying capacity won out in some states (not immediately in California) but the battle was long and arduous.[62] "I was practically hung in effigy," he commented during an interview in 1980. "Now they are doing it [shooting does], but an awful lot of carrying capacity was lost by carrying too many deer too long."[63] "The reports about the deer situation...were never really acted on," he recalled during the interview. "It took a long, long time...The problem was pretty well solved by the time they got around to looking carefully at it--the deer had mostly died."[64]

One group that required quite a bit of persuading before it would concede Leopold his point was the Sierra Club. When the Sierra Club's conservation committee came out opposed to doe shooting, Leopold attended a meeting and gave the committee what he called "a big song and dance based on all the information that we had."[65] The committee reversed its position on doe shooting and after that called on Leopold and the Museum of Vertebrate Zoology for advice on many issues concerning wildlife.

From 1954 to 1960 Leopold was a member of the Sierra

Club Board of Directors, serving as the club's vice-president in 1956 and 1957.[66] He thoroughly enjoyed the informal way board members decided on issues in the 1950s. In an interview conducted by the Sierra Club in 1983, he recalled the board's strategy to decide policy questions.

> [The board] was a pretty small group then and very friendly and an informal sort of an operation. It was nice; I liked it. It's frightening now [1983]. I don't know that I'd want to even be near that board; they scare me half to death! But at that time it was a very nice outfit. Ansel Adams and all the gang, Dick Leonard, of course. We'd all gather around. Heck, you'd sit around with a cup of coffee and decide all <u>kinds</u> of important things in just no time at all. It was fun. I enjoyed that a lot. But once I terminated my activity in '59, I've never been back.[67]

Leopold liked small groups where one's opinion could be heard and where one's persuasive presentation could have a direct impact on the decisions of the group. When he chaired the Advisory Board on Wildlife issues in the 1960s, Leopold would operate in the same way: informally, with lots of talk and coffee followed by a decisive outcome.

Leopold terminated his work on the Sierra Club board to work on his text on Mexican wildlife. He had intended to have that work published long before but did not actually finish the text for publication until 1959.[68] Leopold received a sabbatical leave for the 1955/56 academic year to write the book, but his request for National Science Foundation funding for the project did

not come through.[69] When the Wildlife of Mexico was finally published by the University of California Press it was widely acclaimed and won the Wildlife Publication Award, an award given annually by the Wildlife Society to the best book that year on wildlife issues.[70]

Leopold's book on wildlife in Mexico was an example of the kind of science with which he became most comfortable: natural history based on careful observational practices in the tradition of Grinell and Miller. Composed of essentially highly accurate descriptions--natural histories--of wildlife species and their habitats, the volume was useful as a field guide or wildlife reference work but it did not amount to a groundbreaking scientific study in the new ecological mode of quantitative analysis. The volume was well received and extensively cited as good solid natural history work.[71]

Another volume which Leopold meant to publish in the late 1940s and early 1950s was a work on "wildlife ecology." In essence he planned to complete and revise a manuscript left by his father tentatively titled Conservation Ecology. "I will try to complete Dad's unfinished book on Wildlife Ecology," he wrote to Paul Errington, an old student of his father's and a teacher at Iowa State College.[72] The manuscript remained uncompleted

and unrevised, however. Leopold simply had too many commitments at the time to take up yet another project and it was too difficult to return to the manuscript once new projects beckoned.[73]

The Importance of Fire and Predators to a Healthy Ecosystem.

When ecological issues came to national prominence in the 1950s it is hardly surprising that Leopold--given his growing interest in policy--centered his own work around management questions. In particular he was concerned with the management issues connected to wildlife associated with climax or sub-climax vegetation (ecological concepts having to do with plant communities and succession), the relationship between predators and their prey, and the role fire plays in the ecological balance of nature. He published numerous articles and one book in the 1950s dealing with these issues.

His paper on "Ecological aspects of deer production on forest lands," presented at the United Nations conference in 1949 and published in slightly different forms in 1950 and 1952, is an example of his interest in the wildlife species associated with sub-climax vegetation.[74] He also presented a paper at a meeting of the American Society of Range Management in 1955 entitled

"Big game in relation to range ecology."[75] In a condensed version of the paper, which he submitted to the Sierra Club Bay Area Chapter Bulletin in February 1955, Leopold argued that "[r]ecognition of successional affinities of big game species is basic to determination of sound management policy." Species like deer, elk, and the northern moose thrive on sub-climax species whereas species like the northern caribou, bighorn sheep, mountain goats, and musk ox depend on undisturbed climax vegetation for their sustenance. While sub-climax species fit "nicely into multiple-use land programs," Leopold pointed out, "[t]he climax group cannot." Hence wilderness areas--those areas with no competing uses--should be preserved for species which require substantial acreage of climax vegetation.[76] Leopold moved from an ecological position, based on biological concepts commonly espoused at the time, to a management decision. Climax vegetation should be maintained for sound ecological reasons; at the same time he recognized multiple-use areas--areas where controlled logging, grazing and burning were practiced and where subclimax vegetation was found--as the necessary feeding grounds of many big game species.

Two of the hottest ecological issues debated in wildife management circles in the 1950s were the role played by fire and predators in healthy ecosystems. Fires

and predators were always part of natural ecosystems--that is until European settlers interfered and tried to eradicate both. For ages fires helped keep especially grassland ecosystems healthy by ensuring their very existence by spurring the growth of new shoots. Other communities also have "biological components dependent on fire (i.e., fire-adapted species) in ways that fulfill critical requirements in their life histories."[77] Native Americans appreciated the value of fire to creating a particular desired landscape. When European settlers arrived, however, they upset this balance of naturally occurring fires by either causing fires of their own which were too frequent or by extinguishing naturally caused fires.

Historian Stephen J. Pyne, in his cultural history of fire, Fire in America, traces the changes with respect to fire management that took place after the discovery of the New World. Frontier fire practices usually followed the Native Americans' lead in periodic prescribed burning. Industrial fire practices, whereby protection from fire became crucial, soon took precedent, however. The newly established Forest Service was opposed to what it referred to as Paiute Forestry--a derogatory term for prescribed burning or light burning as it came to be known. After 1924 light burning became official heresay.[78] Not all scientists or foresters, however, agreed with the Forest

Service's blanket fire protection practices. In the 1920s and 1930s Dean of the Yale School of Forestry H. H. Chapman published his studies of the effects of fire on the propagation of pine seedlings. He concluded that fire was important to the regeneration of the long leaf pine in the South.[79] H. L. Stoddard, an early proponent of game management, author of the renowned study of the bobwhite quail, and friend of Leopold's father, also studied the role that fire played in natural communities, especially in communities of bobwhite quail.[80] "[I]n 1931 H. L. Stoddard working with the Biological Survey, showed the value of controlled fire in habitat maintenance for wildlife management," writes Pyne.[81] While Stoddard's and Chapman's work convinced some early twentieth-century biologists of the important role controlled burning should play in managed ecosystems, many land and wildlife managers held fast to their belief that fires were destructive to wildlife and wildlife habitat. In 1943, the Forest Service changed its collective, bureaucratic mind on prescribed burning especially in southern forests and sanctioned its use.[82] And by the late 1950s California foresters were also becoming more tolerant of prescribed burning.[83] Nevertheless, the mood in the country in the 1950s and well into the 1960s was fearful of fire and unappreciative of its role in healthy

ecosystems.

Leopold's own education on the role of fire in a healthy ecosystem began while still a student under his father's tutelage. According to later reminiscences, it was his trip in 1938 into the wilderness of the Rio Gavilan that caused Leopold to doubt the wisdom of eradicating fires from natural ecosystems.

> The thing that astonished me about that Gavilan country was that it burned every year--fires just kept running through there...Yet I never saw a healthier piece of real estate than that Gavilan country was. The gramma grass was knee-high as far as you could see, and there was a little prickly species of ceanothus which turned out to be the primary food for deer. It would burn down to the ground, and it would spring right back up with fresh sprouts. It began to dawn on me that fire was a perfectly normal part of that sort of semi-arid country, and might even be an essential part of it.[84]

Leopold remembered coming home with "ideas about fire [he had] never had before." In short, he began to doubt the widespread practice of fire prevention.

> [W]hen I started looking around California at some of the situations that you could see right from the highway--including our own national Parks, Yosemite--I was struck with how prevention of fire was creating tremendous fire hazards in the thick growth of white fir and incense cedar and other stuff. I began to wonder if this is really the way to manage this kind of country, completely excluding fire, which had been a natural part of the countryside.[85]

Exactly what role the Gavilan experience played in changing Leopold's ideas about fire policy is difficult to

determine. No doubt the works of Herman Chapman--who was Dean of Forestry when Leopold attended Yale--and Herbert Stoddard also played an important role in the incendiary education of Starker Leopold. If at times during his education, he could vacillate on the need for fire--he could, for example, still argue in the early 1940s that fire, by destroying habitat, had a deleterious effect on Ozark wildlife--was by the end of the decade to come out solidly on the side of fire.[86] By the late 1940s, for example, he was including controlled burning in his management recommendations. "Fire, which is a devastation when out of control, still may be one of the most useful tools in managing key areas of deer range," he wrote in his paper presented at the United Nations Conference on Natural Resources in 1949.[87]

In 1957, Leopold presented a paper at the Fifth Bienniel Wilderness Conference, a conference devoted to "Wildlands in Our Civilization." His paper, entitled "Wilderness and Culture," which later appeared in the Sierra Club Bulletin (1959), caused quite an uproar. In his talk and subsequent paper, Leopold tackled head on the issue of fires in wilderness areas, especially National Parks. "There is still one striking exception in the trend toward naturalness in park preservation," he observed, "the complete exclusion of fire from all areas, even those that burned naturally every year or two before

becoming parks."[88] He explained to his audience that "many forest types that are to be perpetuated developed with fire as a dominant molding element."[89] And he predicted--correctly--that allowing fires to burn would become part of National Park policy "sooner or later."[90] "I am convinced," he wrote,

> that ground fires some day will be reinstated in the regimen of natural factors permitted to maintain the parks in something resembling a virgin state. Both esthetic considerations of open airy forest versus dense brush, and assurance of safety from conflagration of accumulated fuel will force this issue sooner of later.[91]

Leopold's comments elicited an angry response from Park Service personnel attending the conference. If the Forest Service had changed its ideas about controlled burning in 1943, the National Park Service remained firmly opposed to fire as a management tool. "The NPS had long identified fire as a threat to the scenic and recreational values of the parks," writes Pyne. "Prior to 1968 the standing directive for the national parks was that firefighting took precedence over all other activities except the safeguarding of human life."[92]

It is therefore no wonder that the National Park Service personnel attending the conference in 1957 felt threatened by Leopold's comments. "[O]ut of the corner came the old-time Park Service boys," Leopold recalled years later. "Harold Bryant, who was one of the old-

timers, stood up, and he was shaking he was so mad. And he made me mad when he started out and said, `I am amazed that the son of Aldo Leopold....' And boy, that really set me off. So we had a hell of a good little debate there. My wife claims that two of my students were holding me back!"[93]

The heated debate continued with the head forester for the National Park Service entering on the side of Bryant. After that incident Leopold refrained for a while from expressing his views on fire and national parks. But not for long. And he had the last say in the debate when in 1963 he included his ideas on fire in his recommendations to the federal government on National Park management--recommendations which were implemented in 1968.

Leopold continued to influence fire policy well into the 1970s primarily through his students. Most of the research on the biology of fire which followed in the wake of his report on park management came from Leopold's students, according to Pyne.[94] For example, one student, Bruce Kilgore, became involved in the fray when he wrote an article for the National Parks Magazine entitled "Restoring fire to the Sequoias."[95] At that time the old student, Bruce Kilgore, was research biologist with the Park Service Office of Natural Science Studies at Sequoia-

Kings Canyon National Parks, where he had become involved in the issue of fire in ecosystem management. When Daniel Poole--president of the Wildlife Management Institute in 1970--hesitated to accept Kilgore's burning program, Leopold wanted to help his former student convince Poole. "[I] want so very much to come to Sequoia," he wrote to Kilgore in July 1970, "particularly if we can give Dan Poole a bit of education which he could damn well use."[96] Kilgore, it turns out managed well on his own. His work on the fire history of the Sequoia forests is now often cited as support for the thesis that fires were and should be a natural part of ecosytems.[97]

Another ecological issue which engaged Leopold in the 1950s was the predator control controversy. Already at the center of a whirlwind of controversy, the predator control issue centered on the role predators played in the balance of nature and the consequences of their large-scale destruction. "At one time the public assumed that all carnivorous animals were threats to populations of game and domestic animals," writes wildlife biologist William Robinson.[98] Even scientists in the early twentieth century endorsed the principle of predator control.[99]

In the 1920s, however, some scientists, especially mammalogists at the Museum on Vertebrate Zoology in Berkeley under the leadership of Leopold's future mentor,

Joseph Grinnell, became concerned with predator control policy. They sensed that predators instead of being harmful were beneficial because they controlled the populations of their prey. According to scientists like Grinnell, E. Raymond Hall--a one-time student of Grinnell's and professor of zoology at the Museum of Vertebrate Zoology when Leopold was a student--Joseph Dixon and A. Brazier Howell, also associates of Grinnell's, the irruptions in the Kaibab deer herd in the 1920s and a horde of mice in Kern County California in 1927 were the result of unfettered population growth due to predator extermination.[100] They were, however, unable to prove that an extermination of predators would upset the "balance of nature." As appealing as the concept of a balance in nature was in the 1920s, it was also vague and unverifiable. The science of ecology was neither mature nor scientific enough to provide scientists opposed to predator control with conclusive evidence to support their case.[101]

According to historian Thomas R. Dunlap, "[t]he research of the 1930s laid the basis for the modern defense of predators as integral parts of the ecosystem and represents the maturation of ecological theory."[102] Two ecological studies in particular provided the scientific basis for later arguments against wide-spread,

indiscriminate predator control: Paul Errington's work on the bobwhite quail in Prairie-du-Sac, Wisconsin and Adolf Murie's studies of predators in National Parks. Errington, a graduate student in game management at the University of Wisconsin working with Leopold's father, broke new ground with his ecological study of a population of bobwhite quail. The results of his study clearly showed that "predation was not...of much importance in regulating the quail population."[103] If not predation, what, according to Errington, was the regulating factor controlling the quail population? Food and cover were much more important factors than predators, Errington concluded. He found that "[i]n the winter of 1933-1934 an unusually high fox population strikingly confirmed the earlier results. Good land carried quail despite the foxes and bad land, even lacking predators, did not."[104]

Studies of large prey species conducted in the late 1930s confirmed Errington's results. Between 1937 and 1941, Adolf Murie studied predator ecology in National Parks: the coyote in Yellowstone National Park and the wolf in Mt. McKinley National Park. The results of his studies underscored the importance of food and year-round shelter requirements as the crucial factors limiting a prey population.[105] Predators, he concluded, were not a serious hazard to their prey. Rather they served a positive function by culling the herds of deer, elk, or

Dall sheep of their weak or injured members.[106]

Natural history writers, such as Rachel Carson, Sally Carrighar, and Leopold's father began in the early 1940s to write about the interconnectedness between animal communities and thus underscored for a popular audience the valuable role predators played in nature.[107] By the 1950s the public was primed by both science and nature writing to oppose the rampant predator control policies of the Federal Government.

When Leopold visited the Rio Gavilan wilderness in 1937, he acquired a new appreciation for wolves and predators in general.[108] After his return trip in 1948, he was even more convinced of the value of predators for a healthy balance in nature. He had found what he called "concrete evidence of the much talked of natural balance between predator and prey."[109] "Despite unchecked predation by wolves and mountain lions, the white-tails were abundant," he wrote in his essay for Pacific Discovery, "Adios Gavilan,"

> It is a common belief of hunters in the United States that unless the large predators are controlled, a deer population will dwindle to nothingness. Yet a relatively large population of both wolves and lions preyed heavily on the deer without diminishing their numbers unduly.[110]

No doubt Leopold's ideas on the importance of predators to a balance in nature were influenced by his

father, who had grown painfully aware of the importance of predators as he changed from a hunter of predators--and in particular the lions and wolves that could have kept the Kaibab deer under control--to an ecologist cognizant of the importance of predators to the wholeness and health of an ecosystem. Leopold had most certainly also been influenced by his professors Joseph Grinnell and E. Raymond Hall, and Paul Errington, his friend and intellectual comrade from the 1930s to the latter's death in 1967. Thus it is not surprising that Leopold should have entered the fray on the side against indiscriminate predator control.

As with the deer management and fire control issues, Leopold did not do any original research in the area of predator/prey relationships. He synthesized the material from the research of others and more importantly brought it to the attention of the public. Leopold was the public educator par excellence. In 1954 he presented a paper to the National Association of Biology Teachers called "The Ecology and Economy of Predation," in which he argued that predation is but one form of regulation on prey population levels. According to Leopold, predators and their prey have over the eons worked out a "modus vivendi comparable perhaps to that existing between parasites and their hosts."[111] A predatory species would not--or, more importantly, could not--wipe out a whole population of a

prey species, he argued. Other factors in the environment--such as ample cover and food and water--provided a prey species with the ultimate protection--even from predators. "When the population is cut down to a smaller number, the survivors become ensconced in the most secure spots where they are relatively safe," he wrote.

> [I]f all requirements for safe and healthy living are present, neither the owl nor any other predator can reduce the quail below a certain minimum level. The environment, in other words, sets a limit on the severity of predation losses.[112]

The role predators play in decreasing populations of prey species was exaggerated, he told the biology teachers. If predators were not present to limit the number of a prey species, he explained, other factors in the environment--either the availability of food or, what Leopold referred to as, "intra-specific bickering"--would do the job.[113] He reminded his audience that the carrying capacity of an environment--set "primarily by the physical aspects of the environment and by the adaptations and tolerances of the animals"--determined the size of a population. In fact, instead of rebuking predation, Leopold argued, humans should consider predation an advantageous way to limit surplus individuals because it "cleanly eliminates some individuals without impairing the

vigor and health of the survivors."[114] "Alternate controls such as starvation, disease, and intra-specific bickering," he continued, "impose a drain on all members of a population, leaving survivors weakened in body or spirit" by the loss of food or social intolerance.[115] To conclude his paper, Leopold likened wildlife populations to bank accounts:

> [P]redation as we understand it today is a mechanism for disposing neatly and effectively of the biological surplus produced by prey species. This annual surplus, which might be likened to the interest on a bank account, goes to support an interesting fauna of flesh- eating birds and mammals. But the capital deposit, which is the breeding stock of prey forms, is protected by an elaborate set of natural checks and balances and ordinarily cannot be overdrawn by the most avaricious efforts of the hungry relatives...The Bank of Nature does business on an annual basis and the surplus is not compounded from year to year--if not expended by the predators it still reverts to the general fund of soil nutrients.[116]

Leopold's view on predator-prey relationships, while neither unusual nor original at the time, was outspoken and strong enough to catch the public's eye. In a piece written in 1954 for the Sierra Club Bulletin entitled "The Predator in Wildlife Management," Leopold argued not only on scientific but also on ethical grounds against "uncompromising control of predatory animals." [117]

> Perhaps much of this devious and complex reasoning is rendered unnecessary by a consideration not yet weighed into the argument, namely, the intrinsic social values of the predators themselves.[118]

Predator control did not increase the huntable population of wildlife--as many hunters at the time thought--but even if it did accomplish that end, Leopold asked, "what moral right has the hunter to dictate the fate of all wildlife to serve his specific form of sport?" "For every deer hunter," he went on to say, "there is a mountain hiker for whom the track of a lion would be the high spot of a summer's adventure. Is there any valid reason why society must rob Peter to pay Paul? Should not game management imply the conservation of wildlife collectively to serve the interests of the whole public rather than merely those of the shooting public?" "Perhaps in social maturity," he concluded, "we will some day overcome the prejudice against our ancestral enemies, the beasts of prey, and find that we can live better with them than without them."[119]

In this piece, as in all the essays he wrote on predator control, Leopold was building up to the work he would do in the 1960s when he would get the chance to directly affect the nation's predator control policies.

The Rise of a Hunting Philosophy.

Leopold's interest in hunting did not abate in the 1950s. If anything it deepened and became more philosophical. From 1954 to 1967 he was co-owner of a hunting club, the Cattail Club, with three other hunters.

Every year the hunters would prepare the 28-acre marsh south of Marysville, California for hunting by creating an environment appealing to ducks and geese, and then spend as much time there during the season as was feasible. Not one to divorce sport from science, Leopold used the club not only for pleasure but as a site to conduct minor research projects, such as the work for an article on "Nesting interference in a dense population of wood ducks," which appeared in 1965.[120]

Hunting and wildlife biology remained intertwined in Leopold's mind. He not only continued to incorporate hunting into his work as a wildlife biologist, but he believed that wildlife biology itself was intimately connected to hunting because it was geared toward increasing game species. Wildlife biologists, according to Leopold, dedicated their lives to producing a maximum crop of wildlife.[121] Leopold was not alone when he associated hunting with wildlife management. Historically the two were closely associated and until the 1970s wildlife research was primarily involved with meeting the needs of hunters by increasing game populations because, as one wildlife biologist put it, hunters contributed the financial support for wildlife research.[122] In 1951 Ira Gabrielson, head of the Biological Survey when Franklin Roosevelt turned it into the Fish and Wildlife Service in 1940 and first president of

the Wildlife Management Institute in 1946, was becoming the "grand old man of conservation."[123] In his text Wildlife Management, Gabrielson clearly connected wildlife management to hunting--one of the "human activities that affect wildlife" as he put it.[124] "It is obvious that wildife management involves much more than meeting the biological needs of wildlife," he wrote. "It also requires the management of human activities that affect wildlife and human use of the wildlife resources if it is to succeed."[125]

To practice the kind of biology Leopold practiced, one had to be handy with a gun--one had to be a hunter.[126] Gathering specimens was very important to Leopold's science. On his trip to the Mexican wilderness in 1948, Leopold and his co-workers hunted to gather specimens. "After a few days of exploratory hunting we settled down to study the wildlife as it had existed here for past eons," he wrote in "Adios, Gavilan," "at the same time levying our tribute upon the land--specimens for our collections."[127] Thus it was relatively easy for Leopold to combine hunting with wildlife study.

Leopold's love of hunting shone through his wildlife management decisions. For example he believed that predators were essential elements of wild communities not only for the ecological role they played but also because they enhanced the hunting experience. "[T]he presence of these carnivores in the fields and woods adds something to

the sport of hunting there," he wrote in 1954 in a piece for Conservation News, the magazine of the National Wildlife Federation. "And this value, however ephemeral it may be, should be considered in determining predator control policy."[128] In an article in which he discussed how to preserve "the qualitative aspects of hunting and fishing," Leopold recounted an experience in the wilds when spotting predators had made the trip that much more worthwhile. "I recall with pleasure a deer camp in Lassen County in which coyotes sang to our fire every night, and the morning light disclosed three or four of them mousing in the meadows...This little band of coyotes raised the whole trip above the commonplace," he wrote.[129]

For Leopold one of the responsibilities of wildlife science in the 1950s was to educate the hunting public, to convince them of the moral, ethical and esthetic contingencies of hunting. At the nineteenth North American Wildlife Conference in 1954, Leopold presented an appraisal of all papers given. In his comments, Leopold addressed one concern of wildlife managers: the commercialization of hunting. "Commercialization of hunting almost inevitably will be accompanied by artificialization," he argued. "The problem simply stated is this--should we continue trying to give the people what they seem to want, namely live targets and full creels at any cost? Or should we try to educate

them to what we think they might enjoy more--outdoor sport with emphasis on esthetic rather than physical objective?" Leopold's answer to his own rhetorical question was resounding.

> I think it is imperative that we follow the latter course. In addition to supplying a maximum harvest of fish and game we should be striving to build up, not tear down, the esthetic value of each head of fish and game. Artificialization of sport is the antithesis to this.[130]

Leopold strongly believed in the more philosophical side of hunting. In 1972 he would write his well-known essay "The Essence of Hunting," in which he lay out the ethical and esthetic aspects of hunting, ideas which clearly were developing in the 1950s. In an essay for the Conservation News of the National Wildlife Federation Leopold addressed what he believed were the "qualitative aspects" of hunting and how to "preserve" them. "[T]he sort of outdoor sport that we know, love and are trying to perpetuate involves a strong spiritual and emotional experience. It is a test of skill and ability, a rigorous exercise in woodlore. It is not limited to the physical experience of shooting some animal...."[131]

Leopold participated actively in the ongoing debate concerning the role hunting played in declining wildlife populations. Throughout the 1950s and 1960s as some citizens became aware of dwindling numbers of wildlife, they directed their scorn toward the one cause of wildlife

death they could identify--hunting. Wildlife experts, barraged with complaints, countered arguments against hunting with biological explanations involving such concepts as "margin of safety," "biological surplus," and "habitat destruction."[132] In a letter to Fred Packard of the National Parks Association, who had written to David Brower of the Sierra Club to complain about the controlled hunting of desert bighorn sheep in Nevada, Leopold argued that habitat destruction, not hunting, was responsible for low populations of bighorn sheep. "I have some rather strong feelings on this question which are in general contrary to yours," he wrote, "and I would like to get in a word on the whole question."

> I do not agree with you at all that because a game species is rare it should receive complete protection from hunting. By and large species become rare because their habitat has shrunk, not because they are overshot. A rare species which still exists in a limited remnant of habitat may be just as capable of supplying a small harvestable surplus as is a common species occupying a bigger range....[133]

There were other, more scientific, reasons for hunting in Leopold's estimation. "I think that limited hunting seasons of males only can be of advantage to even the rarest big game species," he wrote. "Among polygamous forms the elimination of part of the males has no depressant effect whatsoever on reproduction and may in fact cause a higher production of young by cutting down

food competition with the breeding females."[134] Leopold also argued that hunters actually helped preserve a species. Once an animal was no longer protected, according to Leopold, hunters would take an interest in it and do whatever was required to maintain a huntable--therefore viable--population. "It is a curious thing," he wrote to Packard, "that taking a rare species off the protected list and putting it on the game list inevitably tends to strengthen popular interest in the welfare of the species."[135]

Alaska and the Importance of Wilderness.

In the summer of 1952 Leopold spent nearly four months traveling around Alaska with British naturalist, Frank Fraser Darling. Darling and Leopold made the trip, which was sponsored by the New York Zoological Society and the Conservation Foundation, to study the status of the caribou, moose, and reindeer herds and their future place in the Alaskan economy and ecology. "Our task, as greenhorns spending four months in 586,000 square miles of territory, has not been to attempt to solve the problems of conservation in Alaska," wrote Darling and Leopold, "but to make an objective appraisal of them. We have tried to evaluate the potential importance of the ungulate

mammals in the future economy of Alaska and set their conservation and management against those other forms of land use which might loom paramount, such as pastoralism, forestry, or agriculture."[136]

Alaska in 1952 was still a federal territory and the territorial and federal governments were on the brink of deciding future development plans. Darling, for one, hoped that Alaska would remain federal territory for a while. He felt that conservation planning would be easier and more effective under federal control. "[A]s a complete outsider, interested only in conservation," he wrote, "I rather hope Alaska remains Federal territory for some time yet."

> The Forest Service controls the whole of the south- eastern forests and will prevent reckless exploitation...What does not seem to be generally grasped by newly-come developers and resource-tappers is the slowness with which animate natural resources regenerate in this cold climate.[137]

Leopold and Darling considered their opportunity to help determine Alaska's conservation policies before the land had been altered too extensively by human intervention as unique. "A policy of wildlife conservation ideally should precede the penetration and development of any country new to civilized man," they wrote idealistically in the introduction to their book on Alaskan wildlife and wildlife policy, Wildlife in Alaska: An Ecological Reconnaissance.

> We know that in practice no new country has been developed with conservation in mind. Recognition of the need for conservation ordinarily comes when the native stocks of animals, which seemed limitless, are reduced to a point below the level of further economic exploitation or are threatened with actual extinction. Then people readily become conservation-minded. As a rule, the longer the period of exploitation, the more difficult of solution are the conservation problems.[138]

Luckily, they felt, "Alaska [was] so newly occupied and so slightly altered, [that] there [was] time for policies of conservation to be conceived, considered, and put in hand before really severe or irreversible devastation [took] place."[139] For Leopold and Darling their study of Alaska represented "in short, a rare opportunity...to predetermine the course of development and utilization of wildlife resources in an area that is still not far removed from original condition."[140]

The two naturalists had planned their trip to Alaska since 1950.[141] The itinerary was impressive: from Juneau to Point Barrow and Schrader Lake with many stops at points in between.[142] Their mission began on the first of June 1952 and ended September 27th when they attended the Alaska Science Conference at McKinley National Park.[143] The trip impressed both wildlife biologists very deeply. Darling wrote extensively about his Alaskan adventure in Pelican in the Wilderness, a description of his odyssey in North America, and Leopold wrote letters back to the museum staff in which he waxed eloquent about his

adventures and the scenery.[144] Not at all impressed with the Alaskan cities--he found them all "more or less dumps"--he was "much taken with the country."[145] "The mountains above our camp were spectacular, with glaciers and ice walls draped above us," he wrote to his secretary at the Museum.[146] While he was not able to hunt, Leopold nevertheless enjoyed the fabulous fishing opportunities. He and several of the other biologists with whom Leopold and Darling traveled that summer took every opportunity to try their luck with the rod. Darling--not a fisherman himself--was often overwhelmed by the fishing frenzy of his companions. "Alaska is fabulous fishing country," he wrote in his travel memoirs, "and I suffered throughout my time there by constantly being in the company of fishing fanatics."[147]

Undaunted by the lack of enthusiasm of his colleague from the highlands of Scotland, Leopold managed yet again to combine hunting--in this case for fish--with science. "And the fishing surpassed anything I ever hope to encounter," he scribbled home to his envious readers in a style reminiscent of the journal-keeping days of his youth, "fish every few casts and the average weight of 33 that we put on a scale was 8 pounds. The largest--22 pounds! On my skinny little rod it took any where from half hour [sic] to an hour and three-quarters to land each

one. Needless to say we didn't keep many--just played them to the bank and turned them loose again."[148]

Leopold also loved the out-of-the-way Eskimo and native Alaskan villages. Struck by the importance of game to the Eskimo way of life, he was very impressed by the Eskimo hunting tradition. He found, for example, the questions asked at a Mekoryuk town council meeting about the federal game regulations "sharp and to the point."[149] "[H]unting is not for recreation here!," he wrote. "These people still live entirely on game and the only concern [is] for food supply."[150] Leopold and Darling tried to incorporate an understanding of the Eskimo way of life into their report. "We have been particularly concerned with the place of the big game species in the economy of the native peoples of Alaska," they noted, "and have therefore had to consider some of the sociological problems of Eskimos and Indians."[151]

Once the exploratory field work was done, Leopold and Darling settled into the University of Alaska to make a start on their report. As Leopold had found the report part of his Mexican venture less appealing than the preceding field work, so he found writing the Alaska report onerous as well. "Maybe it's not the travel and adventure that become tiresome," he complained mildly to his secretary, "but the inevitable sweating out a report afterward!"[152] The "inevitable" report would, he noted,

get written. And it promised to be controversial. "[W]e have lots of impertinent suggestions to offer everyone on how territorial affairs should be handled," Leopold commented in one letter.[153] In another letter--this one to his past mentor and present colleague, Alden Miller--he gave the gist of the report:

> The most obvious conclusion of our labors is that the caribou is part of the climax biota of the tundra, and the loss of lichens occasioned by reindeer grazing along the Bering coast and by fire in the Yukon basin...has automatically eliminated or reduced the range and hence the caribou population. The same changes account for the spread and local increase in moose, which is a sub-climax animal, associated with willow and birch reproduction following burning or other disturbance of the climax. Overshooting is of local importance; but a management program based solely on hunting control and predator control is missing the main issue. Such will be the central melody of our report, with appropriate harmonics and trimmings, and some pretty pictures to give it class.[154]

Implicit in this descriptive paragraph is criticism of the United States Fish and Wildlife Service. Darling and Leopold knew from the outset that their trip might entail such criticism. "Starker and I had come on a mission which might mean criticism of the U. S. Fish and Wildlife Service," Darling noted in his Pelican in the Wilderness. "The service knew that, both in Washington and Alaska...."[155] Essentially, Darling and Leopold were critical of the Service's emphasis on curbing hunting and controlling predators as the primary ways to increase

wildlife populations. "The budget and administrative program of the Fish and Wildlife Service," they wrote, "is still designed to cope largely with the direct decimating factors--hunting and predation--the main objective being to increase breeding stocks of the big game herds, rather that to increase yields. In building up stocks...inadequate reference is made to range capacities or limitations."[156]

In their report and in their subsequent book, Wildlife in Alaska, Darling and Leopold stressed the importance of habitat management as a means to control--or increase--wildlife populations. This aspect of their work was highly consistent with Leopold's other scientific projects of the 1950s. His work on the deer management issue, for example, also recognized habitat as the controlling factor in population increase or decrease. In both cases, Leopold debunked the idea that protection from direct kill was the way to increase population size. In their book on Alaskan wildlife, Darling and Leopold wrote:

> results of a program [of the Fish and Wildlife Service] based largely on protection from direct kill have been less uniformly satisfactory...Even protection from natural predators, in addition to protection from man, has not brought the desired response. The answer lies apparently in subtle changes in vegetation which accompanied the era of exploitation and which may affect the status of wild species even more drastically than direct killing.[157]

Leopold and Darling's work essentially documented and discussed the nature of population changes in herds of caribou, reindeer and moose and, importantly, the authors also made recommendations for management strategies to improve herd status. Caribou populations had decreased over time. Initially this loss was due to "indiscriminate hunting...following exploration and settlement of Alaska."[158] After game regulatory measures were enforced, the population of caribou remained low and did not recover its normal size and range. "Therefore it is clear," argue the authors, "that other important factors probably contributed to the original decrease and are preventing current recovery. The two most obvious are burning and reindeer grazing of caribou winter ranges."[159] Caribou, according to the authors, rely on a climax vegetation--lichen. When the supply of lichen is decimated by either burning or overgrazing, the population of caribou must also decrease to fit the carrying capacity of the land. Predators, instead of serving a negative function in the balance of caribou populations, could be used to play a positive, population controlling role.

> The importance of wolves and of wolf predation...should be viewed as one factor which has served in the past, and may be called upon in the future, to help prevent overpopulations of caribou, and of other large mammals as well.[160]

The authors made explicit the connection between the deer

management issue in the lower forty-eight and the caribou--and reindeer and moose--issue in Alaska. "Deer irruptions all over the United States," they warned, "attest to the fallacy of closely regulating hunting and predation without reference to range limitations."[161] Based on their observations, the authors recommended range preservation as the means to maintain or increase caribou herds.

> On the basis of this situation, we postulate that the big problem in caribou management is preservation of the range and not control of decimating factors, such as hunting and predation, which have been getting most of the attention.[162]

They recommended the same for the reindeer population. Reindeer were introduced into Alaska from Siberia in the 1890s as a replacement for the depleted animal populations following early settlement. Initially the herds increased rapidly, but then in the late 1930s the population began to decrease markedly. There were few checks on the population which was thus allowed to increase beyond the winter carrying capacity of the range. "We would suggest," argued Darling and Leopold, "that the rise and fall of the reindeer population in Alaska is an example on a grand scale, and well documented, of the typical swarming and crashing of an animal population suffering but few checks."[163] To improve the status of the reindeer population in Alaska, Darling and Leopold

advocated "only lightly stock[ing]" the depleted ranges "for many years to come."[164] Again, they reiterated, reduced hunting and predation alone would not lead to population increases.

Moose, according to Darling and Leopold, posed a different problem with a slightly adjusted solution. Because they thrived on subclimax species, such as young willow, aspen, and birch, moose fared well when the extensive burning set in motion by the early settlers and miners devastated the climax vegetation of lichen and spruce.[165] Their numbers, and more importantly, their range increased. Wolf populations, which were decreasing as extensive predator control measures were taken, could not curb moose numbers. "[T]he spread and increase of moose appears to have occurred concurrently with the rise in wolves," argued the authors. And, they continued, "[t]here is certainly no inverse correlation between moose and wolf numbers. Hence we wonder about the control of wolves for the protection of moose, particularly when the potential moose crop is not harvested." Again they sounded the bell warning the public and the federal policy makers not to rely on curbing predation as the only way to improve moose populations. "Predator control," they repeated, "when applied as an end in itself, without reference to the existing balance between surplus, is not necessarily good game management. The same funds might

better be spent in more productive channels, such as improvement of winter ranges."[166]

Leopold and Darling's approach to the wildlife management situation in Alaska sounded very much akin to the thinking of early conservationist Gifford Pinchot, whose highest-use policy reigned supreme in the early years of the American bureaucratic involvement with natural resource conservation. "[I]t is...true," they wrote in their chapter entitled "A broad approach to management," "that all land has values and the human ecologist seeks to define the highest use to which each acre, rich or poor, may be put best to serve society...In our judgment the values which already exist on much of the Territory--wild fish and game, and the opportunity for wilderness recreation--offer the highest use to which the land can be put." Their task as they saw it was to determine how best "to make the most of these assets, particularly of big game."[167]

For their study of Alaskan wildlife, Darling and Leopold compared the "cash value of wildlife products" to other resources such as forest products and metallurgical industries. The two naturalists drew on a study done in 1951 by the Department of Interior which anticipated that fisheries and wildlife resources would outperform other sources of income by 1962.[168] Because wildlife and

fisheries were the most valuable resources of the territory, Leopold and Darling concluded that they "deserve[d] the most careful husbandry."[169] The two naturalists, one an avid hunter the other not, represented the interests of both hunting and non-hunting wildlife advocates when they recommended preserving the wildlife resources of Alaska.

> The native ungulate species of the Alaskan fauna...are an immensely important resource to which no dollar money value can be given...The meat value to the white population of moose and caribou is at the moment considerable, but will proportionately decline as the human population increases. The sporting value may be expected to rise as the population increases. The esthetic appreciation of the ungulate game is growing and should not be minimized vis-a-vis sporting value. More and more people are coming to Alaska to see these animals in their natural setting and have no desire to shoot them. Consideration for this kind of visitor will be amply repaid in value to the Territory.[170]

To manage well and utilize fully the big game herds of Alaska, Darling and Leopold advocated habitat preservation, "by deliberately controlling two of the principal influences on range conditions--fire, and numbers of grazing animals."[171]

While Darling and Leopold did not collaborate on any projects after their Alaskan adventure, the friendship that had found sure footing on the tundra of the Alaskan wilds would remain strong until Darling's death in 1979. As Darling described their time together in Alaska: "We

had a wonderful three months together to cement a friendship, already deep and, what is perhaps extraordinary, our friendship survived our collaboration in the Report!"[172]

In March 1957, Leopold was invited to give the H. L. Russell Memorial lecture in Madison, Wisconsin. As his topic Leopold chose--rather predictably--"Conservation in Alaska." Leopold was honored to deliver the Russell memorial lecture for two reasons. First, he considered Russell responsible for "advancing [the] evolution" of the "scientific study of wildlife management"--the profession he had chosen as his own. Russell was dean of the University of Wisconsin's College of Agriculture when he "maneuvered the establishment of a Department of Wildlife Management--one of the first of its kind in any university." Significantly, Leopold's father was selected to head the newly formed department.[173] The younger Leopold may have been proud to represent the advances his profession had made since his father and Russell's time. Second, Leopold felt like the native returning home. He still considered himself a "wandering badger"--a "vagrant son of Wisconsin"--and was pleased to be so warmly received in the home territory.[174]

His address, "Conservation in Alaska," stressed the importance of wildlife to the Alaskan economy. In the sketchy outlines of his talk he noted that the "basic

precept" of his study was the "[e]conomic importance of wildlife [as] inversely proportional to [the] value of other resources." "Most of Alaska suffers from profound paucity of resources," he commented, "[e]xcept wildlife."[175] Alaskans' income depended on the preservation and good management of their wildlife resources, because "4/5 of [the] territory has nothing but wildlife and wilderness values," he wrote.[176] It would not be easy, he stressed, to establish and implement the planning that was needed to manage the Alaskan wildlife resources. Other, in the long run less important to the Alaskan economy, competing uses for the land might appeal to developers. With this address, Leopold was forecasting the fight for recognition competing resource users would wage in the 1970s and 1980s when the harvesting of timber, and, more importantly, of oil resources would threaten the wilderness and wildlife values of Alaska.

Much as Darling and Leopold sought to preserve the Alaskan wildlife habitats for the recreational purposes of hunting and wildlife observation, they also recognized the wilderness value of the Alaskan wildlands. Wilderness had value for Leopold not only as a recreational resource--a place to get away from it all for "the discerning outdoorsmen"--but also as "a sample of the primitive northland for posterity" and as an outdoor laboratory for

scientific investigation.[177] "The scientific importance of reserving such study areas cannot be overemphasized," Leopold and Darling had written in their study of Alaska.[178]

As co-founder of the Wilderness Society, Leopold's father had been a strong proponent of wilderness preservation.[179] Like his father, the younger Leopold believed that preserving wilderness areas was of utmost importance. Both believed that remote areas left untouched by the human hand were essential "playgrounds" for persons wishing to escape the rigors of urban life.[180] And both recognized the scientific value of stretches of land left untrammeled by the human foot.[181] But unlike his father, Starker put the argument in economic and management terms. In a foreword for early wilderness advocate and co-founder of the Wilderness Society Robert Marshall's posthumously published Arctic Wilderness, Leopold wrote:

> [A]lthough growth and economic expansion are indeed important to Alaska's economy, it does not necessarily follow that complete disruption of wild-land values is in the best interests of that economy. On the contrary, the tourist industry and recreational values that attract visitors are important potential sources of wealth...For as more and more North Americans cluster in cities to earn their daily bread, the recreational value of wild country increases in social value almost exponentially.[182]

If wilderness had economic value as a tourist attraction,

it also had value as a "laboratory" for scientific investigation. Because Leopold was interested in science as a management tool as opposed to science for science's sake, he argued for wilderness preservation in management terms. "Our efforts to manage the land and its life often falter for lack of clear understanding of how the soil and its plant and animal dependents maintained their balance in the first place," he wrote in the Marshall foreword. "Long-term studies of such natural interdependencies would prevent many a blunder in land management. Carefully preserved wilderness check areas are prerequisite to conduct these investigations."[183]

In 1955 Leopold delivered a talk at the Fourth Biennial Wilderness Conference entitled "Scientific Values of Wilderness," in which he took a broad view of the term wilderness. For scientific purposes wilderness areas did not need to be the large, rugged, isolated areas we associate with wilderness today. All that was necessary were "small natural areas in [the] heart of agricultural district[s]."[184] Because Leopold was interested in studying how land-use practices affected the natural balance between the soil and the flora and fauna of an area, these small plots according to Leopold "may be of greater sci[entific] value than great wildernesses on mountain tops."[185] Such "natural areas" were to serve as points of comparison with sections of land whose natural

communities had been upset by economic endeavors. "Often our form of land economy, superimposed on an existing natural community, may yield satisfactory returns for a time and then output begins to fall," Leopold warned his audience. "Changes occur, especially in the soil, that were not anticipated. At that time it is highly desirable to have for comparison intact samples of the original communities to see how they were self-sustaining."[186]

Leopold believed that such wilderness areas could and should be managed. In an address prescient of his work in the 1960s on National Park policy, Leopold advocated managing wilderness areas "to simulate original conditions as closely as possible."[187] As part of his management strategy, Leopold applied his ideas on the importance of fires to a healthy ecosystem. Management of wilderness areas, for Leopold, would entail periodic burning. At a time when fires were perceived by many to be antithetical to the maintenance of wilderness resources, Leopold recommended burning to "produce a natural type."[188] Dynamic types of ecosystems, such as grassland and chaparral and "practically all the commercial timber types," were "formed or maintained originally with fire as a component," he argued.[189] Hence, Leopold told his audience, to maintain these types "you have to attempt to recreate original conditions, including periodic

burning."[190] Because he knew that some government officials--senior Park Service officials, such as "Harold Bryant, in particular"--opposed "the deliberate use of fire," he cautioned his audience that "[a]s a matter of policy in preserving natural areas we are going to have to accept responsibility for...controlled experimentation with fire."[191]

Wildlands were valuable in Leopold's mind for the various ends they served: as habitat for valuable wildlife resources, as models for sound land management, and as tourist attractions. But wildlands also held an intangible value for Leopold, a value however immeasurable which inspired him to write a poetic piece for the popular Sierra Club Bulletin. "Such is the aspect of spring on the Kashunuk," he wrote, "a time of incessant sound, of pairing and love-making and impending birth. The glorious intensity of procreation, continuing through 24 hours of the day (there being no darkness), will soon pass to a summer phase of gangling young and molting plumages. And then the birds will leave again. The tundra lies cold and quiet under the drifts, awaiting another spring."[192]

To the question he had posed at the start of the decade--"Must there be a cow on every hill, a road in every valley?"--he now could offer a resounding negative reply. His appreciation of wilderness was now no longer tentative or apologetic. He was convinced at a deeper,

moral level that wilderness areas should be preserved. By the end of the decade, he was writing of this moral imperative to conserve wildlands. In notes he took for a talk on "Man, wildlife, and wilderness," he declared: "Objective will be to preserve, to save; moral obligation, esthetic values."[193] In his essay, "Wilderness and Culture," which appeared in 1959 in the Sierra Club Bulletin, he wrote: "The only possible force that could be motivating the effort to preserve natural areas is the moral conviction that it is right--that we owe it to ourselves and to the good earth that supports us to curb our avarice to the extent of leaving a few spots untouched and unexploited."[194]

Leopold's Alaskan writings scattered as they were throughout the decade summarize in a way his scientific concerns of the 1950s. His concern for deer management issues found a parallel in the question of managing the caribou, moose and reindeer resources of Alaska. He applied his conclusions about the ecological importance of fire and predators to Alaska. His Alaskan research gave new meaning to his conclusion that habitat preservation was the way to increase wildlife resources. And in his efforts to preserve the Alaskan wilds he found a way to give voice to his deeply-felt concern for wilderness preservation.

Leopold's Alaska work also fed into the work he would take up in the 1960s--wildlife policy issues. The final chapter of the Darling-Leopold treatise on Alaska is called "A broad approach to management." In the chapter the authors reiterated their belief in the importance of "big game herds" to the economy of the territory. "There is a chance in Alaska to make game management a primary industry rather than an adjunct or `orphan sister' of more intensive forms of land use," they wrote.[195] The key to the success of the wildlife resource was management--management based on sound policies. The bone the authors chose to pick with the agencies managing Alaska's wildlife resources was "the inadequacy of present policy." "Conservation of the range should be dominant over conservation of the individual animal, not the other way around," they emphasized.[196] To conserve the range--the game habitat--several government agencies would have to coordinate their activities. While not an easy task to accomplish, such coordination would be necessary before "the full potential of wildlife [could ever] be realized."[197] Leopold's concern for policy issues and his readiness to take up a position as advisor to the government on management concerns anticipated his involvement in wildlife resource policy in the 1960s. This third decade of wildlife work would firmly place the younger Leopold next to his father as an important

conservationist and it would give him due credit as a policy expert on wildlife matters.

CHAPTER 2 ENDNOTES

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4 Ralph J. Raitt, "In Memoriam: A. Starker Leopold," The Auk 101 (October 1984): 868.

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10 A. Starker Leopold, "Status of Mexican Big-game Herds," Transactions of the 12th North American Wildlife Conference (1948): 437-48.

11 A. Starker Leopold, "The Wild Turkeys of Mexico," Transactions of the 13th North American Wildlife Conference (1948): 393-400.

12 Aldo Leopold to A. Starker Leopold, 5 January 1948, University of Wisconsin, Aldo Leopold Papers, (cited hereafter as UWLP), Box 2, f. Aldo Starker Leopold 9/25-10/8.

13 Ibid.; Aldo Leopold to A. Starker Leopold, 29 January 1948, ibid.; Curt Meine, Aldo Leopold: His Life and Work (Madison: University of Wisconsin Press, 1988), 518-20.

14 Sierra Club Oral History Project, A. Starker Leopold: Wildlife Biologist (San Francisco: Sierra Club, 1984), 1, (cited hereafter as Leopold Oral History).

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CHAPTER 3

FROM SCIENTIST TO PUBLIC POLICY MAKER.

As Leopold's ideas and wildlife management work of the 1950s became better known, he was drawn further from biological investigation and into the arena of public policy matters. During the 1960s Starker would serve on an advisory board for wildlife issues for Secretary of Interior Stewart Udall. As chairman of the board, he authored three controversial and important reports and instigated what were considered quite radical wildife management ideas. Leopold's reports on wildlife management in the National Parks, predator and rodent control and the national wildlife refuge system were landmark studies in their day, while the report on the National Parks remains an important document today. Leopold did not instantly abandon wildlife science, however. He was reluctant to give up all claims to his title of scholar.

The decade began with an invitation from Time Incorporated to publish a Life edition for the Nature Library called The Desert. In March 1961, Maitland Edey, editor of the Nature Library, proposed a book on the natural history of the desert with an offer too good to refuse--eight thousand dollars and expenses.[1] Starker accepted the offer within a week of receiving Maitland's

proposal. The idea of "reach[ing] such a large readership with an authoritative account of the ecology and natural history of the desert is tremendously appealing to me," he told Edey.[2]

Starker wrote quite a bit of the text while living on the island of Maui during the summer of 1961--a situation he considered "near perfect."[3] Leopold, scientist and hunter that he was, had some difficulty preparing a text for general readership. Edey considered Leopold's writing "a little `Professorial' at times," and asked permission "to do a little tinkering with it [chapter one] for style and pace, brightening and tightening up."[4] Edey had one further recommendation to make after he received later chapters in August. "Chapters seven and eight are both interesting," he commented to Leopold, "except that I want to play down the delights of hunting in the desert, if you don't mind. These are books on natural history," he reminded Starker, "and they will be read by nature lovers and children, not by sportsmen."[5]

The Desert was published in 1961. Not only was the book a popular success, but in 1963 Alden Miller, Leopold's superior at the museum, recommended a salary advance for Leopold partially because of the book's publication. "Although couched in nontechnical form for the most part," Miller wrote Chancellor E. W. Strong, "the

work represents the best scholarly comprehension of the field and draw[s] on the author's own research records from the field." "The fact that such creative writing is aimed at a wide audience and has been very successful in reaching this audience certainly is commendable," he concluded.[6]

Starker's position at the University of California changed numerous times throughout the 1960s. In addition to his regular academic position at the Museum of Vertebrate Zoology--by this time he was a full professor--Leopold was associate director of the Museum from 1958 until 1965.[7] He was also assistant to the chancellor from 1960 to 1963, "during the ill-fated administration that floundered on the free speech movement and Vietnam war protests."[8] And from 1965 until 1979 Leopold was director of the Sagehen Creek Field Station.[9] According to Bob McCabe, Aldo Leopold's past colleague and Starker's close friend, "[a]dministration encroached on his [Leopold's] teaching and research."[10] Whether it was university administration or government advisory work that got in the way, Leopold's productivity as a scholar changed its focus in the 1960s to emphasize policy work.

Leopold held his Berkeley affiliation dear to his heart. But as in the 1950s, he was tempted by offers of interesting positions both in academe and government. "Last week Starker was called by the president of Yale and

offered a deanship of a unit there encompassing Forestry and Conservation and Natural Resources," Miller wrote to Dean William B. Fretter of the College of Letters and Science. "About a week before he was urged to take the deanship of the School of Conservation at the University of Michigan," Miller continued.

> These places, the leading institutions other than Berkeley in this line, had made approaches a year before and he turned them down. He turned them down again this time with some considerable misgivings. He also last week declined a post as Assistant Secretary of the Interior offered him by Secretary Udall.[11]

While, as Miller told Fretter, Leopold was "considerably worried and restive about delays and possible negative attitudes at the departmental level in supporting [his] program [in Wildlife and Fisheries Biology]," he was not ready to throw in the towel and leave Berkeley.[12] He continued to work under Alden Miller at the museum teaching and directing graduate students, until 1965 when Miller died.

Before his death, Miller was Leopold's strongest supporter at the museum. When, for example, higher authorities requested that "further evidence of research...be added to the record" before Leopold received a "normal salary advance" in 1963, Miller responded with a three-page letter defending Leopold's writings and research activities.[13] "We must not lose him," Miller

wrote in another letter to the administration in 1964.[14]

Miller was a very powerful figure. When he died, so died a large block of support for the wildlife management program (as part of the zoology department) and, more importantly, for Leopold himself. Upon Miller's death, Leopold became acting director of the museum but because he felt that he was more in a position of caretaker than decision maker, he tendered his resignation in November 1966.[15] With Miller's death, Leopold lost his anchor of support at the museum and working conditions became intolerable. Some scientists at the museum resented Leopold, lacked respect for his science, and were perhaps jealous of his success and influence under Miller.[16] Early in 1967 these differences of opinion forced Leopold to leave the museum for the department of forestry and conservation where he was professor of zoology and conservation forestry until his retirement in 1978. While this "alienation" and subsequent departure from the Museum--"where he had been graduate student, associate director, and acting director (and to which he had a deep loyalty)--were keen disappointments," Starker did not become embittered. He settled down into eleven fruitful years in forestry in Mulford Hall.[17]

Throughout the 1960s Leopold taught such courses as Wildlife Biology and Management, Wildlife Populations, and

Wildlife Ecology and Population Dynamics.[18] A popular teacher, Leopold's courses were well attended and long remembered. He received laudatory letters from past students, even those no longer actively pursuing wildlife management careers. One ex-student turned army enlistee remembered Leopold's course in Wildlife Conservation "as one of the most informative courses" he had "ever taken."[19] Recommendations for promotion or salary increase always mentioned Leopold's distinctive teaching skills and his ability as "an unusually talented lecturer."[20]

In teaching as in his own research, Leopold held true to his love of practice rather than theory. Students appreciated this practical bent and highly recommended his courses and seminars, known for their heavy reliance on case studies. Leopold's skills as a lucid writer--one able to explain difficult concepts in lay terms, skills he employed in his texts on wildlife in Mexico, wildlife in Alaska and the desert--were talents he drew on as a lecturer. In their evaluations, students often commented on his "ability to present...material in direct, understandable language."[21] Ralph Raitt, an ex-student turned professor, remembered Leopold as having had a "remarkable ability to clarify complex natural interrelationhips and entangled issues in conservation."[22] Dale McCullough, ex-student turned colleague at Berkeley,

wrote after Leopold's death that Leopold was a "great raconteur, which accounted for his great popularity with students. His lectures were not exercises in blinding oratory or slashing wit. They were small gems of common sense, spoken with quiet good humor and gentle optimism. His object was not to bring students to their feet, but to their senses."[23]

Leopold had a disproportionate number of graduate students working under him who would gain international reputations. In 1973, according to his superiors, Leopold's former students held "an appreciable proportion of the most important academic and scientific positions in wildlife management in North America."[24] Especially well-known was Raymond Dasmann, author of numerous books on wildlife and conservation issues.[25] Bruce Kilgore, one-time research biologist for the Park Service and proponent of controlled burning on park lands, was also a student of Leopold's as were Hal Salwasser of the Forest Service in Washington, D.C. and Reginald Barrett and Dale McCullough, wildlife biologists at the University of California in Berkeley. Throughout the years, Leopold had to turn away prospective students, arguing that he could "only do an adequate job of assisting a limited number of boys at one time."[26] In later years, Leopold would look back on his affiliation with the university as the "most satisfactory"

position he held.[27]

Leopold worked on a number of projects on a variety of wildlife and conservation issues throughout the 1960s. Most continued work started--at least conceptually--at an earlier date. His publications, while never at the scientific center of the ever burgeoning field of wildlife ecology, now veered even further from the cutting edge of primary research and turned to public policy work based on secondary sources. This is not to say that Leopold became more theoretical; he in fact held fast to his practical bent. Nor is it to argue that he left his field boots behind for a comfortable armchair position from which he could reflect peacefully on uncontroversial wildlife principles. While he donned his field boots ever less frequently for research and more for policy studies or just plain fun--hunting and fishing--Leopold in fact became deeply embroiled in the hottest wildlife issues of the decade. More than involved, Leopold was at the center of the storm over National Park policy, predator control and wildlife refuge definition. He also remained involved with the wilderness debate and started work on a text on wildlife populations which he would co-author with Ian Cowan.

Already in the 1950s Leopold had the idea of revising his father's Game Management--since 1933 the classic text in wildlife management--by including recent biological

information.[28] By 1958 he had decided to "tackl[e] a book on principles--not merely a revision of `Game Management' but a new book." "If I actually do get involved in this," he wrote to Paul Errington, "I'll probably be up to my ears for another couple of years."[29] Even without the project on "principles," Leopold was "up to his ears." Writing and teaching obligations intervened and Leopold made little progress--beyond an outline--on the text. In 1960 Leopold sat down with Ian McTaggert Cowan, a wildlife biologist of his own generation working out of the University of British Columbia, to draft an outline for a text on wildlife populations. The volume would be a joint effort; Leopold would write approximately half of the chapters while Cowan would write the other half. Some sort of loose contractual arrangement was made with Houghton Mifflin.[30]

By 1968 four of the nineteen chapters were written; Cowan had finished his chapters on "Climate and weather" and "Food and nutrition" while Leopold had completed chapters on "The biotic community" and "Adaptations of animals to local environments."[31] The book was still not completed by 1971 when Harvard University Press expressed some interest in publishing the text which they understood to be on "resource management--resources being used in the broadest sense."[32] A sabbatical leave in residence during

the 1971-72 academic year was supposed to help Leopold finish the volume, but according to David B. Wake, director of the Museum of Vertebrate Zoology in 1973, Leopold "was unable to divorce himself from other responsibilities sufficiently to complete the work."[33] For whatever combination of reasons, Leopold and Cowan never did finish what they had hoped would be the "definitive text on population dynamics for the wildlife profession."[34]

One of the few chapters Leopold did complete for his text on "principles" was published separately in 1966 as "Adaptability of animals to habitat change," in an important volume, Future Environments of North America, edited by F. Fraser Darling and John P. Milton.[35] Bruce Kilgore, at that time a graduate student working under Leopold and later known for his writings on the need for fires in National Parks, helped gather data and source material for the article.[36] Essentially a recapitulation of work he had done in the 1940s and 1950s--on heritable wildness and ungulate response to plant succession--and derivative of other scholars' more recent research, the article included no ground-breaking data or analysis.

Leopold's story, while not new, was well and clearly told in classic Leopold prose. He argued that animal species "clearly associated with and dependent upon undisturbed climax situations...suffer the most from

environmental change" brought on by man, while those animals thriving in "seral or subclimax biotas" adjust very well to changes in vegetation and land use.[37] "There appears to be a direct correlation between the affinity with seral or subclimax biotas," he wrote, "and adaptability in the sense of the capacity to adjust to change."[38]

> The ability to adapt seems to involve two distinct components: (1) genetic plasticity, or the capacity for segments of a population to evolve rapidly to fit local conditions; and (2) the capacity for individuals to learn new habits of survival under altered circumstances. These cannot readily be separated, since the capacity to learn is itself a genetic trait.[39]

If the essay did not cover new ground, it did return the author to an old intellectual stomping ground. The combination of genetic theory--an area of study Leopold had not touched since his dissertation twenty-two years earlier--with standard work on wildlife habitat preferences was well received. The essay was widely reprinted later in anthologies on wildlife conservation and ecology.[40]

The Debate on Wilderness

The wilderness debate--centering around the question:

"How much public land, if any, should be put aside and designated as wilderness?"--was at full throttle in the early sixties. Howard Zahniser of the Wilderness Society had been preparing and revising wilderness bills since 1957. Rewritten sixty-six times, Zahniser's bill was finally passed and the Wilderness Act was signed into law in September 1964.[41] Leopold agreed with the idea of federal protection of wilderness lands and spoke out often in different arenas before the bill's passage in favor of wilderness designation. He testified in favor of Zahniser's bill at congressional hearings in 1957. He also continued to publish articles in popular journals where opportunities to influence public opinion were the greatest. In an editorial for Pacific Discovery in 1960, Leopold argued that it was important to preserve wilderness for numerous reasons. As his father before him, Leopold recognized the recreational, aesthetic, and scientific values of wilderness.[42] And as the older Leopold had done, Starker stressed the moral issue involved. "[I]n evaluating public interest in wilderness preservation," he wrote in "Save the remaining wilderness," "we must list first the strictly sentimental feeling that saving some wild country is the right thing to do; much less impelling is the more selfish motive of personal enjoyment of its beauties."[43] In a sense the younger Leopold was invoking a principle from his father's

famous land ethic published in popular form in A Sand County Almanac. "A thing is right," Aldo Leopold had written almost twenty years before, "when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise."[44]

Leopold also discussed the obvious scientific, aesthetic and recreational values of wilderness, making a strong case for preservation. Then he went on to address some very difficult questions of wilderness management. Professionally accustomed to tackling problems of management, Leopold had no ready solution for these tough issues. "What should be the policy regarding protection of the wilderness forests from fires, insects, and plant diseases?" he asked in his editorial for Pacific Discovery.[45] Recognizing that protecting wild lands from these attacks--and from too much impact from recreational use--would remove the wild from wilderness, he left it up to "a sympathetic interchange of ideas between the public and administering agencies" to resolve the touchy issue of wilderness management.[46]

The Refinement of a Hunting Philosophy.

Leopold's love of hunting remained closely interwoven

with his wildlife work. By the 1960s he had combined his two loves--for the hunt and for the study of wild animals--into a new working definition of wildlife management. In an essay entitled "The Future of Wildlife Management," written in 1966 and presented at the Second Annual Western Student Wildlife Conclave in Colorado, Leopold offered the following definition of wildlife management: "wildlife management means any planned, deliberate manipulation of a wild population of animals for some pre-determined purpose."[47] What had changed for Leopold in the 1960s was a definition of the "pre-determined purpose." In earlier decades producing a crop for hunting had been the primary purpose of wildlife biology for Leopold. This philosophy had changed by 1966. Wildlife existed, according to a more mature Leopold not just to be cropped but to be viewed. "I view our profession today...as infinitely more complicated than I viewed it even ten years ago," he told his audience in Fort Collins. "As a trained wildlife biologist, now, we must take a broader view of our objective than the narrow and rather specific one in which I emerged as a young wildlife biologist, namely that we're producing a crop for hunting. We are still going to produce crops for hunting. But that is only a part of our total responsibility."[48]

In Leopold's new, "more complicated" scheme of things, wildlife biologists' objectives could be grouped

into four categories: (1)"...wildlife as a source of food;" (2) "...protection or control of damage [from wildlife];" (3) "...wildlife management for the production of sports hunting and producing a shootable crop;" (4) "wildlife management for its aesthetic values--appreciation of merely seeing wild animals without cropping them."[49] Thus while ensuring a huntable "crop" of wild animals was still a valid reason for wildlife biologists to determine policy plans, it was only one important reason among three.

To some in that 1966 audience, it might have seemed strange to mention managing wildlife as a source of food. Hadn't Americans "developed" beyond that "primitive" stage? While most countries no longer had to manage wildlife to ensure a dependable protein source for its inhabitants, Leopold recognized that "an increasing number" of wildlife biologists would be taking jobs "with the FAO in Africa or Mexico" where they would "discover...a component here in terms of food value of wildlife that just had never occurred to [them] in [their] own training here in the United States."[50] Those biologists, he argued, should be prepared to deal with a management problem stemming from a shortage of protein for human consumption: the impossibility of trying to build back a herd of wild animals from which individuals are

poached constantly to satisfy the human population's need for protein. In this context, Leopold discussed "game cropping," a practice whereby wild--not domestic--animals are tended and harvested as a dependable source of protein. "There are all kinds of problems that must be overcome," he recognized,

> and the harvesting and processing of wild game is not half as easy as to harvest and process as a bunch of cattle that you can drive to a slaughterhouse. Yet the meat is there, and assuming that these problems can be overcome here is a whole new field of management of wildlife for a purpose which goes back 2,000,000 years. Now suddenly we realize that maybe we can do well to turn our attention back to this and do it on a systematic basis.[51]

The most radical change in Leopold's thinking was to give equal weight to wildlife viewing--to the esthetic value of wild animals. Hunters, according to Leopold, would have to share the resources managed by wildlife experts with those who chose to appreciate wildlife without carrying a gun. Leopold also emphasized this change in values from hunting to esthetic appreciation of wildlife in a paper presented to the 6th World Forestry Congress in Madrid in June 1966. His paper, "Wildlife and Man--Changing Values," described four "principal relationships between man and wildlife" and attempted to "trace the significant shifts in values and viewpoints."[52] While the paper contained no groundbreaking scientific or policy recommendations--the four principal relationships

were identical to those he addressed in Colorado--it does help chart the changes in Leopold's own thinking about hunting versus other wildlife values. Thus the "shifts in values and viewpoints" that Leopold set out to examine were primarily--and significantly--in his own thinking. When Leopold wrote, for example, that the esthetic relationship between man and wildlife, while "the most recent" value, is also "already one of the most potent," he was reflecting on the new position he gave to that value.[53] Where this new balance of values and interest in the esthetic aspect of wildlife would especially prevail and have importance for Leopold's policy work, was in his report on the future of the nation's wildlife refuges which appeared in 1968.

Leopold had come a long way in his perceptions of human/wildlife relationships to be able to think of hunting as only one component of the relationship. Part of his education derived from his travels. While in the 1950s he had observed the town meeting of Eskimos in Alaska, in the 1960s he visited game ranges in Africa and Australia. These trips added a worldly flavor to Leopold's ideas.

In the spring of 1962 Leopold traveled to Tanganyika and Kenya to help Park and Game Department officials study problems associated with dwindling wildlife resources.

Leopold was quickly convinced that lands could be better managed to protect wildlife and that, in the interim period between British colonial rule and financial independence, American money was needed. Such financially strapped countries as Tanganyika required help, he was convinced, if they were to practice wildlife conservation.[54]

He was very impressed with the expansive country and abundant and varied wildlife. Letters home and journal entries movingly chronicle scenes from his safaris.[55] At one point he watched the birth of a wildebeest "which in all took two hours." He later described in his journal the calf's first steps, amazed at how quickly a newborn wildebeest is mobile.

> In exactly 2 min. the calf began to lurch about trying to stand. After 3 min. of wobbling and falling he was able to move away beside her. Within 100 yards she broke into a slow canter to overtake the herd and the little calf stuck right by her side running with grace and surety--exactly 5 min. after he slid free into the world![56]

In a letter home to Alden Miller, he noted the reason for this seemingly precocious behavior. "Immediate mobility is essential to survival," he penned, "for the herd is followed by countless hyenas and jackals that gorge on calves that are a little too slow."[57] Another observation Leopold made while on safari concerned the hypothesis of Donald Ker and others that hyenas were hermaphrodites. On

the 19th of February, Starker dissected a hyena to test Ker's theory. He found it wrong.[58]

Leopold returned home with more than an enlivened imagination and beautiful memories of exotic wildlife. While becoming more sensitive to the particular wildlife management problems of lesser developed nations, he found evidence for a general policy on natural land management which would come to fruition only a year later. He did not necessarily develop new ideas about wildlife management while abroad, but he did obtain more evidence to confirm some of his convictions about the importance of habitat maintenance and active wildlands management. "Preservation of abundant wildlife in Tanganyika, as elsewhere," he wrote in his report to the New York Zoological Society in April 1962, "depends first and foremost upon maintenance of productive habitat. This cannot be accomplished solely by legislative decree, for habitat is an ephemeral and ever-changing entity. It must be managed."[59] As the "principal tools of management," he not surprisingly recommended "[r]egulation of fire and of numbers of animals."[60]

East Africa's wildlife resources were stressed, according to Leopold, because of policies which ignored habitat maintenance, not--as some conservationists would argue--because of hunting. "Hunting, both legal and illegal, is doubtless a significant element in reducing

wildlife numbers in local situations," he wrote in his report.

> But considering game populations in the aggregate, there is scant evidence that hunting is a primary controlling factor, comparable in importance to habitat destruction. Imperfect as it may be, the regulation of hunting in East Africa is generally adequate to protect basic breeding stocks of game. The big problem is protecting game habitat.[61]

The reasons to preserve Tanganyika's wildlife were clearcut for Leopold. He saw the economic value of "tourist dollars" flowing into East Africa in the pockets of safari-goers and of the potential yield of wild meat. Economics, while important for Leopold, were not the sole reason to preserve wildlife. There was the "purely scientific point of view" which held that wildlife should be preserved for future study. And, equally important, there was the moral point of view. "Abundant wildlife has social significance beyond the impersonal values of economics," he wrote. Wildlife, Leopold believed, should be preserved for posterity. "[T]here exists today a responsibility to preserve for future generations of Africans some of the natural wonder that is their heritage," argued Leopold representing the values of his own nation as it struggled to recognize its own shrinking wild heritage.[62]

While Leopold saw "[t]he problem of game management...as a nation-wide problem, by no means

confined to special parks and reserves," he did perceive that the National Parks would play "an important...function" in this process of "preserving, managing, and utilizing" the wildlife in Tanganyika.[63] And parkland, as other land, had to be managed, Leopold thought, not just maintained. While "[i]t would seem that protection is all that is required to maintain the natural habitat...it often proves necessary to manage both the vegetation and the numbers of animals to maintain an optimum or `natural' balance."[64] Again Leopold discussed the merits of using fire as a management tool. "Fire...is an ecologic tool that has to be controlled and deliberately used to maintain an optimum balance between grass and bush...Investigation of the proper control and use of fire is one of the most critical research needs on the national parks," he advised Tanganyikan wildlife officials.[65] And again he advised managing numbers of wildlife as a means of preserving habitat. "It should be recognized as a matter of policy," he wrote, "that protected areas like the parks can have too many animals as well as too few. When such conditions seem to be developing, there should be instituted first careful, local study of the ecologic balance in question, and secondly, systematic control of animal numbers, as deemed necessary."[66]

The scientific ideas Leopold used to form the basis for his recommendations--ideas about ecologic balance and optimum or "natural" balance--were entirely derivative. Such concepts were firmly entrenched in the literature of ecology, a science based on finding and maintaining balances in nature.[67] What was more original, was Leopold's application of such theory to national park policy and, more importantly, his recommendation to manage and not solely protect wild landscapes. Managing land to keep it "natural" was a radical way of looking at national park operations. It was a policy Leopold would advocate for maintenance of America's "wild" and "natural" national parks as well.

CHAPTER 3 ENDNOTES

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CHAPTER 4

THE 1960S AS THE DECADE OF PUBLIC POLICY WORK: THE NATIONAL PARKS

If in the 1950s Leopold played a role in state wildlife policy making--as advisor on California's antlerless deer hunting--in the 1960s he entered the national arena as chairman of an advisory board reporting to Secretary of Interior Stewart Udall. Udall was part of successive administrations dedicated to improving the environment. In the early 1960s, President John F. Kennedy called a White House Conference on Conservation and that same year delivered an inspiring address to Congress in which he called conservation "the highest form of national thrift."[1] Kennedy also proposed a Land and Water Conservation Fund, a concept supported by Kennedy's successor Lyndon B. Johnson.[2] In 1964 Congress passed an act creating the fund, which has since "served as the source for nearly all parkland purchases."[3]

Lyndon Johnson provided strong environmental leadership until the latter part of the 1960s when he became preoccupied with the Vietnam War. In his Great Society address Johnson stressed environmental quality declaring that "the challenge of the next half century is whether we have the wisdom...to enrich and elevate our national life and to advance the quality of American

civilization."[4] Campaign speeches from 1964 show a deeply rooted concern for natural beauty.[5] He proposed a "creative conservation of restoration and innovation...[whose] object is not just man's welfare but the dignity of his spirit."[6]

Johnson organized a Conference on Natural Beauty in May 1965 which had tangible as well as symbolic results. The sessions, according to political scientist Lynton Caldwell, were "a kind of national rite," in which "[r]epresentatives from a broad cross-section of American society met with highly placed public officials for a `laying on of hands'--a ritual legitimizing and confirming of a public and national responsibility for natural beauty and the quality of the American environment."[7]

At the center of both Kennedy's and Johnson's conservation efforts was Secretary of Interior Stewart L. Udall.[8] Udall earned a reputation as a champion of conservation when, as a representative from Arizona, he worked on the Committee of Interior and Insular Affairs.[9] As Secretary of Interior he had numerous opportunities to directly effect conservation policy and to ensure enforcement of congressional mandates. In 1962, after the congressional Outdoor Recreation Resources Review Commission completed a report on American attitudes towards the out-of-doors--a report which, according to Udall, was "a landmark analysis of our past failures and

present opportunities in the use and protection of our environment"--Udall created the Bureau of Outdoor Recreation "designed to advise and administer the development of recreation facilities on public lands under the Interior Department's aegis."[10] Udall was also responsible for replacing "stiff-necked" and "out-of-step" Conrad Wirth with George Hartzog as director of National Parks in 1964.[11] Hartzog, like Udall, was a "devoted supporter" of the "New Conservation," a policy which among other things considered "[outdoor] recreation...an utter necessity to the spiritual and emotional well-being of each and every citizen."[12] Udall also strongly supported presidential protection of wild rivers and wild lands in Alaska.[13]

One of the most obvious testimonies of Udall's commitment to conservation practices and environmental protection was his book The Quiet Crisis published in 1963. His goal was to make the general public aware of the environmental crisis at hand. He believed that an understanding of "the history of our husbandry, and...fresh insight concerning the men and the forces that have shaped our land attitudes and determined the pattern of land use in the United States" would help "repair some of the mistakes of the past, and...make America a green and pleasant--and productive--land."[14] He dedicated the

book "to the proposition that men must grasp completely the relationship between human stewardship and the fullness of the American earth."[15] Largely a chronicle of the history of conservationists and conservation movements in America from pre-colonial Native American ideas of the land to President Kennedy's efforts to influence conservation policy, the book ends with chapters devoted to "Conservation and the Future" and "Notes on a Land Ethic for Tomorrow." These final chapters are important for what they tell us about Udall's suggestions for solutions to "the quiet crisis." Not surprisingly Udall argued for an augmented role for "government leadership and...investment" in constructing and implementing conservation policy.[16] Equally predictable was his appreciation for the role of scientists in solving environmental problems. "With the acumen of our scientists," he wrote,

> we can achieve optimum development of resources that will let us pluck the fruits of science without harming the tree of life.[17]

He believed that policy makers should use scientists to help them understand the extent of the resources available and "all the alternative plans for their use and development."[18] Like a true progressive, Udall was an optimist who believed in professionalism, scientific analysis, and technical solutions.[19]

In the final chapter of his book Udall made a plea for a "land ethic." "Only an ever-widening concept and higher ideal of conservation will enlist our finest impulses and move us to make the earth a better home both for ourselves and for those as yet unborn," he concluded.[20] His debt to Aldo Leopold is obvious. Fifteen years before in his famous A Sand County Almanac, Aldo had eloquently and forcefully called for an ethic which would consider ecological relationships of prime importance.[21] "There is as yet no ethic dealing with man's relation to land and to the animals and plants which grow upon it," the elder Leopold had written in 1948. If there was a need for a land ethic in 1948, there was even more urgent need for one in 1963. Udall, who was painfully aware of his country's failure to develop an ethic that would discourage environmental destruction, wanted to help Americans fashion one. And it is no wonder that he called upon Aldo's son for assistance. Starker Leopold--chosen in April 1962 to head a special advisory board on wildlife management--had become one of those scientists with the necessary "acumen" to help Americans develop resources without "harming the tree of life."[22]

Starker was perfect for the job: he was Aldo Leopold's son and a professor of wildlife management and zoology at a prominent university. His name at the helm of the committee would lend a measure of legitimacy to any

published results. On the committee with him were Stanley L. Cain, Clarence M. Cottam, Ira N. Gabrielson, and Thomas L. Kimball, all prominent figures in the field of wildlife management. Cain served as professor of botany and as Charles Lathrop Pack professor of conservation and as chairman of the Department of Conservation at the University of Michigan. Cottam directed the Welder Wildlife Foundation in Sinton, Texas and was former assistant director of the U.S. Fish and Wildlife Service. And Kimball, who at one time had been head of both Arizona's and Colorado's game departments, was executive director of the National Wildlife Federation, "the nation's largest sportsmen's conservationist organization."[23]

Gabrielson's tenure in wildlife management circles was also long and successful. Serving as director of the United States Fish and Wildlife Service from 1940 to 1946, he was in 1963 president of both the Wildlife Management Institute (1946-1970) and the World Wildlife Fund (1961-1972). By 1962 Gabrielson had authored several well-known books on wildlife issues: Wildlife Conservation (1941), Wildlife Refuges (1943) and Wildlife Management (1949).

The advisory board's first assignment was to evaluate wildlife management policies in the national parks. Before World War II national parks had been managed

essentially as scenic wildlife reservations. As sanctuaries for big game species, parks were protected from poaching and vandalism, fire, and predators.[24] Such a protection-oriented view of management had serious ramifications for the ecological health of the nation's parks. For example, by the 1930s most large predators--primarily wolves, mountain lions and coyotes--had been removed from Yellowstone National Park in accordance with federal predator control policies.[25] The result was that elk herds grew out of proportion to the range. Consequently beaver, deer, antelope, and bighorn sheep had difficulty holding their own and, more importantly, the range itself deteriorated.

After the disastrous slaughter of large predators, park policy makers were constantly trying to repair the damage done to both wildlife and habitat. By the 1960s the situation was dire. In 1961, the superintendent of Yellowstone National Park, Lemuel Garrison, devised a two-pronged policy to restore some sense of "balance between Yellowstone's animal populations and their environments." The programs Garrison implemented were the reduction--a euphemism for killing--of both elk and bison herds on the northern range of the park and the education of the public about the need for such massive killings. While elk and bison populations were temporarily reduced, both herds would continue to increase beyond the carrying

capacity of the range, because there were no natural predators in the park to keep their numbers in check. The educational program fared no better. Vociferous complaints, especially from hunters who wanted to do the killing themselves, testified to the limited effect of the propaganda campaign.[26] It was in response to these complaints, that Udall set up his advisory board on wildlife management.[27]

Leopold was well aware of his board's assignment. "It is acknowledged," he wrote in the report, "that this Advisory Board was requested by the Secretary of the Interior to consider particularly one of the methods of management, namely, the procedure of removing excess ungulates from some of the parks."[28] Familiar with the questions of management his committee would have to raise, he knew the report would be in the limelight of a heated wildlife management debate.

The report provided an opportunity for Leopold to air publicly many of the ideas he had been grappling with for the past years: the ecological necessity of both predators and fire and the importance of habitat maintenance. "I really worked long and hard on that [report]," he later remembered. "I got in a lot of the ideas that had been brewing in my mind for a long time."[29] He also saw the report as a real opportunity to influence

wildlife policy nationally and even internationally. As he put it "the whole world was watching." "If," he told one listener, "we were to recommend public hunting of elk, parks in Africa would feel pressed to permit the public hunting of elephant. We decided that we would develop a philosophy of management that could be applied universally."[30] With such a serious mission at stake, Leopold did not shy away from advocating an unpopular position on park management questions. As he later told an interviewer: "I figured, `Okay, I'm in my career here; I can say any damn thing I want.'"[31]

As chairman of the board, Leopold drafted the report and sent it out for comments from the other members. Response from the others varied. Stanley Cain loved it. "Stan thought this was really the berries," Leopold recalled. Cottam and Gabrielson also had a favorable response. They only had "little things that they wanted to change." Kimball was the stumbling block. "The bug was really Kimball," Leopold reflected. "He didn't like it very much."[32] Achieving consensus with Kimball dissenting, proved to be no easy task for even as amiable a chairman as Leopold.

The point of contention was the issue of public hunting in the parks. As early as 1944 hunters had demanded that parks be opened up to hunting.[33] In the 1960s they had again risen up in dismay and anger at the

Park Service's decision to cull elk herds. They wanted in on the deal. "[T]his was really a pretty hot issue, this public hunting in the parks," Leopold recalled during a 1983 interview. "Was it to go or not?" As it turned out, Leopold was firmly opposed to the idea. "[T]he Parks[']...primary purpose...is not public hunting," he argued.[34] With its chairman opposed to public hunting, the report's fate was sealed; there would be no public hunting within park boundaries. This did not mean, however, that there would be no killing in the nation's parks. It just meant that the Park Service, as professional caretakers, would be responsible for any herd reductions. In short, the Park Service's policy of herd culling was vindicated. "Every phase of management should be under the full jurisdiction of biologically trained personnel of the Park Service," the report emphasized.

> This applies not only to habitat manipulation but to all facets of regulating animal populations. Reducing the numbers of elk in Yellowstone or of goats on Haleakala Crater is part of an overall scheme to preserve or restore a natural biotic scene. The purpose is single-minded. We cannot endorse the view that responsibility for removing excess game animals be shared with state fish and game departments whose primary interest would be to capitalize on the recreational value of the public hunting that could thus be supplied. Such a proposal imputes a multiple use concept of park management which was never intended, which is not legally permitted, nor for which we can find any impelling justification today.[35]

As "an old state fish and game man" Kimball wanted

public hunting in the parks. To get him to sign the report, Leopold had to fine-tune his negotiating skills. Under terrific time pressure, Leopold took Kimball the final draft signed by all the other members. "Kimball wouldn't sign it," Leopold remembered. "He kept hemming and hawing about public hunting. It was obvious that some of his state friends had really put the bite on poor old Tom." To get the report signed, Leopold had to work around the truth. "There was some phrase in there," Leopold told an interviewer in 1983, "about under such and such

> circumstances the Park Service "might" employ the assistance of public hunting to reduce as necessary. He insisted that word "might" should be "must." And if I changed that word in every one of [the hundreds of] copies he'd sign it. I said, "Okay. Sign it." He signed, and I never changed it! It went out just this way. Well, it would have looked like an awful mess if somebody was reading this through and came to this crucial thing and here that word is in ink! Oh, brother! Tom knew I wasn't going to do it anyway, and we've laughed about it since.[36]

Kimball did not just let the matter rest, however. He wrote a review of the report--one he had co-authored no less--for the National Wildlife Federation's Conservation News of April 1963, in which he brought up the whole public hunting issue again. "As long as park values remain unimpaired," he wrote, "the most economical and feasible procedures [to deal with surplus big game animals

within park boundaries] undoubtedly will involve the recruitment of qualified hunters from the general citizenry to assist in removal programs." He then took the issue and headed off in his own direction:

> The mere fact that the expert riflemen, who are recruited from the general public, and subjected to rigid control by Park Service personnel, may obtain enjoyment from the removal procedure or may even be willing to pay the Federal Government for the privilege of doing the necessary job, or may be willing to accept the carcass of the animal removed as payment for services rendered, should not be a bar to the favorable consideration of this type of management tool.[37]

The response of the hunting public to the report's conclusion on public hunting was not favorable. "I don't agree with it at all," quipped one self-proclaimed "States righter."[38] And when in the winter of 1966-67 park authorities again reduced the Yellowstone elk herd--albeit mostly by live-trapping--the hunting public had it. Senate hearings on the herd culling policy were held in March 1967. Just before the hearings were to convene a "solution" was worked out: no more killing. The Park Service would live-trap only.[39] Thus even with all the uproar, the advisory board's opinion remained in tact: there would be no public hunting within park boundaries.

Unbeknownst to the hunters, the public hunting debate was just part of a larger and extremely important question the Leopold board addressed: should the Park Service manage or protect the parks as wild ecosystems? And there

was another difficult issue to resolve: what exactly was the purpose of national parks--how should the Park Service balance use with preservation? The history of national park management holds the key to understanding the problems national parks faced in the 1960s.

When the nation's parks were set up little consideration, if any, was given to ecological principles. In other words park boundaries were drawn for economic or political reasons, not ecological. This continued to be a problem even after the 1940s and 1950s when government officials had access to the necessary biological information. In short, it was difficult to manage parks as ecological areas because, in fact, they were not. Alfred Runte, historian of the nation's parks, spells this out clearly. "The enduring obstacle to sound ecological management in the national parks was the prior emphasis on setting aside purely scenic wonders," he writes.[40] "[F]ew national parks," he continues, "provided for the broader, more intricate needs of biological conservation."[41]

Not only was there inadequate and insufficient acreage to manage parks ecologically, but there was insufficient ecological understanding before the 1920s. For example, the first director of the nation's parks, Stephen T. Mather, lent wholesale support to the federal government's predator control policies. He asked the

Bureau of Biological Survey (now the United States Fish and Wildlife Service) to help eradicate large predators in the parks.[42] Even with the overpopulation of elk in Yellowstone and of deer in the Kaibab forest, Mather never did see the reason for keeping predators to regulate ungulate populations. He was not, according to one biographer, "in the ecological know. His love for the birds and beasts was deep and genuine, but it was not erudite."[43] Mather and other top officials might not have been "in the ecological know" but there were others--even within the park service--who were.

Leopold's committee was not the first to recognize the acreage problem and its biological implications for wildlife management. In the late 1920s the new director of the National Park Service, Horace Albright, directed a survey of wildlife in the national parks to be made in the Branch of Education and Research by three well known wildlife experts: George M. Wright, Ben H. Thompson and Joseph S. Dixon. The study was published in 1933, the same year that a Division of Wildlife Studies was established within the Park Service with Wright as chief.[44] Wright's two-volume series Fauna of the National Parks of the United States: A Preliminary Survey of Faunal Relations in National Parks (1933) and Wildlife Management in the National Parks (1935) were landmark reports. They traced the problem of poor resource management to the lack

of adequate land for maintaining wildlife populations. "The preponderance of unfavorable wildlife conditions is traceable to the insufficiency of park areas as self-contained biological units," the authors wrote.[45] The Wright team stressed the need for revised management considerations such as abandoning the garbage feeding shows of bears because such shows had bad effects on the health and habits of bears.

While much of what Wright and his colleagues wrote, including this suggestion about bear habits, went unheeded until a later date, the Park Service did eventually come in to the "ecological know" and try to maintain some kind of balance between wildlife and range resources.[46] The Albright administration considered abandoning the predator control policy in the late twenties and early thirties. And by the mid thirties predator control was largely a thing of the past in the nation's parks.

Even with increased ecological awareness, Park Service personnel still had to contend with the effects of misguided past policies. Just how far the Service should go in manipulating the environment to correct past mistakes was, and probably will, remain the crucial question. Ironically, the Leopold report's attempt to answer that question amounted to a revised reaffirmation of old park service policy. Thus when Leopold and his

committee asked, "[H]ow far should the National Park Service go in utilizing the tools of management to maintain wildlife populations?", they could safely answer, as far as the Service thinks it needs to go.[47] The report supported the idea of "purposeful management of plant and animal communities as an essential step in preserving wildlife resources,"--and here Leopold quotes from the 1916 Park Service statement of purpose--"`unimpaired for the enjoyment of future generations.'"[48]

Leopold drew support for this answer from a report he helped author on "Management of National Parks and Equivalent Areas." In 1962 Leopold had been a part of the American delegation attending the First World Conference on National Parks which convened in Seattle on the fairgrounds of the Seattle World's Fair. He was part of the committee chaired by F. Bourliere from the Medical School in Paris, which wrote the report on National Park Management. Thus Leopold was quite familiar with the report's contents, and quoted extensively from it when it came time to draft his own report a year later. His definition of management, for example, followed verbatim from that of Bourliere's committee. "Management," he quoted in his report to Udall,

> is defined as any activity directed toward achieving or maintaining a given condition in plant and/or animal populations and/or habitats in accordance with the conservation plan for the area...Management may involve active manipulation

> of the plant and animal communities, or protection from modification or external influences.[49]

While many especially in the conservation community would argue that protection was the way to manage wild areas such as national parks, Leopold was looking for justification of an "active manipulation" idea of management. He found it in the World Conference report. "Few of the world's parks are large enough to be in fact self-regulatory ecological units," he quoted again. "Management based on scientific research is therefore, not only desirable but often essential to maintain some biotic communities in accordance with the conservation plan of a national park."[50]

Given that the park service should actively manage parks, to what end should they be managed? Leopold had a ready answer--this time his own--to that question:

> As a primary goal, we would recommend that the biotic associations within each park be maintained, or where necessary recreated, as nearly as possible in the condition that prevailed when the area was first visited by the white man.[51]

In short, "[a] national park should represent a vignette of primitive America."[52] Two radical ideas stand out in this simple sounding formulation. First, that "primitive" was desirable; second, that one actually could actively manipulate the environment to restore or recreate a particular natural--or primitive--state.

According to the National Park Service Act of 1916, national parks should be managed "in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."[53] In other words, parks were to be both preserved and used. As Runte clearly illustrates, controversies regarding the interpretation of this vague, if not oxymoronic, definition were frequent and unsatisfactorily resolved.[54] Especially with the increase in automobile use after World War II, it became difficult to maintain a balance between preservation of the parks' resources and planning for the enjoyment of tourists. By the mid-1950s, more Americans were visiting the nation's parks than there were roads or lodgings to accommodate them. In 1955 National Park Service Director Conrad Wirth fought for and received congressional funding for his Mission 66 program, designed to provide some relief for this post-war travel boom. The ten-year project--to be completed by 1966, the golden anniversary of the National Park Service--was intended to expand the carrying capacity of the nation's parks by building new roads and lodgings and by creating visitor centers. While work on the parks' infrastructures was necessary, many thought Wirth had gone overboard. His Mission 66 program is "generally considered the highwater mark of user-oriented park policy."[55]

Once underway, according to Runte, preservationists' "fears that Mission 66 was indeed road- and big-development oriented" were substantiated.[56] In the early 1960s, preservationists around the country were calling out for more nature-oriented public land policies. The Wilderness Act, for example, was passed in 1964 and set aside more than 10 million acres of wilderness land.[57] This new preservation-oriented public consciousness affected park policy as well.

With his call for a return to primitive America, Leopold both reflected and helped shape this new preservation-oriented mood. "The goal, we repeat," Leopold wrote coming down squarely on the side of preservationists, "is to maintain or create the mood of wild America...but the whole effect can be lost if the parks are overdeveloped for motorized travel." "If too many tourists crowd the roadways," he stressed, "then we should ration the tourists rather than expand the roadways."[58] On the issue of recreation facilities, Leopold was equally direct.

> Additionally in this connection, it seems incongruous that there should exist in the national parks mass recreation facilities such as golf courses, ski lifts, motorboat marinas, and other extraneous developments which completely contradict the management goal. We urge the National Park Service to reverse its policy of permitting these nonconforming uses, and to liquidate them as expeditiously as possible (painful as this will be to concessionaires). Above all other policies, the maintenance of

naturalness should prevail.[59]

Preservationists were pleased with Leopold's position on this issue, but they were hesitant to accept his prescription for maintaining or restoring "wild America." Leopold firmly believed that it was ecologically possible to recreate a natural environment. While he conceded that the ecological know-how was lacking at the time--"[i]n essence, we are calling for a set of ecologic skills unknown in this country today," the report acknowledged[60]--he argued that with additional research such knowledge would be within the park service's reach. With characteristic optimism, he wrote: "We urge the expansion of the research activity in the Service to prepare for future management and restoration programs."[61]

If the exact restoration scientific know-how was lacking, there were a few things the service could start with. Management methods could include re-introducing native species and allowing fires and other natural controls such as predators to curb explosive populations. Aside from the controlled shooting of "excess" park ungulates, fire was the most controversial management tool Leopold advocated. "Of the various methods of manipulating the vegetation," he wrote, "the controlled use of fire is the most `natural' and much the cheapest and easiest to apply." Since park lands had been

protected from fire for so long, however, much of the fuel had to be reduced before a groundfire could be risked, Leopold argued. "Once fuel is reduced, periodic burning can be conducted safely and at low expense."[62]

The implications of the Leopold report for fire management were enormous, according to historian Stephen Pyne. "The new policy," he writes, "was an open invitation to use prescribed fire."[63]

> The policy recognized fire as a natural phenomenon, encouraged the practice of letting natural fires in predetermined areas run their course, allowed the use of prescribed fire as a substitute for natural fire, and expected control of any fire not advancing management goals.[64]

When the Park Service adopted what Pyne has called "the dazzling philosophy of the Leopold Report" in 1968, it jumped, he argued, into the "vanguard of a national debate about fire policy."[65]

Initially, Leopold later remembered, preservationists, who were thrilled with the no-public hunting decision, were opposed to controlled burns or even letting natural fires run their course. After they confronted Leopold about the issue, however, they came round. Leopold remembered their conversion well.

> At the North American Wildlife Conference it was customary...for the president...to have an open-house cocktail party after the banquet, and I was invited this year and I went up there. And all these guys, including [David] Brower and [Tony] Smith, one by one nailed me to the wall, and did I really honest-to-god believe this [idea about

> burning]?...I said, "you're darn right I do. Come on out...I'll show you a couple of places that will scare you half to death, and right in Yosemite Park." And they mulled it over and all of a sudden they decided, "By gosh, maybe you're right."[66]

Conservation journals also heralded the report. They referred to it as "inspired," and "startling."[67] "It is one of the most significant statements in the nearly half-century history since the National Park Service was established," wrote the editor of the Sierra Club Bulletin.[68] "The Leopold report is one of the most significant reaffirmations of national park policy since the establishment of the National Park Service," Bruce Kilgore, one of Leopold's former students, wrote for the Sierra Club Bulletin.[69] Kilgore commended the report for its advocacy of management over protection and for its recommendation to return parks to their primitive state.

> At a time when "mass recreation" is the fad word for many outdoor programs, when "multiple use" is ubiquitous, and when pressures are continually being placed on the national parks for contrived amusements, this report...recommends that a reasonable reminder of primitive America should be restored to our national parks.[70]

In a final round of applause, Kilgore ranked the Leopold Report with the great conservation writings of the past. "[T]he great significance of this report is that it sets forth at an extremely high political level the basic ecological principles which Muir, Olmsted, Leopold, the

Sierra Club, and others have been urging down through the years."[71]

Adolph Murie, the well-known naturalist on the staff of the National Park Service, shared Kilgore's enthusiasm but offered several reservations. "I am so pleased with the public hunting and other recommendations in the report," he enthused, "that I hesitate to make any comments that deviate from full agreement." Murie did, however, disagree with one fundamental aspect of the report. Protection was what the parks needed not management. "I believe," he wrote, "that our attitude should be to protect parks with the minimum necessary management." When park service employees controlled lightning fires, insect outbreaks, and predators, Murie argued, they were managing the park not protecting it. Really Murie's disagreement was a question of semantics. "My comments," he conceded, "are in great part a matter of different phraseology. I am certain that fundamentally there is agreement that our national parks should be preserved in a natural state, as free as possible from all intrusions and manipulations."[72] But he did take issue with the idea of maintaining "biotic associations within each park...as nearly as possible in the condition that prevailed when the area was first visited by the white man."[73] Natural conditions cannot be "maintained," Murie argued correctly. Change, as Leopold well knew, is an

integral part of any natural community. "This goal," Murie complained, "suggests that we freeze the environment at a certain primitive stage. This implies a static condition. Although the committee may not have meant this, it has been so interpreted and accepted by some administrators."[74]

The person whose opinion mattered most to Leopold was Secretary of Interior Udall. Udall had an official and unofficial response. His official response was rather non-committal. He wrote a bland letter--Leopold later called it "a nice little letter that said nothing in particular"[75]--to the committee praising the report and reiterating Leopold's call for more research. He commended the committee for recommending management in lieu of protection--what he referred to in his letter as "fac[ing] up to the realities of the situation." [76] Not surprisingly, he skirted the public hunting issue having only this to say:

> As new national recreation areas are created by Congress, opportunities will increase for the development of public hunting throughout our land. I am pleased that you noted this. When the Land and Water Conservation Bill is enacted into law, certain types of lands will be purchased and developed by Federal, State, and local governments for outdoor recreation, often including hunting. The total effect will be to enhance hunting opportunities.[77]

Udall called the report "constructive" and pledged that it

would "serve as a guide to this Department and to the National Park Service through the years ahead."[78]

Unofficially, and at least initially, according to Leopold, Udall was more reluctant to associate himself with the report's controversial findings. Plans had been made for the secretary to receive the report and officially respond after Leopold had "presented the essence of the report to the nearly one thousand professional conservationists, wildlife managers, sportsmen, and interested laymen in attendance at the most important Annual meeting in the conservation field"--the Twenty-Eighth North American Wildlife Conference held in Detroit in March 1963.[79] According to the published proceedings, however, the secretary "was forced to cancel his personal appearance because of a last-minute change in plans."[80] In his stead stood John Carver, Udall's Assistant Secretary, or as Leopold put it, "one of his [Udall's] henchmen."[81]

Udall had "chose[n] not to go," Leopold remembered in a later interview. After Udall read the report, he backed away from the heat he anticipated. According to Leopold, what worried Udall was not the public hunting issue, but the sections devoted to fire. "[A]ll this stuff about burning scared him half to death," Leopold recalled. "He just didn't know what to make of this, whether we were going to get shot down in flames or

what." According to Leopold, Udall later regretted what turned out to be a miscalculation. When conservationists did not get up in arms about the fire issue, Udall wished he had not backed down. "And it wasn't but a few weeks later," Leopold recalled, "when Udall regretted very much that he hadn't been there, and he told me so. He said, `Starker, God damn you, you hit a home run, and I didn't know it!'"[82]

The Leopold report did become national park policy. By memorandum on 2 May 1963, Udall instructed the Service to "take such steps as are appropriate to incorporate the findings of the Board into the administration of the National Park System."[83] The memorandum spelled out the report's intent for Park Service personnel. "The goal," it reiterated, "...is to maintain or to create the mood of wild America."[84] In 1968 the Service published its revised policies based on the Leopold Report--policies which came to be known as the "Green Book" for public lands zoned as "natural."

While the report was worked into revised Park Service policy guidelines, it has not always been easy for Service personnel to implement its intent. First of all, the report was big on ideas but small on details. Obviously, the committee argued, the Service itself would find out what to do to maintain or recreate wild America and then

do it. "It is obviously impossible," the report read, "to mention in this brief report all the possible techniques that might be used by the National Park Service in manipulating plant and animal populations."[85]

Second, according to one critic of the National Park Service, the recommendations of the Leopold report have not been realized because of resistance on the part of Service personnel. Over a period of years, Alston Chase, a recent observer of Park Service policies, amassed considerable evidence to support his thesis that "the service remains reluctant to give resource management the high priority it deserves" because the service is composed mostly of rangers trained as law enforcement agents not biologists.[86] In a 1987 article for the Atlantic Monthly, Chase made this case fairly and cogently.

Third, when Park Service biologists did study alternative methods of recreating the mood of wild America, they did not always feel comfortable acting on their conclusions. Twenty years after the report's appearance, Service personnel still worried about making decisions--which to some might seem arbitrary--to manipulate, not just protect, the parks' plant and animal populations. When in 1983 Leopold met with the superintendent of Sequoia-Kings Canyon Park, the discussion turned to decision making in park management. Leopold found that even one of his old students--"one of

my products, one of my own kids, and a damn good boy" as he put it in a separate interview--was uncomfortable making decisions. "[T]hey're uneasy about arbitrary decisions," Leopold told the interviewer, "they really were concerned in a genuine way with arbitrary decisions that have to be made as soon as you move into management."[87]

In 1983, two decades after he authored the report, Leopold still believed in his manipulate-to-preserve idea of management. "I still defend it," he said. "Okay, so you make some arbitrary decisions. So what? They may be arbitrary, but that doesn't necessarily mean that they're capricious, as long as your objective is a goal of what you construe to be a natural ecosystem."[88] Leopold had never shied away from changing a landscape to promote wildlife habitat. He was part of a school of thought that trusted the results of well-construed management. "Management doesn't scare me," he told a listener. "As long as you know what you're doing--as long as you know why you're doing it, I should say--I can't feel uneasy about management."[89]

The report has recently suffered a second blow. Not only have its ideas not been fully realized, but its thrust has been misrepresented in a series of recent books and articles on Park Service policies. While a few well-

researched and scholarly treatises give Leopold's ideas a fair hearing, there are just as many unscholarly, popular tracts that do not.[90] In his uneven critique of Park Service practices, Playing God in Yellowstone: The Destruction of America's First National Park--a study fraught with errors while at the same time airing important challenges to misguided policies--Alston Chase, a philosophy professor turned journalist, argues that the report "replaced science with nostalgia...[and] romance."[91] Unfortunately, other authors have taken their cue from Chase. "[P]hilosophical idealism rather than sound scientific sense," is how Richard Bartlett refers to the report.[92] And, journalists, unwilling to spend time researching their topics, have completely misrepresented Leopold's ideas. They refer to the report as propounding a "hands-off philosophy," which is the antithesis of Leopold's intent.[93]

While the report was short on specifics and while it did perhaps give too much power to Park Service personnel, it was a brave and timely assessment of wildlife issues in the nation's parks. When Leopold was called on to advise the government, the nation's parks were in terrible shape. After the abuse they received prior to the National Park Service Act in 1916--the logging, burning, grazing, and hunting--they received equally abusive treatment in the form of "protection" from natural controls such as

predators, lightning fires and insect outbreaks. Exotic plants and animals had been inadvertently introduced and all parks had been greatly disturbed to make room for human use and enjoyment. The result, according to Leopold, was "biotic associations" which were "artifacts, pure and simple."[94] Leopold's remedy for this disastrous situation was straightforward: restore the parks to their "natural" state all the while recognizing that the parks would need to be managed actively because they were not ecologically independent areas.

Bear Management in Yellowstone National Park.

The 1963 report to the Secretary of the Interior was not the last time Leopold influenced Park Service policy-making. He served on important Park Service committees throughout the 1960s and 1970s and authored at least one more important document on national park wildlife policy: A Bear Management Program and Policy for Yellowstone National Park.

In 1964 George Hartzog, director of the Park Service, appointed Leopold chairman of the Natural Science Advisory Committee.[95] In 1967 he was made director of the Office of Natural Science Studies--or "Chief Scientist"--of the National Park Service. He accepted the position on a

probationary basis "to help get the research program off the ground" as he put it.[96] When he took the job, Leopold had reservations about the amount of time he would be able to devote to it, and as it turned out he was too busy to be the engaged chief scientist he had hoped to be.

In the winter and spring of 1968 Leopold served as Knapp Visiting Professor in the department of wildlife ecology at the University of Wisconsin in Madison, a position which demanded much time and energy. By March 1968 he was tired of juggling so many balls. He resigned as chief scientist albeit "with pangs of real regret," and recommended Robert M. Linn, deputy chief scientist, as his replacement.[97] In May 1968, director of the National Park Service George Hartzog accepted Leopold's resignation reluctantly writing, "the boost you have given this important program during this formative time is not to be measured merely by the amount of time you have had available to devote directly to this job."[98] As per Leopold's recommendation, Linn was appointed chief scientist in 1968 and continued to work very closely with Leopold who remained active as chairman of the Natural Science Advisory Committee until 1971. On the advisory committee with Leopold were Stanley Cain of the University of Michigan, Charles Olmsted of the University of Chicago, and Sigurd Olson, naturalist and essayist living in Ely, Minnesota.[99]

As chair of the Natural Science Advisory Committee, Leopold became embroiled at the end of the 1960s, in the fury over National Park Service policy on grizzly bear management. The debate was, in some ways, a direct offshoot of the Service's interpretation of his 1963 report. Pitted against each other were two views of bear management. On one side of the issue were recently hired Yellowstone Park Superintendent Jack Anderson and his Supervisory Research Biologist Glen Cole; on the other side were two independent biologists, John and Frank Craighead, and their followers. At issue was how to wean grizzly bears of their artificial feeding habits and return the population to its "wild" state.

Yellowstone grizzlies had been feeding at Park Service dumps for decades. Before World War II the Service had capitalized on the bear's bad habit. To increase the number of visitors to the park--visitation grew from 25,000 in 1914 to 260,000 in 1929[100]--and to help tourists enjoy their visit to Yellowstone appeasing their desire to see a wild grizzly, Park Service employees actually staged feeding shows with, as reporter Tom McNamee put it, "grandstands...erected and the garbage spread out buffet-style on raised platforms. There were regular feeding schedules just as in a zoo, and the parking lots nearby overflowed with five to six hundred

cars nightly."[101] The feeding shows ended, however, after a series of incidents in which human life and property were threatened. The demise of the nightly shows did not mean that the bears stopped feeding at the dumps, however.[102] In fact the dumps remained open even after the Park Service had received scientific advice to close them. In 1944 Olaus Murie, issued a report in which he recommended that the park be sanitized to help wean the bears of their unnatural feeding habits. The Park Service passed up the chance to clean up its act, however.[103] And by 1967 grizzly-caused injuries in Yellowstone had increased significantly.[104] When two women were mauled and killed by different bears on the same night in Glacier National Park, Yellowstone Park personnel knew they had to do something. In 1968 they moved to close the dumps.

The architect of the plan to close the dumps was Supervisory Research Biologist Glen Cole. According to Cole, closing the dumps quickly would result in retraining young bears to regain their wild habits and search for food in natural ways. If some bears--those who haunted campgrounds in their perpetual search for unnatural food--would have to be killed, so be it. Cole did not worry excessively about eliminating grizzlies because he believed there were essentially two populations of bears: the population that hung around dumps and campgrounds--essentially the expendable population--and

another population, a back country population, whose numbers had never been included in any census and whose wild habits would save the species from extinction if the dump-raised bears proved unable to adapt.[105]

Cole's ideas fit neatly with official park policy which was to protect "representative populations of grizzly...bear under natural conditions" and "to regulate human use so as to avoid incidents and the need to destroy problem bear," a policy which in turn fit neatly with the Park Service's interpretation of the 1963 Leopold Report.[106] Cole took the Leopold report seriously. He always spoke of ridding the population of semi-domesticated grizzly to "preserve the wild grizzly."[107] And he shared Leopold's dream of "a vignette of primitive America." In one telling letter to Leopold he wrote: "We may have a chance on your vignette of primitive America."[108] Cole's theory of grizzly management was to phase out the park's dumps as rapidly as possible so young bear would not acquire artificial eating habits. In this way the population would return to its wild state relatively quickly.

Not everyone agreed with the Park Service's plan to speed up closure of the park's dumps, however. In particular, John and Frank Craighead, two biologist brothers with whom Leopold had almost worked in the late

1940s and who had been studying the Yellowstone grizzly population since 1959, opposed the plan. The brothers--as they came to be known--produced the first major study of grizzly bears and in the process pioneered field techniques which have become essential to any subsequent bear study.[109] They argued that rapid dump closure would drive bears into campgrounds in their search for food and would consequently result in more bear/human incidents which in turn would lead to unnecessary and unaffordable reductions in the grizzly bear population. In 1967, in anticipation of the Service's management plan of 1968, the brothers issued an interim report representing their eight years of study on the Yellowstone grizzly population--a report highly critical of the Park Service's bear protection and management program.[110] When their report--"Management of Bears in Yellowstone National Park"--had little perceptible effect on dump closures and as more grizzlies were killed, the brothers took their cause to the press. There was no "back country population" of grizzly bears, they argued, and the Park Service's policy would only result in the demise of the grizzly bear. The Craigheads recommended a very gradual phasing out of artificial food sources so bear-human incidents could be avoided. They also advised "putt[ing] out food in some form, garbage or otherwise, that will attract and hold bears in areas away from campgrounds."[111]

When in 1968 and 1969 more bears had to be destroyed due to property damage and risk to human life, wildlife experts around the country rose up in alarm. The brothers claimed that the Park Service had not heeded their advice and had proceeded too quickly with the cleaning up process; the Park Service claimed that they were proceeding slowly and that the bear-human contacts were the accumulated result of "semi-domesticated bear[s] hooked to artificial foods."[112] In fact, according to Yellowstone Park expert, Paul Schullery, the Park Service had accepted the brothers' recommendations to close the dumps slowly and "in 1968 and 1969, the amounts of food were reduced rather than eliminated."[113] The result was the same, however, no matter who was to blame: bear-human contacts were increasing. Matters had reached a head by the summer of 1969 when five persons, including a six-year-old girl, were attacked by grizzlies.[114] The Park Service needed help. For expert scientific advice they turned to the Natural Science Advisory Committee headed by Starker Leopold.

A meeting of the advisory committee was set for the 6th and 7th of September, 1969. During the summer of 1969, Leopold wrote to Cole about the proposed advisory committee meeting and the "liberal sprinkling of trout" Leopold hoped to work into his schedule. "I hope you will

be free to join me in some of each of these activities," he wrote. "I look forward to seeing you, old boy," he concluded, clearly expressing his fondness for Cole.[115]

The committee consisting of Leopold, Cain and Olmsted (Olson was absent), agreed to meet privately with the Craighead brothers, who, according to Yellowstone Park expert Paul Schullery, refused to discuss their recommendations with Park Service personnel present.[116] The rest of the two-day conference was devoted to expert testimony on issues related to bear management and work sessions to hammer out a report to Park Service Director Hartzog.[117]

Without explicitly taking sides, the report that Leopold wrote clearly supported Park Service policy. Whether it was institutional loyalty, his closeness to Cole or the weight of scientific evidence, Leopold appeared unimpressed with the Craighead data. "Unfortunately, prognosticating how garbage-fed grizzlies will respond to deprivation depends on judgment rather than data," Leopold wrote, dismissing the Craigheads' research results with a swipe of his hand.[118] Since it was one expert's judgment against another's, Leopold's committee felt that there was no need to remove responsibility from the agents in charge--Superintendent Jack Anderson and Park Service biologist Glen Cole. Essentially the committee's report left Anderson and Cole

free to act as they saw fit.[119] As it was, however, limited funds precluded immediate elimination of garbage, so some sort of gradual phasing out would have to occur.[120] While the committee sided with the Park Service, it was nevertheless alarmed by the increase in bear attacks and the Craigheads' warnings. To counter increased grizzly visitation to campgrounds as dumps were closed, the committee recommended eight campground protection practices which they thought would help avoid harm to tourists and the unnecessary killing of bears.[121]

Leopold sent out copies of the report for comments before finalizing it for Hartzog. Olmsted and Cain made minor changes in wording or structure. Cain wrote "One couldn't possibly help much because you write so concisely and lucidly."[122] Olmsted alluded to the sensitivity of the issues when he wrote: "Your treatment of the whole topic is admirable and tactful while still conveying those points upon which we agreed which are not in line with present policy."[123] Jim Reid, a wildlife management specialist with the Fish and Wildlife Service, wrote: "I heartily endorse the management goals as set forth in the preamble. These are essentially the goals that were established by the Service in 1959. I do, however, question the Advisory Committee's implication that the Service has not been working toward the attainment of the

management goals, i.e., I would have preferred to see the purpose of the meeting stated as an evaluation of alternative management strategies in order to develop a safe and ecologically sound program that will fully achieve the goals."[124] Leopold also gave Cole an opportunity to comment on the draft. Cole penciled in a few changes mostly in wording to soften the Park Service's image. His commitment to the Service's management approach and his idea that criticism on the part of the Craighead brothers was mostly a case of sour grapes is evident in his comment to Leopold: "I think the reason for the meeting was that our attempts to accomplish the park's objectives were being constantly criticized in the press. Of course you can't say this. Hopefully, the report will settle things for restoring wild bear to using natural foods and the rest can be simply details."[125]

The Craighead brothers got no such opportunity to comment on the draft. When they received their copy of the report, however, they fired off a letter to Leopold urging him to make one important change in wording. The original report had referred to the Craighead report of 1967 as "unpublished and unavailable for the use of public agencies administering grizzly populations." The brothers called that statement "incorrect and serv[ing] no useful purpose." Leopold accepted their recommended change: that the report mention that the Park Service had access to the

data and simply urge prompt publication of the report.[126] In his official letter to Linn, Leopold stated that he "concur[red] in John Craighead's suggested modification." Penciled in at the bottom of the letter, however, was the following comment: "I hope you agree that concurrence was the best course to follow in this situation. I have no desire to argue these nit-picking details. So let's change the one page of the report on any additional cc [carbon copies] that are sent out."[127]

After the report hit Hartzog's desk, however, problems with both the grizzlies and the Craighead brothers escalated. In June 1970, Leopold received from the Craighead brothers a request for further research time in Yellowstone National Park. He hesitated to grant them the request because of past bad blood. "I find nothing specifically objectionable about this research proposal," he wrote to Superintendent Jack Anderson, "except for the fact that it originates with the Craigheads who have been so singularly uncooperative with other projects in the past."[128] "I don't see any particular reason to extend an unpleasant and difficult relationship if we can find some way to avoid this," he concluded.[129] Anderson had no intention of granting the Craighead request. "At this point, I do not propose to enter into such a memorandum of understanding principally because of the reasons you point

out," he wrote to Leopold.[130] "Since your opposition to the park's program is so clear," Anderson wrote to Craighead, "and we wish to avoid a continuous controversy while we are attempting to do a very difficult job, I request the you consider the studies of bears at the Trout Creek dump completed."[131] Anderson tried to dissuade Craighead from the notion that his "research methods and findings" were the problem. What had especially annoyed Anderson, as he explained to Craighead, was repeated violations of the agreement specifically the section "where [the Park Service] ask[s] to be able to comment on [Craigheads'] management recommendations before they are disseminated to the press or published."[132]

John Craighead was furious. He wrote a lengthy detailed letter to Anderson making his case for more time at the Trout Creek dump.[133] He also wrote to Leopold asking that he intercede on the brothers' behalf.[134] "Regardless of the reasons given for denying us the opportunity to complete our research work," Craighead complained, "we have been `thrown out' because we have tried to present our position and this has not been in agreement with those held by certain people in the Yellowstone administration."[135] Since he had been instrumental in denying the Craigheads' request in the first place, it was hardly surprising that Leopold did not help out.

Leopold continued to disagree with the Craighead brothers' research on the grizzly. Throughout the early seventies, Leopold and Cole corresponded regularly about the controversy.[136] When at one point, John Craighead offered to pay his own way to Berkeley to address Leopold's students. Leopold demurred making excuses about lack of funding and a tight schedule.[137] "We will have to defer our meeting till another day," he wrote.[138] When Frank Craighead published his Track of the Grizzly (1979), in which he gave his side of the whole controversy, Leopold wasted no time getting hold of a copy. Leopold's annotations in the margins of the text confirm his lasting disrespect for the brothers' part in the grizzly bear controversy. "What a crock of bologna!" he wrote beside one paragraph.[139] "Horse shit!" and "How in the hell did they know that?" by others.[140] Leopold did not, however, make public this lack of respect. Preservation of the peace and a semblance of impartiality were paramount concerns for Leopold.

While Leopold remained on cordial terms--at least officially--with the brothers, his relationship with the grizzly, as author of the Yellowstone bear management report, deteriorated rapidly after 1969. In January 1970, Leopold published an apology for the Park Service's bear management program in the popular magazine Natural

History. He referred to the Service's program as one of a series of "protective moves," which "represent the best and most civilized action that we can take."[141] While the article might have helped save the face of the Park Service, it did little to save the grizzly.

Things got steadily worse for the grizzly after 1969. McNamee's book, The Grizzly Bear and Paul Schullery's The Bears of Yellowstone give detailed accounts of the problems both the bears and their managers had during the 1970s and 1980s.[142] It is impossible to say what effect Leopold's management report had on the bears, but it is clear that the Park Service sped up their program of dump closure after the September meeting.[143] In 1970 it decided on abrupt closure of the last open dump--the Trout Creek dump.[144] In March 1970 Leopold's committee reconvened, this time in Portland, Oregon, and gave their stamp of approval to the Park Service's plan.[145] Cole was able to proceed with his program: to have the grizzly population "on natural foods by 1972."[146]

The process of returning bears to a natural diet was costly, however. In 1970, according to Schullery, 44 grizzly bears died or were killed--"the highest known total in history." In 1971 again 44 bears died. While Park Service personnel were only directly responsible for 20 of those 88 deaths, something was clearly amiss.[147] What is not clear is whether the Park Service's program of

rapid dump closure was directly responsible for the high number of bear deaths. According to Schullery, other factors could have played a large role. For example, record keeping practices improved after the 1970s. The Park Service's control actions changed and natural food items became scarcer just as dumps were being closed.[148] Whatever the cause, things were in such utter disarray in Yellowstone by 1973 that the Secretary of Interior requested that the National Academy of Sciences convene a committee to evaluate the crisis. Ecologist Ian McTaggart Cowan, a close friend of Leopold's and considered by most to be a genuinely disinterested observer, chaired the committee which came down hard on the Park Service.[149]

While the bears were on natural foods by 1977, the problem was far from solved. It was now impossible to chalk up the problem to bad press as Cole and others had complained in the early seventies.[150] In the eight years following the Leopold bear management report, grizzlies had killed more people in the parks than in the previous century.[151] National Park Service Director Everhardt requested that Leopold and Durward Allen, a wildlife biologist also on the National Parks Advisory Board, review the bear management problems in the nation's park and "suggest what further measures might be taken to promote and protect the interests of both the public and

the bears."[152]

Even Leopold, staunch Park Service supporter that he was, had to admit that there was a problem with the management program. Leopold and Allen came down hard on the Park Service. They gave the Service "an A for effort in trying to manage bears but no more than a C- in accomplishment."[153] Leopold and Allen recommended that the Park Service improve efforts to educate the public about "public deportment in bear country," upgrade sanitizing practices, refine record-keeping systems, hire specialized personnel capable of dealing with bear related problems, and augment research efforts to better understand and even train wild bears.[154] The authors also recommended that the Service "initiate a legal appraisal of NPS responsibility and liability toward the increasing number of unsophisticated people coming to share the parks with the bears."[155]

As it turned out, Leopold and Allen's concern that the Service was leaving itself exposed "to charges of negligence and legal liability" was not unfounded. There were at least three court cases brought against the National Park Service in the 1970s.[156] When in 1979 Leopold was called as an expert witness to comment in a case brought against the federal government, he argued in his sworn statement, that the Park Serivce had adequately warned the public and provided adequate campground

surveillance.[157] When Leopold got word in August 1981 that the case had been settled out of court, he expressed dismay and concern for the precedent set. "I am uneasy," he wrote the government's attorney, "with the idea that the Park Service..,should have to pay even a modest sum for an accident that was not the Government's fault. I see the logic of settling in place of the more expensive trial but I am uncertain about future precedent."[158]

The National Park Service took Leopold's call for a return to primitive America very seriously. And it tried at least in the case of the grizzly bear to implement his policy recommendations. As all parties--policy makers, rangers, the public and the bears themselves--discovered, the practice of restoring America's parks to their wild state would not be painless.

One contemporary observer has called Leopold's advisory board work his "finest contribution to national wildlife resources."[159] And it was largely due to his advisory position that he received three important awards in the mid-1960s. In 1964, he was awarded the Department of Interior's Conservation Award. In 1965 he received the Wildlife Society's Aldo Leopold medal for "service to wildlife conservation." And in 1966 the Audubon Society presented its medal to Leopold.[160]

CHAPTER 4 ENDNOTES

1 President Kennedy's quote is from Stuart Udall, The Quiet Crisis (New York: Holt, Rinehart and Winston, 1963), 185. For a discussion of Kennedy's conservation congress, see Charles E. Randall, "White House Conference on Conservation," Journal of Forestry 60 (1962): 457-58 and "President's Conservation Program Stresses Recreation," Journal of Forestry 60 (1962): 255; and Samuel P. Hayes, Beauty, Health, and Permanence: Environmental Politics in the United States, 1955-1985 (Boston: Cambridge University Press, 1987).

2 Udall, 192; Dyan Zaslowsky, These American Lands: Parks, Wilderness, and the Public Lands (New York: H. Holt, 1986), 35.

3 Zaslowsky, 36.

4 President Johnson's speech as quoted in Lynton K. Caldwell, Man and his Environment: Policy and Administration (New York: Harper & Row Publishers, 1975), 35.

5 Ibid., 34-35.

6 As quoted in ibid., 35.

7 Ibid., 39.

8 For a description of Secretary Udall's success as head of the Department of Interior, see Ronald A. Foresta, America's National Parks and Their Keepers (Washington, D.C.: Resources for the Future, 1984).

9 See the biographical sketch of Udall in his The Quiet Crisis.

10 Ibid., 192; Zaslowsky, 35.

11 Foresta, 68.

12 Zaslowsky, 35.

13 Ibid., 265-67, 305.

14 Udall, viii.

15 Ibid.

16 Ibid., 191.

17 Ibid., 194.

18 Ibid., 195.

19 See Samuel P. Hayes, Conservation and the Gospel of Efficiency: The Progressive Conservation Movement, 1890-1920 (1959; New York: Atheneum, 1974) for a description of a true "progressive."

20 Udall, 202.

21 Aldo Leopold, A Sand County Almanac (New York: Oxford University Press, 1949; 1968 ed.), 201-26.

22 Stuart Udall to A. Starker Leopold, 19 April 1966, p. 1,University of California, Berkeley, Bancroft Library, A. Starker Leopold Collection (cited hereafter as UCBASL), 81/61c, carton 5, f. Advisory Committee--Refuge Report; Udall, 194.

23 "A Vignette of Primitive America," Sierra Club Bulletin March 1963: 4.

24 Susan Power Bratton, "National Park Management and Values," Environmental Ethics 7 (Summer 1985): 117-33.

25 Alston Chase, Playing God in Yellowstone (Boston and New York: The Atlantic Monthly Press, 1986), especially chapter 10.

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27 Chase, 33.

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CHAPTER 5

THE 1960S AS THE DECADE OF PUBLIC POLICY WORK: PREDATOR CONTROL AND NATIONAL WILDLIFE REFUGES

Not long after the Leopold committee issued its report on wildlife in national parks in March 1963, Secretary of Interior Stewart Udall assigned to the committee another,what one journalist called, "touchy task."[1] In May 1963 Udall asked his Advisory Committee to "determine whether the Department of the Interior is doing a proper job in controlling rodents and predators; whether the Government should attempt such control work on private as well as public lands; whether there is too much control or not enough; and whether or not some animal life is threatened with extinction as a result of Government predator control work."[2] Leopold dug into the task at hand with great personal interest and commitment.

Predator and rodent control, especially the role played by the federal government, had, by the 1960s, become a sensitive issue. The federal government first got involved in the business of exterminating predators and rodents in 1915 when the Bureau of Biological Survey--a division of the Department of Agriculture--spent $125,000 on ways to "destroy...wolves, prairie dogs, and other animals injurious to agriculture and animal husbandry."[3] Public sentiment, for the most part,

supported the government's decision. Even William T. Hornaday, director of the New York Zoological Park and early conservationist and animal protection activist, held the view that predators were the root of much evil.[4]

By the 1920s, however, rumblings of discontent could be heard over the din of anti-predator rantings. One of the dissenters was Joseph Grinnell, Leopold's first mentor at Berkeley. At a 1924 meeting of the American Society of Mammalogists, according to historian Curt Meine, Grinnell and a few others argued "on scientific and economic grounds that the Biological Survey was causing more harm--real and potential--than good in carrying out its large-scale intensive campaign against predators."[5] While animal ecology developed more slowly than plant ecology, animal ecologists, by the late 1920s, were beginning to look at the health of total ecosystems and to regard studies of predators as central to their work.[6]

The Biological Survey was broken up in 1939 and predator control fell to the Department of Interior's Fish and Wildlife Service (1940-1956) later called the Bureau of Sport Fisheries and Wildlife (1957-1974).[7] The new name and department affiliation did nothing, however, to shrink the government's broad-scale program. And the public was still largely comfortable with the anti-predator campaign. "The program was accepted generally as

one essential to the livestock industry and important to the national economy," writes James Trefethen, a historian of wildlife management.[8] "Conditioned since early childhood to consider the wolf as a slavering, snarling menace and the fox and coyote as thievish villains," he goes on, "most of the American public could have cared less if the whole lot were exterminated."[9]

Attitudes would change rapidly, however, after World War II when Compound 1080 was introduced. Compound 1080, sodium monofluoroacetate, is not only a powerful poison--a teaspoon sprinkled on a chunk of meat can kill the largest predator--but it remains in the tissues of any animal ingesting it. In other words, the carcass of a wolf killed by 1080 becomes "a deathtrap" for any scavenger who feeds upon it. Conservation groups rallied against the widespread use of 1080 causing such a fray that the distribution of the compound was brought under strict federal control.[10] Meanwhile Aldo Leopold and other naturalist essayists began challenging the public's anti-predator attitudes. Leopold's A Sand County Almanac, which appeared in 1948, includes an essay entitled "Thinking like a Mountain" that graphically describes the elder Leopold's conversion from a zealous hunter to humbled admirer of predators and tugged at readers' consciences.

While the public was learning about the effects of

compound 1080 and the respect due to predators, they were also hearing from animal ecologists about the importance of predators to healthy ecosystems. According to historian of science Thomas Dunlap, "[b]iologists played a key role in translating latent dissatisfaction with the `conquest of nature' into a political movement which included, as part of its program, a new attitude and policy toward predation."[11] One of those influential biologists was Starker Leopold. His report to the secretary of interior was instrumental in channeling discontent into revised ecological practice.

The report that Leopold delivered to Udall in March 1964 criticized the government's predator control program. Because Leopold considered the issue more "complex than the relatively straightforward issue of managing wildlife in national parks," he focussed the committee's critical eye on the role of the Predator and Rodent Control branch of the Fish and Wildlife Service (PARC).[12] At the outset, the advisory board adopted two tenets. Especially the first was radical in its timing and emphasis. When Leopold wrote, "All native animals are resources of inherent interest and value to the people of the United States," he placed with one tilt of the pen as much value on wolves as on game animals like deer. To calm the fears of woolgrowers and other agriculturists who

benefitted from the government's predator control program, the committee included a second tenet: "At the same time," the committee continued, "local population control is an essential part of a management policy, where a species is causing significant damage to other resources or crops, or where it endangers human health or safety."[13] The committee believed that both interests could be served by the government's policy. One just needed to be able to discern how to balance the two. "The problem," they wrote, "is to differentiate those local situations where control is justified from the numerous cases where the same species of animals have social values far in excess of the negligible damage they cause."[14]

The problem with PARC was its inability ever to assign value to a predator or rodent. "[T]he federal predator and rodent control program," the committee discovered, "is to a considerable degree shaped and designed by those who feel they are suffering damage from wildlife." In short, farmers and ranchers who benefitted from the program called the shots. While some control of predators and rodents was necessary, the committee concluded, such control should be strictly limited.[15] The Leopold committee had only minor complaints about the methods used in federal predator control programs. Even the use of compound 1080--especially in the open lands of the western United States--posed no particular problem for

the committee. It was the extent of predator control that bothered them.[16] When it came to rodent control, however, compound 1080 was not the poison to use. "[S]econdary poisoning of unintended victims by 1080 distributed primarily for rodents is, in the opinion of this Board, a major problem in animal control which requires regulation," Leopold wrote.[17] For rodent control, Leopold's committee recommended "strychnine or other chemicals which are not readily transmitted to scavenging animals."[18]

The committee offered a six-point plan to the secretary. First, they recommended appointing an advisory board on predator and rodent control. "[W]e feel," Leopold wrote, "that an Advisory Board would keep [the secretary] far better informed than at present about the adverse social values involved in various control cases and how these should be handled in the interests of the American public as a whole."[19] Second, the committee recommended that PARC reassess its own goals. "In point of fact," argued the committee, "the segment of the public interested in husbandry and wise use of all animal resources represents a substantial majority and can no longer be suppressed."[20] Third, the committee made a few suggestions on PARC operations. Fourth, they advocated a greatly amplified research program, "financed out of

savings resulting from curtailment of the present PARC program."[21] Fifth, PARC should find a new name, a name which might "better express this new concept [of control as advocated by the committee], both for the public at large and for the personnel concerned."[22] Last but certainly not least, the committee asked the secretary to find legal measures to restrict the use of poisons such as 1080. With its six-point plan, the committee recommended that there be a "complete reassessment of the goals, policies, and field operations of the Branch of Predator and Rodent Control with a view toward limiting the killing program strictly to cases of proven need, as determined by rigidly prescribed criteria."[23]

The report--entitled Predator and Rodent Control in the United States--was welcomed by most groups. Carl Buchheister of the National Audubon Society, commended Leopold and his committee "on this very fine and historic report." Especially pleasing to the conservationists was the first tenet Leopold and his committee proposed. "We are delighted," Buchheister said during comments after Leopold presented the report at the Twenty-Ninth North American Wildlife Conference in Las Vegas--aptly devoted to "Resources for the Good Life"--"that the committee has declared the principle that predatory animals and birds are valuable parts of our wildlife."[24] A Kansas resident also in the audience in Las Vegas, referred to the report

as "extraordinarily excellent."[25] As was to be expected, the woolgrowers had some problem with the committee's recommendations. J. R. Broden, vice president of the National Wool Growers Association, spoke out against the report. "I assume," he said, "that Dr. Leopold would be disappointed if he did not receive a complaint from the livestock [interests]...I have listened with a great deal of interest to the report and of some of the impressions that have been left, I am quite highly critical."[26] Essentially, the only point of agreement between Leopold and Broden was the formation of an advisory board to advise the Secretary of Interior. Livestock interests needed to be heard, Broden admonished. "[L]ivestock profits have to come into operation here," he told Leopold and the audience.[27]

The complaints of the livestock community notwithstanding, the secretary accepted most of the recommendations. As a way to spur changes in its mission and to clean up its public image, PARC received a new name. According to one historian of wildlife management, "PARC was consolidated with other bureau functions within the Fish and Wildlife Service and renamed the Division of Wildlife Services."[28] Other changes took place as well. Trained biologists were hired to replace the old "government hunters" whose indiscriminate killing of

predators and rodents had marred the reputation of PARC.[29] And a wildlife biologist was appointed chief of the division. The use of compound 1080 was restricted as well.[30]

After the Leopold report was published, however, the controversy surrounding the government's role in predator control did not subside. According to James Trefethen, whose study The American Crusade for Wildlife was published by the Boone and Crocket Club, there were "[b]etween 1964 and 1971 four major investigations of the federal role in predator and rodent control...all of them critical of existing policies while noting significant progress toward the correction of deficiencies."[31] Public outcry against predator and rodent control intensified after the Leopold report due in no small part to growing concerns about toxic substances in the environment.

Although he would have been a likely candidate to remain actively involved with the issue, Leopold refused to get embroiled in the fray until he was called again to serve on a government committee. When in January 1971 Leopold was asked to participate in a documentary film "on the status of coyotes and their persecution by government agencies and others," he demurred on ethical grounds. He applauded the commitment of private individuals interested in evaluating the actions of the Fish and Wildlife Service, but felt it would be inappropriate for him to

criticize the agency he had "worked" for in 1964. "I would feel pretty awkward attacking the government agency which asked me to make such a report because they had not followed our recommendations to the letter," he wrote.[32] "I'm sorry that I feel obliged to cop out on you in this worthwhile undertaking," he concluded, "but I am sensitive to the ethics of my position and relationships to the government. I don't like to recommend something and then turn around and sock them in the stomach if they don't follow my recommendations. Better that someone else do the socking."[33]

This is not to say that Leopold agreed with the government's post-report actions. In a letter to a state legislator from Salem, Oregon he complained--albeit mildly--about the Fish and Wildlife Service's inability to practice highly selective predator control measures. "I'm sorry to say [that] even now...the Fish and Wildlife Service and many western states" still do not approach predator control in a selective way "aimed just at those individual animals that are really causing trouble," he wrote.[34] By this time, Leopold was much more forceful in his representation of the interests of non-hunters and non-agriculturists, however. "I think that there is a much bigger issue involved here," he wrote to Dan Simmons of Oregon's legislative fiscal committee, "...and that is

the high esthetic value of predatory animals to the American public, a force which...no longer can be ignored." "Decision[s] on how predators should be handled is no longer [the] prerogative of the livestock people or the game departments or the hunting public," Leopold emphasized.[35]

Finally in 1971 President Richard Nixon's Council on Environmental Quality and the Department of Interior agreed to sponsor another study of government's role in predator control. Leopold was part of the impressive committee assigned the task of reviewing federal as well as state policies. Chairman Stanley Cain had been assistant secretary of interior in the late 1960s and Durward Allen, Maurice Hornocker, Richard Cooley and Frederick Wagner were all experts on predator-prey relationships.[36] Among other things, the Cain committee condemned the use of compound 1080, resulting in President Nixon's executive order prohibiting the use of all chemical poisons for predator control on federal lands.[37] Leopold stood firmly behind the recommendations of the report and was "delighted" with Nixon's "decisive" implementation of its recommendations.[38] After the report was presented to the public in March 1972, Leopold commended the President. "The recent Executive Order of President Nixon precluding the use of poison on public lands and calling for other modifications in control

programs represents a positive and gratifying advance in our national philosophy toward carnivorous animals," he said.[39]

To the Rescue of the National Wildlife Refuge System

In April 1966, Secretary Udall again requested the expert advice of what he called the "blue-ribbon `Leopold Committee.'"[40] In a letter to Leopold, he described the task at hand: the committee should "take a long, searching look at the National Wildlife Refuge System and related problems and [offer]...recommendations on how to perfect it."[41] The National Wildlife Refuge System was in shambles as Udall explained, largely because it had grown "opportunistically, rather than on a planned scientific basis."[42] Udall's strong belief in the invaluable contribution science could make to government decision-making was again apparent in his letter to Leopold. "We realize that social and political and economic realities are the very stuff of government...but nevertheless we should be able to make better informed scientific judgments," he wrote.[43] It was the "wisdom and experience" of scientists like Leopold that could help government make better decisions.[44]

The National Wildlife Refuge System that was so in

need of repair essentially began in 1903 when Theodore Roosevelt designated Pelican Island in Florida as a federal refuge for the protection of birds from the guns of plume hunters and other sportsmen.[45] By 1966 the system had grown from its meager beginnings to approximately 29 million acres, as land was added with the primary purpose of protecting the continental migratory waterfowl population.[46] In 1966, the Endangered Species Preservation Act redefined the National Wildlife Refuge System as "including all lands administered by the Secretary of the Interior that are now designated as wildlife refuges, protection units for endangered species, wildlife ranges, game ranges, wildlife management areas, and waterfowl production units."[47]

While the system by 1966 had amassed quite an acreage with a diversity of descriptions, it lacked focus and direction, according to Leopold. "[A] clear statement of policy or philosophy as to what the National Wildlife Refuge System should be and what are the logical tenets of its future development" was still lacking, he wrote in his report.[48] Leopold's committee--still comprising Clarence M. Cottam, director of the Welder Wildlife Foundation; Ira N. Gabrielson, president of the Wildlife Management Institute; and Thomas L. Kimball, executive director of the National Wildlife Federation; and including Ian McTaggert Cowan, dean of the University of British

Columbia, who replaced Stanley Cain when the latter became assistant secretary of interior in 1966--set out to suggest "a viewpoint to guide refuge administration and management."[49]

Leopold was in a good position to suggest a philosophical direction for the refuge system. He had after all just finished setting the philosophical tone for National Park Service policy. Three years after his committee's landmark statement of purpose for the national park system, "vignettes of primitive America" were still dancing in his head. With these ideas in mind, he and his committee set out to naturalize the National Wildlife Refuge system as far as was possible. While the committee could not--and did not set out to--change the primary purpose of the refuges as established by law, they proposed adding an element of naturalism to the management policy. "This board," they wrote,

> recognizes the primary importance of protecting and perpetuating migratory waterfowl, as subjects of hunting and as objects of great public interest. Public shooting on parts of the refuges is another important function . Likewise we acknowledge the significance of refuges in serving the needs of rare or endangered species.[50]

It was "beyond"--or outside of--those goals that the system should be returned to its natural state.[51]

Leopold established the framework for his philosophical discussion by asking a question: "In

America of the future, what are likely to be the highest social values that the refuges can serve?"[52] The refuge system could not be "all things to all people," he recognized and he--as a scientist in service to his government--was prepared to help determine the highest social values the system could serve: naturalism and aesthetic appreciation.

As in 1963 with the report on wildlife in national parks, Leopold strove for enriching the natural by means of image and active management. He had to let his readers "see"--in other words imagine--the refuges as natural entities. His image for the national parks had been both vivid and powerful, but he could not use it again. Instead of calling the refuges "vignettes of primitive America," he referred to them in drafts of the report as "sanctuaries." But Kimball nixed that idea in his comments on the report. "Starker," he wrote, "do we want to present a sanctuary approach to wildlife mgmt. That concept went out 20 yrs. ago. Perhaps some other word."[53] Leopold promptly replaced "sanctuary" with the less vivid term "bit of natural landscape." "[W]e view each National Wildlife Refuge," the report stated, "in the old-fashioned sense of a bit of natural landscape where the full spectrum of native wildlife may find food, shelter, protection and a home."[54]

Having established the image of refuges as natural landscapes, Leopold insisted that they be managed that way. "In essence," he wrote in the report, "we are proposing to add a `natural ecosystem' component to the program of refuge management."[55] What such a "component" meant for the program is clear from the report:

> Wherever a fragment of some native biota remains on a refuge it should be retained or expanded and restored insofar as this is practicable and in conformance with the primary function of the refuge.[56]

Leopold had not wavered from his position that active management--rather that protection--was the way to preserve naturalness in an ecosystem.[57] "The national refuges should stand as monuments to the science and practice of wildlife management," he wrote in the report.[58] Especially game ranges and non-waterfowl refuges had fallen prey to the misunderstanding that protection necessarily promoted natural values. Protective policies in these areas had caused explosive population growth often above the carrying capacity of the range. "Nothing can be more deleterious to the habitat and to the animals themselves than carrying too many on the range," Leopold warned. "The gun is usually needed in management sooner or later."[59] "Presumably the game ranges could receive, at least locally, more intensive habitat management than in the past," he concluded.[60] It

is clear that Leopold was not prepared to relinquish an active role for wildlife managers in engineering a natural landscape in the wildlife refuges.

While Leopold advocated management in lieu of exclusive protection, not just any managers nor management policy would do. He advocated management by a certain group of professionals for certain specific--in this case natural--ends. "The refuges are intended to serve certain biological and social objectives," he wrote, "and their development should be guided primarily by the professional managers who are to make them function."[61] The committee could easily observe that many refuges were overdeveloped for production of crops and they heard that many refuges managers were encouraged to develop cropland instead of restoring native vegetation.[62] In their report the committee chastized what they called "an ambitious staff of engineers and managers" for equating "any development with improvement." And they noted that "[s]ome refuge plans were stronger in principles of agricultural engineering than of wildlife ecology."[63]

In the place of agricultural engineering, Leopold wanted to see "ecological engineering." Precisely what that entailed was not clear, but the larger brushstrokes of Leopold's intent were evident: "Frequently the same techniques [as with agricultural engineering] are involved, but the ecological framework maintains and

blends natural relationships with man-designed improvements."[64] It was essentially this emphasis on agricultural engineering that sparked the Leopold committee's call for naturalism. And in turn their plea for naturalism would hit agricultural development especially hard. "In light of our plea for naturalism in refuge management," Leopold and his committee wrote, "we suggest a thoughtful moderation in physical development of terrain."[65] And what development took place should be strictly "ecological" rather than agricultural.

Leopold's position followed from his conviction that refuges should serve what he termed "the highest social values." As a wise observer of both public and scientific trends, Leopold concluded that such values were naturalness and public support for wildlife. To assign refuges the role of furthering those values, Leopold, besides countering the view of refuges as breeding grounds for wildfowl, would have to address two other common views of wildlife refuges: as purely public hunting grounds where the non-shooting public would not want to venture or as recreational playgrounds for public outings.

The hunting issue is particularly interesting. Leopold's position on the importance of hunting seemed by the end of the 1960s to be changing. He was still an avid hunter, but he was also able to see the handwriting on the

wall: non-hunting wildlife interests were on the rise and those interests had to be represented. The preparation of the draft report on wildlife refuges offers a unique opportunity to examine Leopold's struggle with the hunting issue.

When Leopold and his blue-ribbon committee made their recommendations to the federal government, hunting and wildlife refuges were almost synonymous. This connection was not fortuitous. While initially set up as sanctuaries, wildlife refuges quickly became associated with public waterfowl hunting, as the bulk of the funds to support the system came from a hunting tax paid by duck hunters. And by 1958, forty percent of any refuge was open for hunting.[66]

For Leopold this close connection posed two problems: lands purchased with duck stamp funds were expected to be "of maximum value to waterfowl" and non-hunting wildlife interests were too often ignored.[67] While hunting was important to Leopold, he felt it should not take precedence in the wildlife refuge system over other wildlife interests. "The number of Americans concerned with viewing or photographing wildlife is increasing at least exponentially with population," he wrote. "Their interests should be served by the refuges, along with the interests of the hunting public."[68] In earlier drafts, Leopold had used stronger language: "The number of

waterfowl hunters is not increasing," he had written. "Our main point is that the refuge system should be oriented to serve the wildlife interests of the general outdoor public, not primarily the hunting public."[69] One of his fellow committee members--Thomas Kimball, Executive Director of the National Wildlife Federation--had urged Leopold to change his wording: "Does this mean or could it be interpreted to mean," he queried, "that all other wildlife user interests are to have priority over hunters. If this be the intent, I can't buy it."[70]

Leopold ended up trying to find the middle ground between Kimball's suggestions and those of Ira Gabrielson. The latter agreed with Leopold's recommendations regarding hunting. "[A]s other uses of refuges grow," he wrote to Leopold, "hunting may increasingly interfere with other legitimate recreational uses."[71] "I agree completely with your conclusion that it is not necessary to permit hunting on the smaller non-migratory game species...," he concluded.[72] In contrast to Kimball, Gabrielson wanted to see the statement on hunting made even stronger.[73]

Clarence Cottam, director of the Rob and Bessie Welder Wildlife Foundation in Sinton, Texas, agreed with Leopold and Gabrielson on the hunting issue. "I, for one, would like to see all hunting eliminated on the smaller refuges but I do believe in hunting on the larger

refuges," he wrote by way of comments on Leopold's draft report.[74] "I see no reason for not having rabbits, quail, squirrels and other creatures in abundance in areas where people can go and enjoy seeing them," he continued. "I see no reason why the trigger-happy individuals should be the only ones allowed to enjoy these creatures."[75]

As it ended up, the committee's recommendations on hunting were strong, but not as strong as they might have been. Kimball recommended changes in just about every paragraph devoted to a discussion of hunting on refuge land, often writing "I can't go along with this wording" or "don't like this term."[76] As is clear from his draft, Leopold had intended to diminish the importance of hunting on refuge land:

> We take the view that the national refuges should be consciously developed as show places for all kinds of wildlife. Seventy per cent of the 14 million visitors come to the refuges to see and photograph wildlife and enjoy the natural scene. Hunters constitute only four per cent of the visitors. Hunting, therefore, should be fairly restrictive to favor a maximum abundance and variety of wild birds and mammals, gentle enough to be easily seen by the visiting public.[77] (italics added)

Kimball did not like this paragraph at all. "Don't know where these figures came from but probably include sightseers, picknickers, etc. etc.," he wrote. "[C]an't go along with this wording."[78] Leopold softened his language and, in so doing, the position of the committee

on the issue:

> We take the view that the National Wildlife Refuges should be consciously developed as show places for all kinds of wildlife. All forms of disturbance, including hunting, should be so regulated in areas of visitor concentration as to favor an optimal display of wild birds and mammals, gentle enough to be easily seen by the visiting public.[79]

There were many other places where Leopold tried to undo the emphasis on hunting on refuge land. "Wildlife oriented uses, with emphasis on wildlife viewing, should be an objective of every refuge," he wrote in the draft section of recommendations.[80] Kimball circled the word "emphasis" in the draft and wrote in the margin: "I agree wildlife viewing is an important segment of refuge purpose but I refuse to give it emphasis or priority over other refuge values."[81] Leopold modified the sentence to remove any hint of emphasis: "Wildlife-oriented uses, such as wildlife viewing, should be an important secondary objective of every refuge."[82] In one section devoted to hunting and fishing Leopold had wanted the report to read:

> Hunting and fishing are appropriate uses for portions of many refuges, so long as they do not endanger the protective function. Keeping in mind, however, the importance of the refuges as places for public viewing of wildlife, both hunting and fishing...should be controlled so as to minimize disturbance of birds and mammals along roads or other viewing points.[83]

Kimball rejected both the idea that refuges have a "protective function" and that refuges should have primary

importance as wildlife viewing areas. The report was changed to reflect these comments.

It is difficult to tell why Leopold felt compelled to change his position to jibe with Kimball's. Perhaps he wanted to choose his battles; perhaps he ended up agreeing with Kimball's interpretation of the committee's work. Perhaps he feared unnecessary problems with hunting associations with which he was closely affiliated. Kimball was after all executive director of a very important and active wildlife association--the National Wildlife Association--for which Leopold himself served as conservation consultant.[84] Whatever the reason, Leopold took Kimball's comments to heart and gave the report a less radical stance with respect to hunting than he had set out to do.

Even if the document did not proscribe--or even restrict--hunting in the way Leopold had intended, the report did stress other wildlife values. Refuges should be places "where the outdoor public can come to see wild birds and mammals in variety and abundance compatible with the refuge environment," the report stated. And further, the report stressed that a refuge should be "a 'wildlife display' in the most comprehensive sense."[85] In their recommendations at the end of the report, the committee mentioned that "wildlife-oriented uses, such as wildlife

viewing, should be an important secondary objective of every refuge."[86] Another way that the committee tried to change the focus of refuges from public hunting ground to "wildlife display" areas, was to recommend that general funds be used to finance the program of land acquisition and development.[87]

> Duck stamp funds alone are inadequate to finance this program of land acquisition and development. In view of the growing recreational and educational value of refuges to the general public, we suggest that use of general funds is justified to augment the tax on waterfowl hunters in extending the refuge system.[88]

Kimball and all other committee members went along with these recommendations.

The other problem with wildlife refuges, according to the committee, was the public's perception of the areas as "public playgrounds."[89] The committee noted that especially "in highly populated areas, some refuges...have become so oriented to mass recreation that there is a question whether these areas are serving their original function as wildlife reserves."[90] The committee knew that sixty-nine percent of the visitors in 1966 were not interested in hunting or fishing, but in general recreation and outdoor enjoyment.[91] "How far," the committee could then ask, should refuge administrators "go in attempting to help meet this popular demand for public playgrounds; secondly, what kind of recreation should be

offered on the refuge areas?"[92] Leopold had ready answers for both questions. He received great support from committee members--especially Ira Gabrielson and Clarence Cottam--when he reiterated and thus strengthened the previous Fish and Wildlife Service's policy statement "that recreation on the refuges should in all cases be secondary to the primary purpose of management for wildlife enhancement."[93]

The problem had started in 1962 when Congress passed a bill that provided for outdoor recreational facilities in refuges if the primary purpose of the refuges was not compromised.[94] Unfortunately, the primary purpose of some refuges was compromised as refuge administrators reeled under the pressure to develop their refuges ostensibly to meet the public's demand for outdoor enjoyment. In a letter to Leopold, Ira Gabrielson made this point clearly: "There seems to be a great emphasis on mass recreation emanating from the Service," he wrote, "either from Washington or the regional offices. I have been told by a number of refuge managers that they have been warned to `get on the ball' or they would be in difficulties."[95] Leopold took this information seriously and advocated curtailing recreation on refuges that does not "retain a qualitative element of naturalism."[96]

Thus rather than recommending no recreation on refuge land, Leopold and his committee believed that some

development--strictly limited to ecological or educational purposes--of the refuges could actually enhance the appreciation of wildlife. "Wildlife viewing, hiking, sight-seeing, nature observation, study, and photography can be enhanced," he writes in the report, "by well-labeled self-guided tours, wildlife trails, observation points or towers, and by construction of interpretive centers and natural history exhibits. It is these types of recreation and associated ecologic teaching that should be emphasized on the refuge areas."[97]

The committee members responded to Leopold's drafts of the report in different ways. Essentially Leopold had to be a broker, treading carefully the middle ground between other members' interests. While Gabrielson, for example, thought that the first draft of the report met "many of the objectives and thoughts [he] had in mind," he lamented the weakness of Leopold's language. "We did not hesitate to call a spade a spade in two previous reports," he wrote to Starker, "and I think frank objectivity is very much needed in a few places in this one."[98] Leopold underlined sections of Gabrielson's letter and incorporated changes where appropriate except where they conflicted with other committee members' ideas. Cottam penned a "few minor comments" to Leopold on the first two drafts. "I like the report very much," he wrote to

Leopold on 5 March 1969--just before Leopold was to hand the report over to Udall. "I think it is a real compliment to your leadership and there is no point of any significance in here with which I am not in complete agreement."[99] Cottam complimented Leopold on his "skilled writing and even clearer thinking" and expressed indebtedness to Leopold for his leadership.[100] Kimball suggested the most changes in tone and wording. And Leopold followed his lead in most cases. Kimball sensed that Leopold wanted to see the refuges in the same light as he had viewed the National Parks and he did not like it. Leopold accepted the criticism to keep the peace and made slight word changes to appease Kimball.[101]

The Leopold committee's recommendations to enhance naturalism in the management of the refuges was well received by the public and the secretary. Peter Jordan, assistant professor of forest ecology at Yale University, felt strongly that the National Wildlife Refuge System could make a unique contribution in conservation education and reiterated this message in a letter. After congratulating the committee --"It looks like you've chalked up another classic," he wrote to Leopold--he asked that Leopold try to strengthen the section on the use of refuges to provide conservation and environmental education.[102]

Secretary Udall applauded Leopold's report. He

called the report "an eloquent recitation" and a "distillation contain[ing] strong stuff...some...will choke on...." "I believe," he wrote to Leopold, "all of us who are concerned for the future of the Nation's wildlife refuges are glad that you have underscored the dangers of trying to make any refuge be all things to all people. In the most complimentary sense, your recommendations are for the birds as well as for the people."[103] This no doubt was just what Leopold had intended--"recommendations for the birds as well as for the people."

For Leopold wildlife refuges, like national parks, were sacred areas. He felt strongly about preserving them as natural areas. In an article he wrote for the National Wildlife Federation's publication, National Wildlife, he expressed more poetically than in the report his concern that refuge lands retain as much naturalness as possible. The report, he wrote, "expressed the hope that the Refuge System can continue to offer a maximum number of Americans the chance to enjoy such spectacles as massed waterfowl against a sunset sky, a wisp of snipe power-diving into a marsh, or a coyote mousing in a meadow. These things and the protection of our wildlife and their habitat are what make the Refuge System so important to this nation."[104]

Consulting for private ventures.

Leopold had accepted the refuge assignment even though he was as he put it "overscheduled." "I've let myself in pretty badly this time," he wrote to a colleague in September 1967. "How in the world does anyone get into such a mess as this?"[105] Leopold was inordinately busy in the late 1960s. Not only was he teaching and writing advisory reports for the federal government, he was also consulting with private parties. Two ventures stand out: consulting on the proposed Rampart Dam project in Alaska in the mid-sixties and advising Champion Paper on logging in the Tongass National Forest at the end of the decade.

In July 1964 Stephen H. Spurr of the University of Michigan's School of Natural Resources received funding for a project to "investigate both the ecological and economic consequences of the proposed Rampart Dam on the Yukon River in central Alaska."[106] Leopold, as part of the research team, was assigned the task of investigating the impact of the proposed dam on waterfowl. The effects on wildlife were projected to be devastating. As Leopold wrote in his section of the summary report, "construction of Rampart Dam would negate thirty years of endeavor in waterfowl preservation."[107] The whole report spelled it out clearly for the scientific community and the political

allies of the project. The public got wind of the deleterious effects of the proposed project as well. Together with Justin Leonard, Leopold wrote an article for Audubon Magazine decrying the anticipated loss to fish and wildlife resources should the dam be built.[108] The dam project did not go through. As Leopold later explained in an interview shortly before he died: Senator Ernest Gruening of Alaska had tried to "ram [the project] through" until he got word of the kind of recommendations the Spurr research team would make. "And Gruening gradually began to see that this was going to go over like a lead balloon and he backed out of it...And the thing just quietly died and that was the end of Rampart," he told the interviewer. [109]

In 1969 Leopold was approached by the president of Champion Paper "to see if [he] would participate along with a couple of other people in advising the company on how to conduct a logging operation on the Tongass National Forest."[110] The company had already signed a fifty-year lease with the Forest Service for "8.6 billion board feet of lumber to be taken over the fifty-year period."[111] According to Leopold, what the president of Champion Paper, "Mr. Bendetson," wanted from Leopold was advice on "How...[to] do this [logging] with a minimum adverse effect on the environmental situation..."[112] Leopold

negotiated a contract between the University of California and Champion Paper for a one-year investigation of what Leopold referred to as "the wildlife situation"--the anticipated effect on wildlife of the logging operation.[113] Leopold assigned the task of researching the projected impact on wildlife to a recent graduate student of his, Reginald Barrett, whom Leopold referred to as "a good field man."[114]

Barrett returned home a year later with bad news for either the wildlife or Champion Paper: the proposed sale would devastate wildlife populations. Leopold did not hesitate to pass the negative response on to Bendeston. He related the following series of events to an interviewer in 1983:

> By the time that Reg had been in the field for a year, it was perfectly clear to him, and he made it clear to me, that the removal of that much timber would leave absolutely no wildlife to speak of. I mean the bears, the deer, and even the waterfowl of bays, the estuaries, would be badly messed up by the logging operations. And as such this would be a <u>catastrophe</u> from the standpoint of the wildlife. This then was the report that we then had to give in to Mr. Bendetson. In short, we said, "It can't be done: you can't get eight billion feet out of here without making a complete, utter mess of it from the standpoint of wildlife."[115]

Leopold followed strict protocol and did not give the report to any other organization, such as the environmental group that was challenging Champion Paper in court, until the contractually specified time had lapsed.

"[W]e submitted the report to the company," Leopold remembered.

> they had paid for it. We gave no copies of it to the Forest Service or anyone else until the period of a month or some weeks. I had specified this on the original contract, that we would be free to release our report after such and such a period. So when the period passed, we sent copies of the report to the Forest Service and the Sierra Club, which had litigation already over this particular sale.[116]

Champion Paper cancelled the sale and, according to Leopold, Bendeston remained on good terms with Leopold.[117]

While Leopold was proud of his part in getting Champion to cancel what would have been a disastrous sale, he remained circumspect about the conflict between industry, government and environmental groups where natural resource interests were concerned. He believed that some industrialists like Bendetson were sincere in their concern for the environment and that "professional advisors" like himself would be able to convince these industrialists not to proceed with environmentally unsound projects.[118] While he was, as he put it, "in the camp of the Company," he hesitated in public to point any fingers.

Privately Leopold was disturbed by what he called the "zealous enthusiasm of some extreme conservation groups."[119] He wrote, for example, to Senator Gruening in October 1971 that he "resented the legal action taken by the Sierra Club" against Champion Paper. "I feel that as

professional advisers we are quite able to keep the Company's proposed program in line with good conservation practice," he complained to Gruening.[120] In a separate letter to Gruening about the sale of timber, Leopold wrote: "...I hope that a mechanism can be found to develop a sane program of resource use without having to constantly resolve the disagreement between the protectionists and the users."[121]

Leopold never did become a zealous activist against industrial manipulation of the natural world. Perhaps he felt that to remain a credible and powerful advocate of wildlife and wilderness values he had to remain credible in the eyes of industry. And, more importantly, he seemed to have faith in the system; he really seemed to believe that it was in industry's own interest to pay attention to environmental issues and that scientists--or as he called them "professional advisers"--could be the agents of change and truth. "[W]e're [scientists] being asked some very legitimate, professional questions about [what] the impact [is] going to be on all these different species," he told an interviewer from the Sierra Club in 1983. "And several millions of dollars are going into the research program on these wildlife species, and my job is merely to make sure they're asking the right questions."[122] It is also important to note that Leopold was not opposed to the

use of natural resources for industrial purposes. He considered himself a conservationist in the old Gifford Pinchot sense of the word: his credo was dedication to the preservation and--very significantly--the wise use of resources.[123] Preservation per se was not his goal.

Leopold, as one ex-student turned colleague noted, was "an educator in the broadest sense."[124] He had the uncanny ability to talk to all sides of a controversial issue and come out personally unscathed. What allowed him to understand an issue from all sides was his well-roundedness. He wore so many hats--that of government advisor, hunter, scientist, board member of an environmental group, and consultant to private industry--that he could easily exchange the one for the other without compromising either the interests he represented or, he felt, his own beliefs.

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CHAPTER 6

THE 1970S AND 1980S: LEOPOLD'S FINAL YEARS

Starker Leopold's accomplishments in the 1970s and 1980s were the culmination of almost everything he had worked on in previous years. His career had reached its peak; the time to wind down intellectually--while maybe not physically--had come. The name that Leopold had made for himself, not that which he had inherited from his father, was enough to make him one of the most sought-after and respected advisors on wildlife and conservation issues both nationally and internationally. As one of his ex-students, Dale McCullough, remembers: "Hardly an issue arose without his [Leopold's] being consulted...." McCullough had planned to write a dissertation on a rare species of elk and therefore needed to "take six elk for scientific purposes under a collecting permit from the California Fish and Game Commission." After the presentation, for which he was well prepared on account of "the volatile nature of the request," McCullough received only one question: "Does Starker Leopold approve of this request?"[1]

Leopold did not at any time "trade on his father's reputation," as one keen observer of the Leopold family put it. "The honors that came to him were earned."[2]

While the ghost of his father's reputation never left Leopold, by the end of his career he had made his peace with it. "You're working uphill when you have a dad like I had," he told an interviewer a year before his death. "Sort of makes you work half again as hard. But I reached past the point many years ago of worrying about that. I proved I could carry my weight and I wasn't just the son of Aldo Leopold."[3] By the 1970s, Leopold had certainly proved that he could carry his weight. And his reputation would do nothing but continue to grow.

Throughout the 1970s, Leopold's tenure as advisor to the federal government on national park issues continued. In 1972 he accepted membership on the Advisory Board on National Parks, serving a six-year term until 1977.[4] And in 1976 he was appointed by Secretary of Interior Rogers Morton to the Advisory Committee on Wildlife, Fisheries and Parks.[5] Besides directly influencing national park policy, Leopold's ideas had an indirect impact on the Service when his students became involved with Park Service affairs. For example Leopold protegee Mary Meagher became assistant to Glen Cole and later a Yellowstone National Park biologist in her own right.[6] And Bruce Kilgore was a research biologist with the office of the chief scientist of the National Park Service from 1968 until 1972 when he became assistant regional director of professional services with the western region of the

National Park Service.[7]

Awards were forthcoming throughout the seventies and eighties. In 1970 Leopold was elected to the National Academy of Sciences. That achievement meant a great deal to him. "As far as I know," he told a journalist in 1982, "I'm the only wildlife biologist ever elected to the National Academy of Sciences."[8] He received a Fellows Medal from the California Academy of Sciences also in 1970. And in 1974 he earned the Winchester Award for Outstanding Accomplishment in Professional Wildlife Management.[9] The University of California extended to Leopold the Berkeley Citation in 1978, the year he retired and became Professor Emeritus. Six years after his student, Raymond Dasmann, received the American Institute of Biological Science's Distinguished Service Award, Leopold himself received one in 1980.[10] And in 1980 he also received an honorary doctorate from Occidental College. He would have been a candidate for an honorary doctorate from his alma mater in 1984 but he missed that goal by a year.[11]

Leopold busied himself professionally with especially two projects in the 1970s: writing a book on the California quail and bridging the deepening schism between hunters and non-hunters. The latter project especially taxed Leopold's patience and skill as an educator. As one

contemporary author put it, sport hunting by the 1970s had become the "subject of intensive controversy, often obscured by emotionalism and half-truths."[12] It was true. The wildlife conservation movement had indeed become divided into two adversarial political camps: hunters and non-hunters.

Leopold was clearly disturbed by what he referred to as a "strong wave of anti-hunting sentiment." He called the problem "extremely serious" and a threat to "the whole conservation movement."[13] With his skills as an educator he sought to smooth out the differences. In an important article for the National Wildlife magazine called "The Essence of Hunting," Leopold tried to explain to non-hunters his philosophy of hunting. For him the protection-minded preservationists were essentially divided into two camps: "the anti-hunting extremists" and "the majority of thoughtful conservationists."[14] It was to this majority that he directed his comments. The article is set up as an interview with Leopold who is referred to as "one of the most respected figures in ecology" capable of offering "an informed and reasoned view of sport hunting in America."[15]

The first question posed to Leopold was whether "hunting for sport [had] ever contributed to the demise of any wildlife species in the United States?" Leopold answered with cool precision thus establishing from the

outset a position of scientific authority. "[A]fter the conservation era began early in this century, and the states developed effective laws for wildlife protection," Leopold reported, "there is not a case known to me where sport hunting has seriously reduced or endangered populations of game animals."[16] Then he went on to address his own reasons for hunting. With classic clarity and brevity, Leopold stated that he hunted for "the sheer joy and pleasure of it." It is "still my favorite form of recreation," he said. "To me," he went on, "the rejuvenation that I get from this type of outdoor exercise beats anything that I know."[17]

The actual killing, he argued, was almost incidental. "[T]here is a special thrill to duck hunting when I am sitting in the dark," he told the interviewer, "listening to the wings overhead, being aware of the smells and sounds and sights of the marsh. If, incidentally, I kill a few ducks, that's fine too." Then he extrapolated to other hunters. "[P]resum[ably]" most people hunt for the same reason, he stated. "Among my hunting companions," he went on, "I sense this type of appreciation. It is not the kind of thing men talk about; they talk about what they do, not what they feel."[18] Most hunters developed this appreciation for the process rather than the goal, he argued. "I think all of us start out as pretty

bloodthirsty young hunters who want something in the bag," he told the interviewer. "We later come to appreciate that the enjoyment of hunting is something quite apart from the killing...The point is that you're out there for the joy of the whole experience, and the shooting is secondary."[19] Hunting, to Leopold's way of thinking, was challenging, exhilarating and "profound." "You're testing your senses and trying to outwit a wild animal," he said. "Altogether the psychological experience is far more profound than that of just getting out and walking across open country."[20]

Hunting was as natural as predation for Leopold. When he received a letter from someone who after reading his article asked: "Does a man have the right to pursue a form of amusement that causes suffering or death to some other creature?" Leopold answered with: "As far as I am concerned, predation which involves taking the lives of prey animals is something that has existed on this earth since life began and man certainly evolved as one of the predators. I see no clear point in man's history where he loses the status of a predator and on this basis I shall continue to enjoy the sport of hunting. I certainly do not believe in having animals suffer and go to great pains not to leave cripples in the field or otherwise to cause unnecessary agony. But I think I have as much right to take some wildlife as a hawk or fox and I most certainly

approve of their rights in this respect."[21]

At the conclusion of the interview, Leopold appealed to his readers' concern for wildlife when he pleaded for moderation and common sense. Non-hunters and hunters should work together to maximize their respective powers to preserve wildlife resources, he argued. "We're not going to preserve wildlife in its maximum abundance and variety," he warned, "unless hunter and non-hunters share the joint responsibility for ensuring wildlife's future."[22] Leopold himself had so often mediated between warring factions that he believed in all honesty that the two groups would be able to work together. "It isn't all that difficult really," he stated. "Once a group of organized hunters and a group of organized preservationists sit down and talk to each other, they often find they can work together and that they have a great deal in common."[23]

Whether Leopold's plea for a peaceful resolution of the issue had any tangible results is unclear. What is clear is that the two sides remained divided and that Leopold kept trying to bridge the gap. He did so, however, from a different position than he had taken earlier in his career. Whereas Leopold once believed that the scientific community should stay out of the fray, he now believed that he and other experts should get involved

in the political process of decision making. "It is high time," he wrote to the president of the American Fisheries Society's California and Nevada chapter, "for the scientific society to implicate themselves, at least in a guarded way, in some of the decision making processes which otherwise are completely obscured in political fog. I may say that I have changed my mind in the last couple of years on this point. Some years ago when I was president of the Wildlife Society, I strongly resisted the pressure to get involved in a position of advocacy. Now I do not believe that we can avoid this responsibility."[24] In an address to the Western Section of the Wildlife Society in January 1974 and again in an address to the 38th annual meeting of the National Wildlife Federation in March of that year, Leopold wrestled with the problem of the "anti-hunting sentiment." With his comments, he sought to analyze the problem and "suggest a direction in which may lie a workable solution."[25] "We cannot afford to overlook the wave of anti-hunting sentiment or to charge it to the rantings of a lunatic minority," he warned his fellow hunters. "It has in fact become a real political force, not only in the state and the nation but in international wildlife affairs."[26]

Leopold did not blame the non-hunting public for the problem. "I do not mean to imply that the interest of the general public in wildlife protection is in any way

unjustified or without merit," he cautioned his hunter audience. "On the contrary, I think that the wave of public concern about the status of wild animals is an extremely healthy and commendable development."[27] For Leopold, the problem essentially lay in the states' narrow fiscal and administrative structure of wildlife policy-making. Whereas the base of public support for wildlife had broadened to include non-hunting interests such as rare or endangered species, the states' framework had remained narrow. "The central base of finance is still hunting and fishing licenses, supplemented with special taxes on sporting gear," Leopold complained. "Primary responsibility of state game commissions and departments is still directed to the interests of the hunting and fishing public, or at least such is the feeling of the non-hunting public." Game departments and commissions had not "made any specific provision to bring the non-hunting public into the process of decision making."[28]

Without any structural opportunity for input into wildlife policymaking, the alienated non-hunting interests felt compelled to take their case to "non-expert" decision-making bodies such as legislatures and courts. "There is a growing tendency, therefore," Leopold argued, "for the preservationists to take their wishes and grievances to state legislatures for redress rather than

to follow the intended channel of going to state game commissions. This in my opinion is a primary cause of the growing schism in the ranks of those concerned with the welfare of wildlife."[29]

The central question in Leopold's mind was "who should be making...wildlife management decisions--the [game] Commission or the Legislature?" The tendency of preservation groups to take their concerns to non-expert decision-making bodies worried Leopold considerably. His deep and abiding faith in professionalism cinched it for him: it was wrong to make wildlife decisions "on the basis of public sentiment rather than biological realism."[30] "[T]echnical administrative matters...should be handled in a professional way by professionals," he argued.[31] Decisions about wildlife matters should be made by expert commissions not legislatures "happy to dabble in...[such] matters."[32] Leopold was truly disturbed about the situation. "We as professional biologists are losing the initiative and the leadership in formulating wildlife regulations and policies," he told his fellow wildlife biologists. "We are rapidly tending back toward the situation in the 1920s when there was no wildlife profession and technical decisions were made in legislative committee hearings. I cannot believe that this is a healthy trend in the furtherance of wise conservation and use of wildlife resources."[33]

To get the "preservationists...[to] bring their problems and suggestions to the [Game] Commission instead of going straight to the legislature to force their views on the Establishment," Leopold proposed altering the framework for state wildlife policy making.[34] Game commissions needed to be broadened to include non-hunting interests. "State game commissions should include some non-hunting members whose primary interest is in wildlife preservation rather than wildlife utilization," Leopold argued. And there should be "advisory committees on non-game management."[35] Fiscal measures could also help make the states more responsible to non-game wildlife. For a long time, Leopold had been "pressing for enactment of federal legislation to offer the states matching funds, comparable to the [Pittman-Robertson] funds but drawn from general revenue for the study and preservation of non-game species."[36]

To conclude his address, Leopold acknowledged that individual hunters probably recognized the need for change but argued that "collectively we have done little to bring it about."[37] Hunters were a small minority in the nation, he reminded his audience, and it was important to band together with non-hunters to preserve not only wildlife but hunting as a sport as well. "If we fail in this accomplishment," he warned, "I fear that rational

management and utilization of wildlife, including hunting as a sport, will be in a precarious situation."[38]

Leopold worked long and hard in the 1970s to get state game commissions and departments more involved with the interests of preservation-minded groups. It was an up-hill battle. In June 1971, he corresponded with Congressman John Dingell on introducing legislation which would "offer federal support to the states in the management of non-game wildlife."[39] And in July 1971 Leopold exchanged letters with John Borneman of the National Audubon Society's office in California. He kept Borneman informed of his efforts to influence the director of the Department of Fish and Game's position on the protection of non-game species. "I am fully aware of this rather violent reaction of the Director to the pressures of protection groups," he wrote, "and in fact I have had several conferences with him on the subject."[40] "I am working hard," he continued, "to convince him that growing public pressures for wildlife protection are very real indeed and will not be overcome by resistance on the part of Fish and Game Agencies. Rather I'm taking the view that the Fish and Game Agencies should take a leading role in the formulation of protection programs taking the initiative away from the extremist groups that may be carrying protection too far in unnecessary directions."[41]

As Leopold explained to wildlife biologist Durward

Allen of Purdue University, a new American wildlife policy was in order--a policy "built on the broad basis that the total public has a stake in it and that funding in some way should be derived from the total public and not solely from the hunting public."[42] He was exasperated with the system and said so in no uncertain terms to his colleague. "[F]or the moment we seem to be stacked with a rather bigoted and narrow minded design primarily to supply hunting for the one segment of the public that wants it and paying only lip service to the other components of the public that have wildlife interest," he complained.[43]

Leopold was so convinced that game commissions should be making wildlife policy and not legislatures that he testified against a bill which would have given protected status to the mountain lion--AB 660 or "the lion bill" as it was known. No one, Leopold argued, was more concerned than he about "conservation and better management of the mountain lion" but he also felt strongly that wildlife policy should not be legislated. "The real issue raised by AB 660 is who should make the decisions of how and under what circumstances the lion should be taken or not taken as the case may be," he wrote to Iris Gimbrett of Glendale California.[44]

> I am stoutly defending the view that our government is structured to charge the Department of Fish and Game and the Fish and Game Commission with the responsibility for the management and

> protection of all wild life and I don't like the tendency for this responsibility to be preempted by the legislature. In theory, at least, the Fish and Game Department and Commission should be better informed and better able to make management decisions about wild life than the state legislature. If this is not true then there is something basically wrong with the system as set up by the State Constitution.[45]

While protectionists like the Mountain Lion Coalition advocated putting the lion on "the completely protected list," Leopold maintained that the "rigid protective legislation proposed by the Fish and Game Department and adopted by the Commission would be more than adequate to protect the lion population during the period of survey and investigation."[46] As it was, Leopold's proposed moratorium on hunting while further study was conducted, won out. But the road traveled had been long and arduous, and not without personal discomfort.

At the time that the lion bill controversy came to a head in 1971, Leopold was working closely with Ian I. McMillan on a book on the California quail. To the chagrin of McMillan--and no doubt Leopold--the two biologists found themselves on opposite sides of the lion controversy. "I can only say," McMillan wrote to Leopold, "that again I am more than sad to be reminded of the growing separation between the game-management bureaucracy and the Conservation movement. And again the most sorrowful aspect of this estrangement is your position as

chief advocate on the one side while I consistently find myself working on the side of the `preservationists' toward the kind of wildlife administration that I have always worked for."[47] Leopold's handwritten reply evidently has not been preserved, but it is known that he responded promptly to McMillan's lamentation.[48] McMillan was a close associate and Leopold would not have wanted any lingering resentment to infect an otherwise sound working relationship.

While Leopold believed that game commissions and departments were the best forums for discussion on wildlife issues, it was clearly not a case of game commissions and departments right or wrong. As mentioned above Leopold agitated for change in what he referred to as the "monolithic structure" and took his case even to the director of the California Game Department.[49] He was not above criticizing his profession or his fellow professionals--or even himself for that matter. In an address to the California-Nevada Section of the Wildlife Society in January 1970, entitled "What Lies Ahead in Wildlife Conservation," he advised his audience to "be receptive to new ideas and broader concepts."[50] And in an address to fellow wildlife biologists in 1974 called "Needed--A Broader Base for Wildlife Administration," he was even more pointed in his criticism. "Much of the blame I think can be laid at our own doorstep," he said.

For decades the profession had focussed its attention "largely or almost entirely on game species." "I include myself in this criticism," he admitted, "for nearly all the research conducted by me and my students concerned deer, quail, pheasants, mallards, and other game species."

> We largely ignored the raptors and mammalian predators, marine mammals, and endangered species. Both the Department and the Commission listened primarily to hunters and fishermen in formulating programs. The concerned non-hunting public was largely ignored, and avid protectionists were viewed as pests. Is it any wonder that the latter group turned to other outlets to press their views?[51]

Their profession, he chastized his audience, had lost its initiative to be the leader in making new policy and a broader philosophy. "We have been the followers," he lamented. "How natural then that the protectionists do not look to us for leadership."[52]

Another hunting issue which came up in the mid-1970s was the use of lead shot in duck hunting. Groups opposing the continued use of lead shot argued that steel shot would be better because ducks were suffering from lead poisoning. In February 1974 Leopold wrote to Nathaniel Reed, assistant secretary of interior, about the controversy. His response to the matter called for scientific calm in the storm of emotional controversy. "In taking a cautious view toward jumping into the conversion to steel, I am attempting to reflect an

objective, scientific appraisal of a biological problem," he told Reed. "I don't give a damn about the adverse reactions of the ammunition industry or of state game administrators. My concern is for an accurate evaluation of (1) the biological extent and seriousness of the present situation, and (2) a careful deliberation of alternative solutions. In my opinion neither of these steps has yet been taken, and for this reason I urge caution in arriving immediately at a definitive course of action. If we are going to use science as a basis for making wildlife decisions, then for God's sake let's use it--thoroughly, completely and correctly."[53]

As a hunter, Leopold was also not prepared to make the change to steel "on the basis of incomplete evidence," but he would do so if it proved necessary.[54] "[L]et me admit to you, Nat, that I have a strong personal prejudice on this question which I cannot wholly subjugate. I consider myself something of an artist with a 20 gauge in a duck blind. I take inordinate pride in my little Spanish double and my ability to take birds cleanly with a low shell average and very low cripple loss. I despise magnum guns and the unnecessary noise they make in the marsh...If the protection of the waterfowl resource demands the sacrifice of this qualitative element of duck shooting, I will go along with it and buy a cannon

suitable to take steel shot, but believe me I will do it reluctantly."[55] "What I am trying to say, awkwardly perhaps," he confessed to his friend, "is that there is much more to the conversion from lead to steel than just paying a little more for a box of shells. My continuing crusade for quality in outdoor sports is at stake."[56]

Leopold used his position as wildlife management expert throughout the 1970s to lobby for other causes he believed in. For example, he came out squarely against grazing on public lands. In an address to the Wild Trout Management Symposium in Yellowstone National Park in 1974 he defended his hypothesis that multiple use practices--especially grazing--were causing ecosystems to deteriorate. "I have a growing feeling that we have seriously underestimated the impact of grazing and other forms of land use on the capacity of wild lands to support wild animal populations, on land or in the water," he told his audience. "Until we fully understand the impact of multiple use, we are in a poor position to make appropriate management decisions."[57] In a separate letter to Nat Reed in 1973, Leopold expressed outrage at the proposed use of poisons to control predators on public lands. "The livestock industry has long felt that it has special privileges on public lands," he wrote to his friend in the Department of Interior, "including the right to destroy plants or animals that interfere with grazing

operations. But grazing is a privilege--not an acquired right. The public at large has privileges too, and I think the vast majority of Americans approved of the presidential order to exclude poisons as a means of predator control on the public domain."[58]

Other issues which bothered Leopold were the "status of various marine mammals and the part the United States is playing in the study and administration of this world resource;" and "the expanded use of off-road vehicles in the California desert and the irreparable damage being inflicted on this fragile habitat."[59] He wrote letters supporting these and other causes in the hopes that his "personal voice" would make the difference. The amount of time such correspondence must have consumed was no doubt considerable, but by the 1970s Leopold realized that his name behind a cause added considerable weight.

Leopold was still very active in international consulting throughout the 1970s. In 1970 his report on Tanzanian National Park policy was published.[60] While working on African wildlife policy matters, Leopold had befriended Joy Adamson of "Elsamere" in Kenya. They continued to correspond on issues of joint concern. In 1972, Adamson wrote to Leopold asking him if he would be interested in helping Hungary solve its wildlife conservation problems. Leopold wrote back

enthusiastically. "I am, of course, much interested in the problems of wildlife conservation in Hungary and would like nothing better than to undertake some cooperative evaluation of their program and their need. About two years ago I was invited as a member of a group to make such an appraisal of the wildlife situation in Ireland and I found this extremely instructive and interesting. Moreover, our recommendations to the Government of Ireland were helpful in formulating a more realistic policy of wildlife conservation. If such an invitation could be extended from the Government of Hungary, not only to me, individually, but I would say to a small group of advisors, it would be of great interest and I think we might do some good."[61]

Leopold ended his career being very depressed about prospects for wildlife in especially East Africa and Mexico, two countries he had given much time and energy. The real threat to wildlife in those areas was, according to Leopold, "growth of the native population."[62] "[T]hey just keep crowding it," he told the Sierra Club interviewer in 1983. "Hungry people--you can't blame them. When you've got people that are hungry, by gosh, they're going to try and feed themselves and their families, but this is the ultimate result: loss of the natural values." (54) After all the effort expended by the people like himself, Leopold sadly concluded that there

was not "any hope for wildlife" in those areas.[63]

Leopold's international ventures were very "instructive and interesting" as he put it, but they no doubt drew time and energy from his own work. For example when Leopold received a sabbatical leave for the 1971/72 academic year to write the text he planned to co-author with Ian MaTaggert Cowan, he ended up spending a good bit of the time on the road.[64] Health problems also interfered. Large parts of 1973 and 1974 were spent recovering from back trouble. He actually had to lie in traction in the hospital in July 1973 and had spinal surgery in March 1974.[65] Because of his health problems and existing commitments, Leopold had to turn down all sorts of invitations to join boards, and his plans to publish his book on the California quail had to be postponed.[66]

The California Quail Text

Since the 1950s Leopold had plans to write a book on the California quail. He had set at least seven graduate students to work on dissertations on the quail and had negotiated grants with the California Academy of Sciences for work on a quail project.[67] During his 1971/72

sabbatical year when he was supposed to finish the text on wildlife populations he had planned to co-author with Ian MacTaggert Cowan--the text that was never completed--Leopold wrote five of the 14 chapters for the quail book. He planned to have the book "brought to completion on or before the terminal date of the contract in 1974."[68] Problems with his back intervened, however, and the book did not appear until 1977.

The book was a classic Leopold success. Critics called it "highly readable, well organized and...of interest and value to laymen and professional wildlife managers alike."[69] Leopold himself describes the book as "written in semi-popular style" suitable "for laymen ranchers and for wildlife professionals as well."[70] As was his wont, he had intended to write the text in "more or less popular language so that it is available for general public use and not strictly [reserved] for technicians and scientists."[71] The book was very well received. In 1979 it earned Leopold his second Wildlife Society award for the best wildlife publication of the year. And it continues to be a work other biologists cite regularly.

He worked on the quail project and book with a quail expert from Shandon, California, Ian I. (Ike) McMillan, who some years before had set up a quail management program on his ranch.[72] Correspondence between the two

biologists indicates that the two did not agree on at least two major points to be raised in the text: the effects of devegetation and hunting on quail populations. As Leopold would finish chapters he would send them to McMillan for "recommended revisions."[73] Each time McMillan would review a chapter in which Leopold had expressed his view on devegetation--or the influence of fire on quail territory--or hunting, McMillan would fire a letter back lamenting Leopold's views. McMillan believed that both devegetation and unlimited hunting were detrimental for quail populations; Leopold held the opposite view.

The disagreement with respect to devegetation was relatively clear cut. McMillan believed that quail habitat had to be preserved; Leopold argued that fire was one tool of preserving such habitat. "With regard to Burcham's 1959 paper, and your decision not to use the quotes from it that I had suggested for page 76, I must again set forth, and this for the last time, that I do not believe in the eradication of shrubland growth as a practice to be advocated or promoted in the conservation of the California quail," McMillan fired off to Leopold in April 1975.[74] The devegetation issue centered around the use of fire to improve quail habitat. Leopold argued that research had indicated that fire helped promote plant

species agreeable to the quail. McMillan disagreed calling such research "erroneous and misleading." "This seems typical of most pro-burning research," he wrote. "I do not feel that the quail book should contribute in any way to any further spread or promotion of such information."[75]

McMillan disagreed even more vehemently with Leopold's position on hunting. "I have been hoping," McMillan wrote to Leopold in March 1974, "that your views on the effects of hunting on quail would change over the years, as mine have. But, as confirmed on the closing pages of Chapter 12 this has not occurred."[76] "I hope we can work out a good, readable reconciliation or compromise on this as it touches on what I find as a main growing concern among hunters," he concluded.[77] McMillan took issue with most of the research that supported Leopold's position and projected the arrival of a "new era of wildlife research." "I confidently predict that new findings will provide information on the effects of hunting on game species that will be far more realistic and reliable than the current, shoot-em-up advice," he wrote in May 1974.[78] Reconciliation or compromise was not in the offing, however. By May 1975 when Leopold had shown no sign of giving in, McMillan wrote a strongly worded response to chapter 14, the chapter on hunting. "Here again is our main difficulty," he wrote. "I'm squeamish

about `ax grinding' to counteract the anti-hunting movement. I have not found that preservation is an important threat to hunting. The big threat is in the miserable defaulting of the game-management establishment. The needed remedy is sound, factual information and recognition that mass public hunting, as now promoted and exploited, is a proven failure and has no future...Before any further work on the remaining areas of discord, I'll be waiting to see the final version of Chapter 14, and am hoping for a profoundly different treatment of seasons and bag limits; allowable harvest; and the question--does hunting endanger quail populations? I am horrified at what those sections now include."[79]

Chapter 14 did not change, however. Leopold stood by his position that "hunting at moderate levels probably has little effect on year-to-year density," and that "where hunting can be allowed without compromising other social values, it is a legitimate and justifiable use of a crop produced annually." Quail hunting to Leopold and other "aficionados" was after all "one of the finest of outdoor sports."[80]

McMillan finally withdrew from the project. As Leopold wrote in his preface to the final version of the text, "McMillan concluded that our differences were insurmountable and he withdrew from co-authorship."[81]

Leopold was generous in his representation of McMillan's views on their differences. While he did not mention the issue of hunting, he had this to say about their other point of contention: "A primary point at issue concerned the propriety of creating openings in chaparral or timber through prescribed burning or by mechanical means--management techniques to which I fully subscribe but which McMillan feels are potentially deleterious to the soil and to the basic integrity of woodland resources."[82] He "accepted McMillan's decision to disassociate himself from sponsorship or authorship of the book" "with a sense of sorrow," and graciously acknowledged McMillan's contributions--his "constructive ideas and suggestions"--to the text.[83] "Much of what I know about quail management was taught to me by `Ike,'" he wrote with genuine warmth and gratitude. And "the book has been greatly enriched by his keen and perceptive observations of quail ecology."[84]

In his prologue to the text, McMillan did not mention any differences of opinion, nor did he address any of the issues he had so vehemently defended in his correspondence with Leopold. Instead he recounted his first experiences with quail--ironically he first encountered quail when as a boy he skinned and ate birds his older brother brought home from the hunt--and ended on a note of agreement with Leopold: "The avowed purpose of this book is to advocate

a program of survival for the California Quail. Secondly, but significantly, it suggests that there is profound social value in human experience that generates a feeling for the land and its productivity."[85]

While his disagreements with McMillan did not necessarily strengthen their relationship, Leopold made every effort to resolve the matter on friendly and respectful terms. If he had learned anything during his long tenure as arbitrator of controversial issues, it was to keep the peace. It would serve no purpose to alienate himself from fellow biologists like McMillan.

Retirement

Leopold's success in dealing with people carried over into his teaching, which remained a strong suit until the end. "I like to teach," he told a student journalist in November 1977, eight months before his retirement in July 1978, "I like to get a response from the students."[86] With time Leopold's teaching had become more philosophical--not necessarily less practical but more wide reaching. His essay exam questions reflect this change. In the 1950s and 1960s, the questions he asked of students attending his introductory course were highly practical and based on case studies Leopold himself had been deeply embroiled in. In 1958, for example, his

students were expected to have resolved the difficult predator control issue. "Explain with examples," he asked students, "why predator control, as commonly practiced by Fish and Game Departments, rarely leads to an increase in game."[87] And in 1965 he asked students to evaluate the antlerless deer hunting question. "Wildlife biologists," the question read, "are almost universally recommending the hunting of all sex and age classes of deer rather than bucks only. State 5 important reasons for this recommendation."[88] By 1977, the year before he retired, he was asking his students more political and philosophical questions--even if they still concerned issues Leopold himself was involved with. Such questions included "How would you resolve the conflict between hunters and anti-hunters on (1) ecological grounds, (2) philosophical grounds?"[89]

Leopold retired from teaching in 1978 to become professor emeritus. His retirement was as busy as his career had been. While he did take some time to work on projects close to his heart such as preparing study skins of birds and mammals for the university's wildlife study collection and carving miniatures of waterfowl from wood, he remained active in his field by devoting his time to writing and advising and, of course, hunting and fishing.[90]

Fishing had become the sport of choice because it was

easier on his back, but he was still an avid hunter. He had plans, in fact, to hunt at the San Felipe Ranch with a friend, David Packard of Hewlett-Packard, the week before he died and had an application for a hunting license for Mexico for the 1983-84 season.[91] Bob McCabe hunted grouse with Leopold in 1982, the last fall he was alive, and described in a moving obituary how Leopold , "[i]nspite of his physical difficulties," had shown a "spirit and enthusiasm for the hunt [un]diminished from the exuberance of his youth."[92]

He reviewed several books and wrote essays for popular journals such as Gray's Sporting Journal, a journal that threatened to cease publication and one that Leopold did his best to keep afloat.[93] His essays were written with obvious care--care not only for the contents but also for the language. The poetic touch of his father's essays in A Sand County Almanac was evident in his own writing.

He also co-authored with two others a book which appeared in 1981 called North American Game Birds and Animals.[94] When jotting down his preliminary thoughts for the book, Leopold wrote: "This has the potential of having one hell of a lot of original and unique material and very different from any other works ever." He thought the book would be useful as a teaching aid and field

manual.[95] It is not clear that Leopold did much of the work on the text, but he was called on to try to sell the book. In the final weeks of his life Leopold had to correspond with a sales representative from the book's publisher about the poor response from colleges for his book. The publisher had not received any large orders from colleges, the representative wrote to Leopold, and could he "send a list of...teachers" who might be interested in the text.[96] Six days before he died and one month after having suffered a heart attack, it is little wonder that Leopold responded with little enthusiasm and not just a little annoyance. "It still concerns me," he wrote, "that the proper responsibility for marketing this book keeps falling on the shoulders of the authors."[97]

Neither did Leopold give up on wildlife advocacy during his retirement. He was, if anything, too busy. "I've got so many things going right now," he told an interviewer in May 1982, "I ought to back off a bit."[98] He didn't back off a bit, however. In the early 1980s, he headed a task force "searching for ways to educate the public about the problems facing San Francisco Bay's shrinking wetlands."[99] He spent the last years of his life investigating possibilities for a museum adjacent to the marshlands. "I'm convinced that the wetlands of California are probably our most precious and most rapidly diminishing resource," he told the Sierra Club interviewer

who spoke to him two months before he died. "And one way that you can reverse a trend of this sort is to put through public education. A museum that attracts a lot of people can be a very effective educational tool."[100]

All he needed was to find the land for the museum. The situation was made more difficult because Leopold was determined that the museum not be placed on government land. His discouragement with the government agencies for which he had worked for the past forty years was clearly at a peak. "I'll be damned if I'm going to put it [the museum] on government land, state or federal," he told the Sierra Club interviewer. "You can't trust them. Twenty years from now, all of a sudden you get somebody in there as head of fish and game or head of some government agency and he's not the least bit interested in this; he wants to do something else. So I'm insisting that before we proceed with this we get a site that we own."[101]

It must have been disheartening for Leopold to end his career--and life--so discouraged with the government he had assisted for so long. If in the 1950s and 1960s he had seen the agencies he worked for adopt policies he believed in and lobbied for, by the 1980s--the years of the Reagan presidency and Dukemejian governorship--all that work seemed for naught. When the Sierra Club interviewer asked Leopold which of the many organizations

that he had worked for was in his mind the "most effective in what they were doing," Leopold answered "the university." "I would say that the government agencies, generally speaking, I'd put toward the bottom of the list, in terms of real performing and producing over a continuing period of time," he noted. "You can't really depend on either the state or the federal government. Just take a look at what's happening right now! Both the state and the federal government! You think you're making headway in conservation, then all of a sudden the whole thing tipped right over on you, upside down."[102]

Leopold planned to wind down after the marsh museum project, and as he put it "just go fishing--and to heck with it!"[103] He did not get that chance, however. After one heart attack on the 16th of July 1983, he suffered a second and fatal attack on the 23rd of August, just 4 days after he had planned to be hunting with David Packard at the San Felipe Ranch in Palo Alto, California.[104]

His death was greeted with great remorse for the loss of a powerful advocate of wildlife conservation, and for the loss of a wonderful person. Described as "a big, friendly man" even by strangers, he was never larger than life; he was the very stuff of life.[105] Obituaries commending his extensive influences on wildlife conservation could not fail to commend the man as well. "At Berkeley, he just stood out from everybody else," one

of his first students, Raymond Dasmann, said after his death.[106] Beyond Berkeley the fruits of Leopold's career continue to live on in the wildlife policies still in practice today.

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