at the National Association of Audubon Societies, which faced mounting turmoil during the early 1930s as an older generation of conservationists with strong ties to the sport hunting community and the Bureau of the Biological Survey gave way to a more independent generation of leaders and staff members, who tended to be younger and have at least some training in modern natural history. Under the leadership of Audubon president John Baker, who came to power in 1934 (just two years after the last sighting of the heath hen on Martha's Vineyard), the organization gave increasing emphasis to scientific research. Consistent with this aim (and at the urging of Aldo Leopold), Baker instituted a research fellowship program designed to gather more data about the status, habitat requirements, and future prospects of endangered species in North America. Although modest in scope, that program served the needs of university programs searching for ways to fund their graduate students during the height of the Depression while helping Audubon moor its wildlife conservation policy recommendations on more solid scientific foundations.

The Audubon fellowship program resulted in a pioneering series of widely distributed research reports on several charismatic birds—the ivory-billed woodpecker, California condor, roseate spoonbill, and others—studies that provided authoritative information about the life, ecology, and population status of these vanishing species. Each of them also offered a set of specific recommendations for how to preserve individual species and the critical habitat they needed to survive. In the end, though, each revealed the limitations of science in wildlife conservation. As Baker and his colleagues discovered, scientific knowledge might be necessary to rescue endangered species, but it was hardly sufficient. Science could not save those species in the absence of the political will needed to implement the recommendations made in those pioneering reports.

THE TRIALS AND TRIBULATIONS OF THE HEATH HEN

At first glance, the heath hen seems an unlikely poster child for endangered species. About the size of a small Cornish hen, it was a relatively drab bird—streaked with various shades of chestnut brown, gray, and black—whose coloration blended in perfectly with what seemed like a drab environment—the coastal plains and shrubby barrens of the northeastern United States. By some accounts, its meat tasted too gamy to be an especially desirable source of food. Nor did sport hunters find it a challenging target, since it massed in open fields and tended to fly with great labor and in straight lines when flushed.[8] It lacked the romantic associations with the frontier West that the bison enjoyed; it did not blacken the sky in awe-inspiring flocks like the passenger pigeon; and it failed to

carry nationalistic symbolism like the bald eagle. Still, the heath hen attracted a significant following, especially in its final days.

Undoubtedly part of the species' charm lay in its mating ritual, referred to variously as drumming, booming, or tooting. Beginning as early as the first of March and reaching a height between early April and the middle of May, mature heath hens engaged in what Gross characterized as an "extraordinary performance."[9] During the early morning and late afternoon, the males gathered in open fields, where they strutted about, dashed forward for a short distance, leaped and twirled in the air, stomped their feet, stretched out their necks, lifted their dangling neck feathers (called pinnea) into a dark V shape that extended above their heads, and raised their tail feathers. After completing these preliminaries, the amorous males then inflated tennis-ball-sized orange-colored air sacs on the sides of their throats and simultaneously issued their haunting call, a low pitched sound in one-and-one-half to three-second bursts that Gross compared to the cry of a tugboat sounding its horn though a distant fog.[10] Seeing dozens, even hundreds of these birds engaged in a booming frenzy proved an unforgettable spectacle, and the behavior became the basis for the generic name that Smithsonian ornithologist Robert Ridgway bestowed on the bird, *Tympanuchus* (which literally means drum neck), when he revised the genus to which it belonged in 1885. Linnaeus coined the bird's specific epithet, *cupido*, chosen because the feather tufts on its neck resembled the wings of Cupid.

Following mating, the heath hen built its nest on the ground, in a spot concealed by dense vegetation. The nest remained so well hidden that naturalists located very few of them, despite increasingly diligent searches as the their numbers became thinned.[11] Because so few nests were found, determining the average clutch size for the subspecies is difficult, but the meager records that exist show a range of between four and twelve eggs per nest. Under ideal conditions, its reproductive potential thus proved quite high. Even when disturbed, the female rarely left the nest, a behavior that probably increased heath hen mortality during the fires that periodically swept across Martha's Vineyard.

The writings of early European settlers in North America make frequent mention of the heath hen, sometimes referred to as the heathcocke, pheysant, or grous.[12] It was once so abundant on parts of mainland Massachusetts that laborers living on the site that became the city of Boston are supposed to have implored their employers not to serve it more than a "few times a week."[13] The British naturalist and artist Mark Catesby crafted the first published illustration of the bird for his two-volume *Natural History of Carolina, Florida and the Bahamas* (1731–43).[14] By the late eighteenth and early nineteenth century the subspecies

commonly appeared in the market stalls of Boston, New York, and other eastern cities. Like many other forms of North American wildlife, the heath hen faced transformation from a component of a unique ecosystem to a subsistence food item and ultimately to a valuable commodity linked to growing markets with nearly insatiable demands.

The increasing exploitation of the heath hen soon gained the attention of government officials, who enacted limited measures to ensure its perpetuation.[15] As early as 1708, the New York state legislature passed an apparently unenforced law protecting the bird on the plains of Long Island. In 1791, that same body passed a bill entitled "An Act for the preservation of the heath hen, and other game," an action that startled several representatives who wondered why officials would want to preserve Indians or other "heathen." Massachusetts passed its first in a long series of protective laws in 1831, limiting the time of hunting to November and December. Though apparently well meaning, these early laws did little to stem the decline of the heath hen population or the shrinkage of its range. Mainland Massachusetts lost the bird by 1840, though it lingered in parts of New Jersey and Pennsylvania until as late as 1869. By 1880, the final surviving members of the race were restricted to Martha's Vineyard.

At this point, naturalists and collectors began paying increasing attention to the rare bird. In 1885, the ornithologist William Brewster—owner of one of the largest private bird collections ever amassed and a founder of the American Ornithologists' Union—became the first to formally differentiate the heath hen from its western cousin, the prairie chicken. Brewster based his determination on a comparison of three specimens of the bird's eastern form borrowed from the collection of the natural history dealer F. T. Jencks to more than a hundred western specimens he had found offered for sale in Boston markets. Based on his studies, he declared the two geographical forms to be "distinct but closely related species," a judgment that his colleagues subsequently rejected when they reduced the heath hen to a subspecies (or geographical race) of the prairie chicken.

Although aware of the drastic reduction in the heath hen's original range, Brewster felt the bird remained fairly common on Martha's Vineyard and was in "no present danger of extinction."[16] In a follow-up article five years later, however, he expressed alarm about the bird's status. Based on firsthand observations and the testimony of locals, he estimated that anywhere from 120 to 200 birds remained, a number sufficiently small "to warrant grave solicitude for the continuance of this interesting remnant of a once widespread race, as well as the most strenuous efforts for its protection and encouragement."[17] Since state law already protected the birds, Brewster argued for more vigorous enforcement

efforts. He also suggested that the Massachusetts Fish and Game Protective Association divert funds it had been using to introduce exotic game into the state for protection of this rapidly diminishing native species.

Brewster's articles set off a flurry of activity among collectors who clamored to possess examples of this newly described and apparently rare bird. One particularly active dealer was the wool mill operator Charles E. Hoyle of West Millbury, Massachusetts, who in the 1890s personally collected or brokered the sale of many of the two hundred or so heath hen specimens amassed in public museums and private collections before the subspecies was lost.[18] In 1895, for example, Hoyle offered Brewster a set of fourteen heath hens for $250, while claiming that in the recent past he had been able to fetch as much as $50 for a pair of the birds.[19] Three years later, Hoyle reported that his supply of heath hens seemed to be drying up. This past season his "man" on the island managed to locate only two broods, a total of a total of twenty-seven birds, all of which he collected as soon as the chicks had fully feathered. Enclosed with the package containing the specimens was a note indicating that Hoyle's unnamed collector "did not expect to ever see another one."[20] While predictions of the heath hen's demise proved premature, intense pressure from collectors represented another factor threatening the bird, and it may have contributed to a population bottleneck from which it never fully recovered.

Collectors were not the only ones to notice the decline of the heath hen. In 1905, John Howland, a deputy state game warden from Vineyard Haven, began pushing the Massachusetts Fisheries and Game Commission and the newly established National Association of Audubon Societies to do something to address the problem. He hoped an increase in the fine for killing the bird (from $20 to $100) and an active campaign to arouse greater sympathy for it on Martha's Vineyard would do the trick.[21] Both institutions responded favorably to Howland's pleas, with Audubon president William Dutcher declaring that the "experiment of trying to save a species of bird on the verge of extinction" would be of "great scientific interest."[22] The Massachusetts state legislature declared a closed season of five years for the heath hen and instituted a fine of $100 for "hunting, taking or killing, or for buying, selling or otherwise disposing of or having in possession a Heath Hen or any part thereof."[23] In 1906, a fire on the island reduced the population to around eighty birds, leading to renewed pleas for conservation. This time the state legislature responded by establishing a 1,600-acre heath hen reservation in the center of Martha's Vineyard, from land purchased with funds donated by a number of organizations and individuals, including William Brewster, John E. Thayer (whose private collection contained twenty-five heath hens),

and John C. Phillips. A year later, the state enlarged the reservation through purchase of an additional six hundred acres and the rental of one thousand more.[24] By the end of that year, estimates of the number of heath hens throughout the island ran between forty-five and sixty.

The heath hen population was then subject to closer scrutiny, more intense management, and wide population swings.[25] In the hope of encouraging the bird to rebound, state officials cut firebreaks, guarded against poaching, planted winter food crops, and instituted a more aggressive predator control program on the newly established refuge. Initially, it looked like these efforts might rescue the bird. In April of 1916, Edward Forbush, the Massachusetts state ornithologist, visited the refuge and found the booming grounds teeming with strutting heath hens. In all, he counted eight hundred birds at one site, and estimates of the population throughout the island ranged as high as two thousand.[26] It looked like the subspecies might have turned the corner on the road to recovery, even to the point of fueling optimism about reintroducing it back onto the mainland. Soon after his visit to Martha's Vineyard, Forbush met with T. Gilbert Pearson (of the National Association of Audubon Societies), Winthrop Packard (of the Massachusetts State Audubon Society), George W. Field (of the Massachusetts Fisheries and Game Commission), and other ornithologists and conservationists who decided to remove surplus birds for captive breeding and transplantation experiments. Then, in May of that year, disaster struck in the form of massive fire fanned by nearly gale force winds. In all, about thirteen thousand acres burned, more than 20 percent of the island and much of the scrub-oak barren habitat the heath hens needed to survive.[27]

Despite the devastating fire, Massachusetts officials decided to continue the risky transplantation experiment.[28] In December 1916, the New York Conservation Commission, which was keen on reintroducing the bird back into its former Long Island stronghold, received eighteen captured heath hens, which it placed in a three-acre enclosure. John C. Phillips, who had previously enjoyed success raising numerous game birds (including the prairie chicken) at his estate in Wenham, Massachusetts, received eight birds, which he kept in small covered breeding pens. In his characteristically understated tone, Gross later described the results of these experiments as "uniformly unsatisfactory." Seven of the heath hens shipped to New York fell victim to predatory birds, while the remainder died of a mysterious disease. One of Phillips's females was accidentally killed, one of the males died in a fight, and the remaining birds showed absolutely no interest in mating. Frustrated, Phillips sent the surviving birds to a colleague in No Man's Land, Massachusetts, where they apparently languished. Following

the fire, the capture and removal of twenty-six birds, a hard winter, and an invasion of goshawks, by the spring of 1917, the heath hen population dipped to one hundred birds.[29]

For a short while, the bird seemed to rally again. Following his 1918 count, Forbush estimated that 150 heath hens remained on the island. That same year, Massachusetts game officials asked A. K. Fisher, of the Bureau of the Biological Survey, to inspect the reservation. Not surprisingly, given the priorities of his agency at the time, Fisher's report called for a more active program of fire and vermin control, both of which were instituted.[30] By the spring of 1920, Forbush counted 314 birds, and Allan Keniston, the superintendent of the reservation, estimated that the total population had increased to 600 birds. Then, for reasons that remain unclear, the population began falling again. By 1922, Forbush counted only 117 birds. Concerned that the state of Massachusetts was spending more than $3,000 per year to maintain a reservation that seemed to be failing in its mission, the director of the Massachusetts Division of Fisheries and Game sent a questionnaire to leading ornithologists, sportsmen, and others who had expressed an interest in the plight of the heath hen. Should the state continue its extraordinary efforts to save the bird? The response proved a resounding yes, and members of the Nuttall Ornithological Club and the Brookline Bird Club urged that a life-history study be undertaken as soon as possible to discover "the conditions which govern the existence of the birds on the island." When state officials failed to sponsor such a study, Phillips spearheaded the effort to raise private funds and hire Alfred Gross to conduct it. Phillips, Barbour, Thayer, and a number of other Nuttall Club members provided the initial funding for the research, with the newly founded Federation of New England Bird Clubs picking up the tab after the first few years.[31]

ENTER ALFRED GROSS, EXIT BOOMING BEN

Alfred O. Gross seemed a natural choice to undertake a detailed scientific study of the beleaguered heath hen.[32] Born in 1883 in east-central Illinois, Gross's early interest in natural history was fostered by his father, a merchant and farmer, and his older brother, who taught him to hunt. Following high school graduation, he attended a college preparatory school, where he supported himself by working as a taxidermist at the University of Illinois Natural History Museum. During his junior year in college, he began working for the pioneer ecologist Stephen Forbes, who offered him a job directing the Illinois Statistical Ornithological Survey, the first attempt to census bird populations across an entire state.[33] After earning his B.A. degree with special honors in zoology from the University of

Illinois, Gross entered graduate school at Harvard, where opportunities for the formal study of field natural history were unavailable.[34] Though his major advisor was the physiologist George H. Parker, Gross still managed to find time to do fieldwork during his summers at Harvard's Bermuda Biological Station, where he completed research on the tropicbird, his first of many subsequent life-history studies. After earning his Ph.D., Gross accepted a position at Bowdoin College, where he would spend the next sixty years, and soon completed studies of the dickcissel, the black-crowned night heron, and the common nighthawk.

Gross first traveled to Martha's Vineyard in early April 1923 and remained on the island until July. Initially, he found the reservation, a "large area of sandy plains grown up to scrub oaks," rather bleak, "little more than an uninteresting waste." Gradually, however, he warmed to the area's "lure and attractiveness."[35] What he failed to do, though, was detect a significant population of heath hens. His initial census revealed only twenty-eight birds, an alarmingly low number that clearly did not bode well for the future of the subspecies. While aware of the limitations of his census technique, which involved actual counts of birds engaging in their "weird courtship antics" supplemented with daily reports of wardens and other reliable observers, Gross feared that many previous estimates of heath hen populations had been marred "by the personal factor" and were thus "larger than the facts warranted."[36] Concerned that a disproportionate abundance of male birds reduced the breeding potential of the small remaining population, Gross recommended the trapping of five male heath hens, a common practice among gamekeepers in England and Scotland trying to maximize the reproductive rate of bird populations. Unfortunately, all of the captured males soon died.[37] The next year's census revealed a modest but still promising increase: fifty-six heath hens, all but three of which proved male. Then the population began declining again, a development that perplexed Gross and his supporters.

Following a 1925 conference on the heath hen, the Federation of New England Bird Clubs hired an additional game warden to patrol the reservation and further ratchet up predator control efforts. Between July of 1925 and November of 1926, Keniston and the warden killed at total of 162 cats, 71 crows, 21 rats, 44 hawks, and 5 owls with little apparent effect on the heath hen.[38] Rather than rebounding, the population continued to decline. The March 1927 census revealed only thirteen heath hens, and the best estimate indicated that a total of no more than thirty birds remained on the island.

In May 1928, Gross published the results of his first five years of heath hen study in a book financed with income from a bequest that William Brewster had granted to the Boston Society of Natural History. His introduction seemed to state the obvious when it declared the heath hen was "on the verge of extinction."

Although the bird had stimulated "great human interest among sportsmen, ornithologists and bird lovers all over the world," now it was "waging what appears to be a losing fight for existence": "It is probable that under the present efficient methods of protection the birds will continue to exist for many years, alternately rising and falling in numbers but finally flickering out. From a biological point of view it would be nothing short of miraculous if the present small group of Heath Hen, chiefly males, fighting against seemingly insurmountable odds, should be able permanently to re-establish itself over any considerable part of its former range in New England."[39]

In the body of his report, Gross summarized the history of the once abundant heath hen and detailed efforts to protect it since Howland first sounded the alarm about the subspecies in 1905. Gross blamed humans as a primary factor behind the "disappearance of the Heath Hen from most of its former range." The bird offered a "striking example of a bird which has not been able to adapt itself to the changing conditions brought about by civilization."[40] Outside of his more detailed analysis of what he thought had happened to the subspecies on Martha's Vineyard, however, Gross refused to speculate about exactly how and why the heath hen declined from its formerly extensive range on the mainland. He did hint that overhunting may have played a role in its overall decline, but he remained silent about the potential impact of habitat destruction, competition from exotic species, exposure to diseases, and other factors that may have contributed to a reduction in the subspecies' range. Undoubtedly part of his reticence here was related to the fact that early records of the heath hen tended to be "uncertain and obscure."[41]

He proved less reticent when discussing the impact of humans on the Martha's Vineyard heath hen population.[42] Summer residents of the island had frequently abandoned cats upon returning to the mainland in the fall, resulting in a large feral population that preyed on all manner of birds and small mammals. Attempts at supplementing the heath hen diet with corn and other grains had backfired by attracting rats and crows to the area, animals that also preyed on the subspecies. In addition, humans had introduced domestic chickens, turkeys, and geese onto the island, birds that carried deadly poultry diseases, like blackhead. At least one of the heath hens captured in the effort to reduce the ratio of male birds in 1923 died from this disease.

Beyond these factors were others—native predators and the periodic fires—whose causes and consequences proved much more difficult to disentangle. Gross admitted that heath hen remains had been found in the stomachs of marsh hawks, red-tailed hawks, and especially goshawks, which had appeared on the island during the winters of 1916–17 and 1926–27. But he remained skeptical of

the widely accepted notion that "wholesale killing" of all hawks and owls, particularly those species that fed primarily on rodents, benefited the heath hen. On the contrary, he feared that indiscriminate killing of predators might "upset the balance of nature so as to act as a boomerang to the Heath Hen." Attempts at fire suppression proved equally uncertain in their impact. Periodic fires were a friend of the heath hen, as long as the population remained reasonably large and widely dispersed, because they helped keep the bird's habitat from becoming overgrown with shrubs and trees. But as the heath hen population became tiny and confined to a relatively small area, it became much more vulnerable to fire. To complicate the matter further, fire suppression efforts on the island may have contributed to more severe burns when fire inevitably broke out.

Gross suggested two final factors that seemed to have contributed to the decline of the heath hen on Martha's Vineyard. Several observers had noted the high ratio of male to female birds in the island's heath hen population. He speculated that this imbalance might have resulted either from "excessive inbreeding" in the small remaining colony or from the fact that females proved more prone to predation and fires while incubating their eggs and caring for their young. Whatever the cause of the distorted sex ratio, Gross pointed that in closely related species, like the ruffed grouse, males were known to harass nesting females and even kill their young, and he feared something similar might be happening with the heath hens on Martha's Vineyard. In addition, Gross noted that male sterility might have played a role in the population decline.[43]

Gross's report represented the most exhaustive study of an endangered species that had ever been attempted. It provided much more detailed and reliable information than, for example, Hornaday's study of the bison, issued in 1889, or anything that was published about the passenger pigeon or the Carolina parakeet before they fell victim to extinction in the first part of the twentieth century. Still, Gross failed to produce a definitive life history and ecological study of the kind that scientists routinely began to undertake at the time he completed his research. For one thing, the rarity of the species severely limited the kind of research he could undertake. Gross, for example, proved unable to thoroughly document exactly what the heath hen ate. Rather than collecting numerous specimens of the heath hen during different times of the year and examining their stomach contents—a technique that economic ornithologists had used for decades—Gross had to rely on the "meager notes" contained in the writings of previous ornithologists, a handful of records taken from museum specimens, and his own field notes.[44] As we have already seen, his ability to learn much about the behavior of females and young was also limited by the fact that he failed to locate the nest of the heath hen, despite repeated searches.

In 1929, one year after publishing his report, Gross penned an article for *Bird-Lore* announcing that "in spite of the best efforts of conservationists, the Heath Hen has steadily decreased in numbers until, this year, apparently, but one bird remains. The death of this individual will also mean the death of its race, and then another bird will have taken its place among the endless array of extinct forms." The state of Massachusetts had spent more than $70,000 and conservation organizations, bird clubs, and individuals had donated "thousands more" to study and protect the heath hen. "For the first time in the history of ornithology," Gross pointed out in a later version of this article, "a species has been studied and photographed in its normal environment down to the very last individual."[45] In his final public statements about the bird, Gross emphasized two causes above all others for its demise: "The habit of the Heath Hen of congregating in open fields and the ease with which it was tricked and killed by the market gunners were contributing factors in its rapid decline after white man and firearms came to America."[46]

The final heath hen, nicknamed "Booming Ben," continued to live for several more years. Ironically, he almost perished in 1929 when John Phillips, who had done as much as anyone to save the species, nearly ran over him with his car.[47] Some scientists argued that the last heath hen should be captured to preserve its skin for prosperity, as had been done with the final passenger pigeon that died in the Cincinnati Zoo, but Gross and his colleagues thought it more fitting to let it "live in its natural environment among the scrub oaks of Martha's vineyard than . . . to mount it and have it collect dust on some museum shelf."[48] The last authenticated sighting of this increasingly famous lone bird occurred in March of 1932. When Booming Ben failed to make an appearance the following spring, Gross reported to Massachusetts officials that the race *Tympanuchus cupido cupido* was extinct, though naturalists never found his body.[49]

The profound sense of loss that the demise of this bird provoked was best captured in an anonymous editorial published in the *Vineyard Gazette*, which devoted an entire issue to the passing of the heath hen: "There is no survivor, there is no future, there is no life to be recreated in this form again. We are looking upon the uttermost finality which can be written, glimpsing the darkness which will not know another ray of light. We are in touch with the reality of extinction."[50] According to this unnamed writer, even scientists who had come to Martha's Vineyard "full of passion for metric measurements and Latin labels" had been inspired "to write poetry" about their experiences with the bird. The demise of the heath hen had opened up a "void in the April dawn" that would not soon be forgotten. In the end, the considerable knowledge that Gross produced

FIGURE 52. "Booming Ben," the last heath hen, 1929. As the final living heath hen, Booming Ben became a minor media celebrity that provoked broad discussion about the larger meaning of wildlife extinction. From Alfred O. Gross, "The Last Heath Hen," *Bird-Lore* 31 (1929): 253.

about the heath hen revealed much about why the species had perished, but it could not prevent this void.

ON THE TRAIL OF THE IVORYBILL

In January 1937, nearly five years after the last definitive sighting of the heath hen, James T. Tanner loaded up his car and headed south. Over the next three years, the twenty-two-year-old Cornell graduate student would devote nearly twenty-one months in the field, logging more than forty-five thousand miles on his Model A Ford and covering countless additional territory by train, foot, boat, and horse. The goal of this lengthy journey was to learn more about the elusive ivory-billed woodpecker, known to science as *Campephilus principalis*, but known to locals across its range as the "ivorybill," the "kent," the "king of the woodpeckers," or the "Lord God bird." With a wingspan of approximately thirty inches, it was the largest woodpecker in North America and among the largest of its kind in the world. This awe-inspiring species had once inhabited the moist bottomlands and swampy forests across the southeastern United States. But as its habitat had been destroyed in the years surrounding the American Civil War, its range had been dramatically reduced and its numbers dangerously thinned. Tanner hoped to discover exactly how many ivorybills remained, to

identify the specific locations they inhabited, and to study their life history, behavior, and ecology. Ultimately, he and his sponsors hoped his research would inform policies that would rescue the beleaguered species.[51]

Financed with a grant from the National Association of Audubon Societies, Tanner's study came at a crucial juncture in the development of American wildlife management, when the field was experiencing a period of rapid professionalization and transformation. Within a few short years in the midst of the Great Depression, Herbert Stoddard authored the first American monograph on the biology and management of a game species (1931); Aldo Leopold published the first textbook and secured first university chair specifically devoted to the field (1933); the U.S. Bureau of the Biological Survey established a Cooperative Wildlife Research Unit Program in conjunction with eight American universities (1935); and wildlife managers and conservationists called the first North American Wildlife Conference (1936), founded their own professional organization, the Wildlife Society (1937), and began publishing the *Journal of Wildlife Management* (1937). During this same period, a handful of professionally conscious wildlife managers began calling for an increased reliance on science to learn more about the factors governing the distribution and abundance of native flora and fauna. It was time, these reformers argued, to abandon the crude "rule-of-thumb" calculations that had long characterized their field. It was also time to broaden the preoccupation with game species, which had traditionally garnered the lion's share of attention and funding.[52]

Perhaps not coincidentally, these calls for reform in wildlife management came not long after the field of natural history began experiencing a series of profound shifts of its own. Naturalists who had once learned their craft through apprenticeships and self-study were quickly giving way to university-trained biologists, while a traditional focus on collecting, naming, and describing new species was broadening to an interest in the ecology and behavior of living organisms in the field. By 1910, the Ph.D. degree had become the standard entry credential into most scientific disciplines. Within the next decade, a series of programs at places like Cornell, Michigan, and Berkeley began churning out university-trained naturalists with the scientific tools and the personal inclination to study native species in their natural environment.[53]

Modern science did offer the hope of providing authoritative information about the status of endangered species. In fact, Tanner eventually succeeded in locating a handful of surviving ivory-billed woodpeckers, in identifying the critical habitat they needed, and in offering a series of policy recommendations that might have ensured their long-term viability. But as Tanner and his sponsor, the National Association of Audubon Societies, learned, science alone could not

save the species. In the early 1940s, when Tanner published the results of his ivorybill research, America seemed much more concerned with preserving private property rights, promoting economic development, and winning the war than in saving an obscure swamp-dwelling bird that ate grubs. While we will never know for certain whether Tanner's recommendations might have snatched the ivorybill from the jaws of extinction, we can be sure that the failure to implement them helped secure the species' fate.

The British naturalist Mark Catesby first described the ivory-billed woodpecker in the early eighteenth century, one of dozens of New World birds he introduced to science.[54] By the first several decades of the nineteenth century, Alexander Wilson, John James Audubon, and other naturalists had recorded the basic facts regarding the ivorybill's appearance and habitat.[55] The bird's plumage was glossy black, with a white stripe that started on each cheek and continued down the side of its neck. It also possessed a broad band of white on the trailing edge of its wings, an area that appeared as a highly visible triangular patch on its back when the bird was perched. Its bill was ivory white and approximately two and a half inches long. The male boasted a prominent scarlet crest that shone brilliantly in the sunlight, while the crest of the female was entirely black. Audubon compared the bird's call to the high false note of a clarinet, while others described it as a nasal "kent" or thought it resembled the sound of a child's tin trumpet. Although it was (and still is) often confused with its ubiquitous cousin, the pileated woodpecker (*Dryocopus pileatus*), the ivorybill was slightly larger, its bill whiter, and its large white wing patches clearly visible on its back when it rested. Early on, naturalists also recognized the ivorybill's preference for deep bottomland forests in the southeastern United States.

By the end of the nineteenth century, the ivorybill had declined to the point that it had become one of the rarest of North American birds. As such, its skins and eggs proved in great demand among bird collectors. Even naturalists who were otherwise sympathetic to avian conservation rarely passed up the opportunity to collect an example of the increasingly prized bird. For example, the ornithologists Frank Chapman and William Brewster had both been founders of Audubon bird protection movement in the late 1880s.[56] Yet, in 1890, the two were delighted to find an ivorybill during an expedition down Florida's Suwannee River and expressed no qualms about collecting the rare bird.[57] The rage for collecting remained so strong that by 1920 more than four hundred ivorybill skins were gathering dust in ornithological collections across the world, yet only than the most rudimentary facts concerning its life history and behavior were known.[58] At that point, some feared the bird might have been gone entirely.

As had been the case earlier with the heath hen, predictions of the ivorybill's

demise proved premature. In 1934, Arthur A. Allen, a professor of ornithology at Cornell, got wind of a recent sighting of the ivorybill in Madison Parish, Louisiana, on an eighty-one-thousand-acre site known as the Singer Tract.[59] At the time, he was contemplating how to spend his sabbatical leave the following spring. During the previous decade, Allen had been building Cornell's ornithology and wildlife conservation program into one of the nation's largest and most successful of its kind.[60] Cornell also represented a moving force behind the American nature study movement, so not surprisingly, besides his extensive undergraduate and graduate teaching duties, Allen also remained committed to the popularization of ornithology. In the late 1920s, he began experiments to produce the first sound recording of birds in the wild. Joining him in these pioneering efforts were two of his students, Peter Paul Kellogg and Albert R. Brand, both of whom would devote much of their subsequent careers to producing bird recordings for scientific study and popular consumption.[61]

During the summer of 1934, Allen and Brand decided to mount an expedition to record the voices of birds, particularly species that seemed vanishing. Brand, a former Wall Street investment banker and now an affiliate with the American Museum of Natural History in New York, planned the itinerary and financed the venture.[62] According to Allen, one of the "first objects of the expedition was the rediscovery of the ivory-billed woodpecker, perhaps the rarest of North American birds and at one time thought to be extinct."[63] Allen and his colleagues also hoped to record the songs, take photographs, and capture motion pictures of many more common species that they would encounter along the way. Accompanying Allen throughout the fifteen-thousand-mile journey were Kellogg and another of his students, James T. Tanner. Brand and George M. Sutton, a bird artist and curator of ornithology at Cornell, also joined the expedition party at various points along the way.

The Brand–Cornell University–American Museum of Natural History Ornithological Expedition set out from Ithaca in mid-February 1935. One of the first destinations was central Florida, where Allen had found a pair of ivory-billed woodpeckers in the mid-1920s that a local taxidermist had later collected. Despite a month-long search in areas of the state the bird had once inhabited, Allen and his colleagues failed to locate a single ivorybill. Disappointed, but undaunted, in late March they headed off to Madison Parish, Louisiana, where they continued their search with the aid of two local guides. Spring rains made the muddy unpaved roads virtually impassible for their heavy trucks, so the naturalists loaded their supplies and 1,500 pounds of recording equipment onto a mule-drawn wagon and slogged their way into the heart of the Singer Tract. On the third day, seven miles from the nearest improved road, the expedition party be-

FIGURE 53. Transporting equipment into the Singer Tract, 1935. From *left* to *right:* James T. Tanner, J. J. Kuhn, A. A. Allen, Albert, and Ike. With the help of Kuhn, a local guide, Allen's expedition party managed to record, photograph, and film the elusive ivorybill for the first time. The success of that expedition led to the creation of the Audubon Graduate Fellowship program. Courtesy of James T. Tanner.

came ecstatic when they finally located a pair of nesting ivorybills. In the words of Sutton: "The whole experience was like a dream. There we sat in the wild swamp, miles and miles from any highway, with two ivory-billed Woodpeckers so close to us that we could see their eyes, their long toes, even their strongly curved claws without binoculars."[64]

The group pitched a tent less than three hundred feet from the nesting site and dubbed their soggy new quarters "Camp Ephilus," a pun on the scientific name of the species they had rediscovered. For the next several days, they gathered a mountain of information on the life and behavior of the ivorybill, more data than had ever been previously accumulated on the species in the nearly two centuries since Catesby had first described it. The men took turns using tripod-mounted twenty-four-power binoculars to monitor the nest from daylight until dark. In addition, Sutton sketched the birds from life, while Allen, Tanner, Kellogg, and their guide made the first photographs, motion pictures, and sound recordings of the ivorybill from a makeshift blind constructed in an adjacent tree only twenty feet from the nest opening, which was nearly fifty feet from the ground.

Allen's motion pictures and sound recordings featuring the elusive ivorybill proved a huge hit at the numerous popular lectures he delivered following his

return to Ithaca. Perhaps no audience was more enthralled with the presentation, however, than the members assembled in New York City for the National Association of Audubon Society's annual meeting in October 1935.[65] At the time, the organization had begun devoting increasing attention to threatened species, in part because of a tremendous upheaval that the group had recently experienced. The sources of that discord were many, but much of it can be traced back to a scathing sixteen-page pamphlet issued back in 1929 and entitled *A Crisis in Conservation: Serious Danger of Extinction of Many North American Birds.*[66] As we have seen, the tract's authors charged the National Association of Audubon Societies with standing by idly while a disturbing number of avian species were rushing headlong into extinction.

It took several years for all the dust to settle, but by 1934, the association's longtime president, T. Gilbert Pearson, had been forced from office, and John Baker, a birdwatcher and no-nonsense business executive took charge of the organization's day-to-day operations. Over the next several years, Baker instituted a series of reforms aimed at restoring the credibility and effectiveness of Audubon.[67] One strategy for reinvigorating the organization was to recruit new staff and board members. An example of the latter was Aldo Leopold, whom Baker described as one of the "most original thinkers on conservation and game management subjects I know."[68] At the time of Baker's ascendancy, Leopold was making a name for himself through his thoughtful writings on conservation, his pioneering book on *Game Management* (1933), and his newly created program in that same field at the University of Wisconsin.

In the fall of 1935, Baker began discussions with Leopold on how to focus American wildlife conservation more on the needs of species facing extinction. Writing to Baker from Germany in September of that year, Leopold articulated a desire for "an inventory of all native species, especially threatened ones, giving a pretty *national work plan* as to just what is needed to perpetuate that species, and who can do it. The entry for each species should include not only protective legislation (on which NAAS has so far laid almost exclusive emphasis), but also protective actions other than legislation, and especially 'environmental control' needs. . . . Research needs should also be listed and 'assigned.'"[69] Leopold drew up a sample entry for the sand hill crane indicating exactly the kind of information required. The entry included a call for financing a research fellowship to learn more about the life history of the species.

Later that year, Leopold began circulating a "rough draft" of a paper entitled "Proposal for a Conservation Inventory of Threatened Species."[70] There he pointed out that despite the "large and sudden increase" in wildlife conservation initiatives in the United States, governmental agencies, private organizations,

and individual citizens had failed to coordinate effectively.[71] Moreover, too much activity remained focused on game species, which were likely to be saved by "powerful motives of local self-interest . . . however great the blunders, delays and confusion" in getting their management properly established. The same was not necessarily true for what Leopold referred to as "wilderness game" (like grizzly bears), migratory birds, predators, and rare plant associations, or "in general all wild native forms that fly at large or have only esthetic and scientific value to man." These species represented the "threatened element in 'outdoor America'—the crux of conservation policy." What was desperately needed was an inventory of these threatened forms "in each of their respective places of survival" as well as an "inventory of the information, techniques, and devices applicable to each species in each place, and of local human agencies capable of applying them."[72] As an example of the kind of information he thought would prove useful to compile and circulate, Leopold pointed to the ivory-billed woodpecker, "a bird inextricably interwoven with our pioneer tradition—the very spirit of that 'dark and bloody ground' which has become the locus of national culture." Ornithologists had recently located a remnant population of these noble birds in a virgin forest slated for logging. Now it was important to bring this information to the attention of the National Park Service, the Forest Service, and the Bureau of the Biological Survey so that these agencies could work together to save this remnant home of the ivorybill.[73]

"AN ANIMATED NEEDLE IN A HAYSTACK"

About the time Leopold began circulating his proposal for an inventory of threatened species, Allen wrote him. While working up his notes on the ivory-billed woodpecker, he had become "increasingly impressed" with the need to have a "well-qualified young ornithologist make an intensive study of the present status and life history of the bird, taking up where we left off last spring."[74] James Tanner, the graduate student who had accompanied the Brand–Cornell–American Museum Expedition the previous year, had expressed an interest in pursuing the project and had even approached Audubon officials to ask about the possibility of funding. Leopold replied that "nothing would delight me more than to see you follow up with a life history study of the ivory-bill. . . . I hope, too, that any research plan would include an administrative plan for the perpetuation of the species."[75]

Baker was quickly sold on the idea. He and his staff, however, began thinking in terms not simply of a single graduate fellowship to study the ivorybill, but a series of Audubon-sponsored fellowships to study other endangered species as

well. Besides discussions with Allen, Baker also approached Joseph Grinnell, at the University of California at Berkeley, about a graduate fellowship to study the California condor and Charles T. Vorheis, at the University of Arizona, about another to study the desert mountain sheep. In a speech announcing the fellowship program at the 1936 Audubon Society meeting, Baker suggested that studies on the whooping crane, glossy ibis, sage grouse, grizzly bear, and mountain lion should also be initiated.[76] Baker then wrote Allen to ask whether Cornell officials would welcome such a fellowship, if Allen would be willing to recommend and supervise a suitable candidate, and when the fellowship could begin. The results, Baker hoped, would be widely circulated in special report that the Audubon Society would publish.[77] In subsequent correspondence, Baker indicated that Audubon could commit up to $1,500 a year for three years to fund the Ivory-Bill Graduate Research Fellowship.[78]

Given the difficulties in securing financing for his students, especially during the Depression, the Audubon fellowship proposal delighted Allen. During the negotiations over the specifics of the contract, he sought to reassure Baker that science might still rescue the beleaguered species. Based on the recent experience of the heath hen, some considered it futile to attempt to rescue a bird that had become as rare as the ivorybill. But "had we known as much about Grouse in general twenty years ago as we do today," Allen argued, "the Heath Hen might have been saved, and the same holds true for the Ivory-billed Woodpecker. Unless we know more than at present there is no hope of saving it."[79]

With three years of secure funding, Tanner set out on the trail of the ivorybill in January 1937. He spent his first several months in the field trying to discover how many and where ivorybills might still exist. Based on published records, specimens in collections, rumors of sightings, and interviews with local residents, he identified about fifty potential sites to survey in seven southeastern states.[80] Ironically, one of the most useful sources of information about the species turned out to be the employees affiliated with the logging industry, who tended to have a detailed knowledge of local timber stands and the wildlife they contained. When he identified what appeared to be suitable habitat in swampy forests, he searched high and low for ivorybill holes and feeding signs, extensive scaling of bark on trees that had recently died, while listening carefully for the bird's distinctive call and the characteristic loud, double rap of its beak on a tree. Tanner compared the enterprise to "searching for an animated needle in a haystack" and after his arduous investigation concluded that only two dozen ivory-bill woodpeckers still remained in about five areas in Louisiana, Florida, and possibly South Carolina.[81]

In fact, he had seen with his own eyes only six of the elusive birds, all of them in the Singer Tract in Madison Parish, Louisiana. There he spent a total of over a

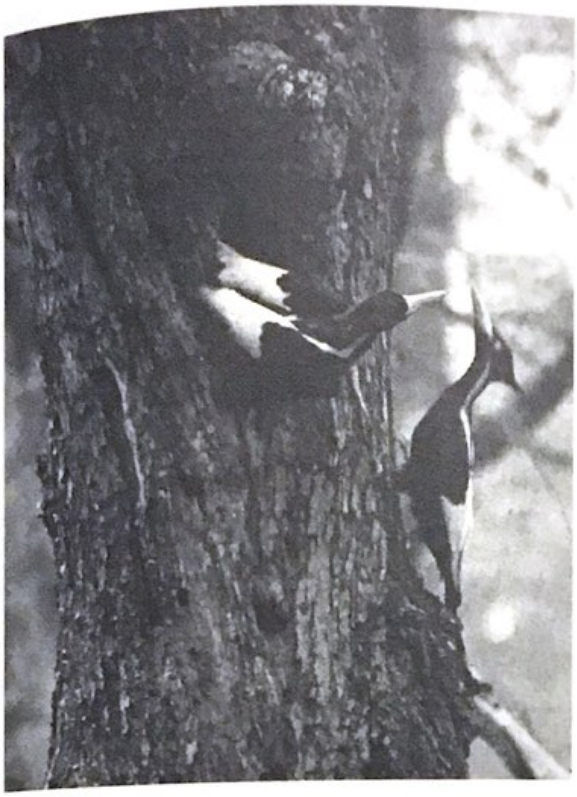

FIGURE 54. A pair of ivory-billed woodpeckers exchanging places on a nest, 1935. During his studies of the Singer Tract ivorybills, Tanner discovered that the species' restricted range was related to its narrow feeding preferences. Using the knowledge he gained, the National Audubon Society pushed to have the Singer Tract preserved. Courtesy of James T. Tanner.

year documenting their ecology and life history. Among his most important discoveries, Tanner found that the species' dire status appeared linked to its narrow feeding preferences. The ivorybill's primary food source was the wood-boring larvae of several families of beetles that live between the bark and sapwood of recently dead trees. Ivorybills existed only in forests where dead and dying trees were frequent and other woodpeckers abundant, conditions normally only found in "tracts of uncut, mature timber."[82] While overzealous collecting and careless hunting might have contributed to the decline of the species in some areas, the overall diminution in range of the ivorybill coincided with the spread of the logging industry in the South: "Mature forests of large, old trees have almost disappeared, and these conditions favorable for the Ivory-bill will very probably never again prevail. Its preservation must be accomplished by saving suitable habitat or by maintaining on certain areas an adequate food supply for the birds."[83]

Ideally, areas still inhabited by the ivorybill should be preserved as "refuges and as primitive areas."[84] According to Tanner, the most promising sites included the Big Cypress Swamp and the lower Apalachicola River Swamps in Florida, possibly the Santee River Swamp in South Carolina, and most importantly, the Singer Tract in Louisiana. In these locations, he recommended securing a minimum undisturbed area of about two and one-half to three square miles for each

pair of the birds. Tanner emphasized that this was a minimum requirement, and "The larger the area of the forest the better for the conservation of the birds—that is certain."[85] Where the chief obstacle to the establishment of a larger protective refuge was the market value of the standing timber, as with the Singer Tract, Tanner recommended a program of selective cutting outside the undisturbed areas that would leave dead and dying trees to supply borers to the woodpeckers. He also thought selective killing of suitable tries might encourage the growth of borer populations, thus increasing the ivorybill's food supply.[86]

Tanner's copiously illustrated account appeared in 1942 as Research Report No. 1 of the National Audubon Society.[87] In a foreword to the publication, Baker declared that the Audubon Society considered scientific research of the type found in this report as an "essential basis for wise policies governing the conservation of wildlife resources" and pronounced that his organization remained firmly committed to the proposition that "the Ivory-bill shall not, as a part of America's heritage, go the way of the Passenger Pigeon and the Great Auk."[88] Allen contributed a preface that proclaimed that "the greatest tragedy in nature is the extinction of a species. . . . Surely no intelligent human being could be indifferent to the passing of the last Ivory-billed Woodpecker."[89]

At the time of Tanner's report, the National Audubon Society had already begun efforts to protect the ivorybills on the Singer Tract. The Singer Manufacturing Company had acquired the land in 1916, and ten years later, company officials contracted with the Louisiana Department of Conservation to establish a game refuge in the area.[90] Their motivation was not to protect the ivorybill or other wildlife in the area, however, but simply to minimize the risk of accidental fire from hunters. By the time Tanner began his study in 1937, the Singer Tract consisted of about eighty-one thousand acres, four-fifths of which he considered "virgin timber."[91] That same year, the Chicago Mill and Lumber Company acquired rights to the lumber on the Singer Tract and soon began logging west of the Tensas River. By 1941, the tract had been approximately 40 percent cut over.[92] Fortunately for the ivorybill, most of the land logged by that point was not in areas where the species had recently been found.

Baker pursued numerous avenues in a desperate bid to protect the site. He appealed directly to President Roosevelt for help, and soon officials in the Forest Service, the Park Service, and the Fish and Wildlife Service became involved in the discussions.[93] However, he failed to convince any of these federal agencies to acquire the home of the ivorybill, the primary obstacle being the value of the standing timber on the Singer Tract, estimated to be worth about $2 million.[94] He pleaded with two successive governors of Louisiana to use the powers of condemnation to declare a wildlife sanctuary in the area, but both refused. With

the pace of logging increasing during the war, in 1943, Baker secured a $200,000 commitment from the state of Louisiana to purchase part of the remaining uncut area in the Singer Tract as an inviolate wildlife refuge. He also convinced the governors of Louisiana, Tennessee, Arkansas, and Mississippi to sign a petition requesting the Chicago Mill and Lumber Company to waive its contractual rights to cut the remaining timber on the Singer Tract and to sell a cutover buffer area for a reasonable price.[95] At a meeting in Chicago in December of that year, however, officials of Chicago Mill and Lumber flatly refused to negotiate. They did reveal that German POWs were logging the land and that most of the lumber was being fashioned into shipping crates and tea chests for the British.[96] By 1944, only one ivorybill remained in the Singer Tract. It represented the last documented sighting of the bird in the area.[97] And still the cutting continued. (Ironically, in 1980, the federal government created the Tensas River Wildlife Refuge on part of the site).

In the end, hopes for saving the ivory-billed woodpecker were dashed on the hard rocks of political and economic reality. Clearly, science could reveal vital information about the status and ecology of this magnificent creature, but science alone could not effect the fundamental reorientation in values needed to save it. By the time American society began to show signs of such a value shift, it was too late for the ivorybill. The species was among the earliest to be listed under the first Endangered Species Act of 1966, but by then, its trail had grown increasingly cold.[98] While recent reports of sightings nurse hopes that the bird might once again grace our bottomland hardwood forests, it seems possible that the ivorybill now exists only as lifeless skins in the drawers of museums, as fading images on paper and film, and as ghosts that haunt us with what might have been.[99]

IN CONDOR COUNTRY

The California condor (*Gymnogyps californianus*) narrowly escaped a similar fate. Anyone who has seen a close-up photograph of the bird—which bears an uncanny resemblance to a Disney cartoon character—might wonder why its decline would engender concern. From the perspective of most humans, the condor is a homely creature that survives in a grisly fashion: by picking through the carcasses of dead and decaying animals, mostly large mammals. Witnessing the species in person, however, can be a different experience altogether. With its massive size, majestic flight, and wilderness haunts, it is easier to appreciate how the bird could elicit mounting concern as its numbers diminished.

Possessing a wingspan of nine to ten feet, the California condor is the largest soaring land bird in North America, and from a distance, viewers often confuse

it with an aircraft.[100] Able to cover vast distances in a single day, the condor relies on thermals or winds blowing over topographic features for flight, a characteristic that generally limits food acquisition to the middle hours of the day. Its average flying speed is around thirty miles per hour, although they have been clocked at up to forty-five miles per hour. According to the conservation biologists Noel Snyder and Helen Snyder, the basic habitat needs of the California condor are relatively straightforward: an area with adequate carrion, reliable winds or thermals, and few obstructions so food can be easily discovered and safely accessed.[101] The species is monogamous, with pair bonds enduring over many years and usually terminating only with the death of one member. At the same time, it is highly sociable, gathering in large numbers at roosts, bathing areas, and feeding sites, a behavior that has facilitated census attempts, but also rendered it more vulnerable. Adult California condors face relatively few predators, save for humans, while eggs and nestlings sometimes fall victim to common ravens, golden eagles, black bears, and (formerly) grizzly bears. However, with a late date of sexual maturity (about six to eight years), an invariable clutch size of only one egg, and a tendency not to lay a second egg in a year following successful nesting, the species has an extremely slow population growth potential, so it must maintain low mortality rates to persist.

The California condor once ranged widely across North America. Remains of the species have been found as far east as New York and Florida and as far south as Nuevo León, Mexico. The extinction of much of the continent's mammalian megafauna at the end of the Pleistocene era probably contributed to a reduction in the condor's range, which was gradually confined to the southwestern portion of what would later became the United States.[102] According to some scholars, the humans who arrived on the North American continent about twelve thousand years ago may have killed off many of the large mammals that once served as the condor's food.[103] Native peoples in the western part of the continent may have also more directly limited the population of the condor by widely using it in ritual sacrifice ceremonies.[104]

Reliable information about the species proved slow in coming. Although brief accounts of the bird occasionally made their way into writings of the early Spanish settlers in North America, the California condor remained uncollected until 1792.[105] That year, the Scottish naturalist Archibald Menzies secured a specimen at Monterey that ended up at the British Museum, where it was mounted for public exhibit, formally named, and scientifically described.[106] Just over a decade later, members of the Lewis and Clark expedition encountered the bird near the mouth of the Columbia River. When a member of the exploring party brought a wounded condor back to camp, Lewis had the opportunity to sketch its head,

measure its body, and describe its soft parts for the first time.[107] In the 1830s, Audubon produced a life-size drawing of the California condor for the folio edition of his *Birds of America*, although the source of the specimen that served as his model is uncertain.[108] In a short account of the species in 1890, the famed ornithologist and longtime California resident James G. Cooper became the first to sound the alarm about its status. Based on wide reading in the literature and his own firsthand observations of California avifauna over a period of nearly four decades, Cooper declared that "unless protected our great vulture is doomed to rapid extinction."[109]

Cooper's dire prediction coincided with and probably contributed to a growing interest in the condor within the ranks of bird collectors. Between 1881 and 1910, they took a minimum of 111 skins and 49 eggs of the species from the wild; at least 20 birds and 7 eggs were collected in 1897 and 1898 alone.[110] As had been the case with the heath hen and the ivory-billed woodpecker, the increasingly rare condor became a highly valued commodity within natural history circles, and that fact, coupled with its low reproductive potential, placed the species in jeopardy. In 1895, H. R. Taylor, a California collector and natural history dealer, offered to pay $250 each for up to three eggs of the bird.[111] While it remains unclear whether anyone took Taylor up on his offer, a decade later he reported that his hired collector had gathered nine condor eggs. In 1908, another California collector, Kelly Truesdale, established a dubious record when the Massachusetts ornithologist, sportsman, and collector John E. Thayer (the very same gentleman whose museum contained no less than two dozen heath hen specimens) paid him $300 for a single condor egg.[112] In his detailed study of the California condor published in 1978, the biologist Sanford Wilbur concluded that "the disappearance of condors from various parts of their range coincided with peaks of collecting activity in those areas."[113] In their recent monograph on the species, Snyder and Snyder are equally blunt in their analysis of the impact of collecting on the California condor: the large take of birds at the hands of collectors "must be considered one of the significant historical stresses on the species."[114]

Even as condor collecting reached a peak, however, a modest movement to protect the bird began. Initially, the center of that movement was a group of California ornithologists and bird collectors who expressed not only a growing pride in but also a deep concern about the native fauna of their ecologically diverse home state. In 1893, four such individuals founded the Cooper Ornithological Club.[115] The organization published brief accounts of its activities in a series of short-lived natural history journals before launching its own *Bulletin* in January 1899. A year later, the journal was rechristened *The Condor*, a nod to the growing attachment its members felt to this increasingly beleaguered species, whose range

now appeared to be confined largely to California. In addition to the observation and promotion of bird study, a stated goal of the Cooper Club was "conservation of Birds and Wild-Life, in general, for the sake of the future."[116] Members of this organization undoubtedly played a role in lobbying for the passage of a rarely enforced state law, passed in 1905, that made it illegal to kill condors or collect their eggs.

A year later, the naturalist and pioneering bird photographer William L. Finley began taking pictures of a nesting pair of California condors in Eaton Canyon, located in the San Gabriel Mountains, just north of Los Angeles. Guiding him through unfamiliar territory on the day that he first found the condor nest were two Cooper Club mainstays, Walter Taylor and Joseph Grinnell, the latter of whom had begun editing *The Condor* only one year previously. Together with his long-time partner, Herman Bohlman, Finley repeatedly returned to the nest site. They encountered adult birds so unfazed by their presence that they did not have to conceal themselves in a blind to photograph them, behavior at odds with later claims that the species was exceedingly wary of humans. In all, Finley and Bohlman produced more than 250 condor images, a remarkable accomplishment considering the heavy equipment available to them at the time and the nesting site's challenging terrain. Finley also issued a series of articles based on his observations of the condor pair and their nestling, which he captured and transported back to his home along the Willamette River in Oregon. He later donated his pet condor, named "General," to the New York Zoological Society, where the bird lived for eight years before dying from ingesting a rubber band that had been carelessly thrown into its cage.

Finley was decidedly pessimistic concerning the fate of the species. In the second of four articles published in *The Condor*, he confirmed Cooper's earlier suspicion that the species "will soon become extinct." Since the time when white settlers had first arrived in the western United States, its breeding range and overall population had greatly diminished. Although the bird survived in the "wilder mountainous" regions of central and southern California, it was "nowhere common." Finley highlighted two principal causes for the decline of the condor: overhunting and predator control campaigns. Most species would be able to withstand these onslaughts, but the condor had the misfortune to possess an usually slow reproductive rate. Given these conditions, Finley concluded, it was "not surprising that the condor numbers are decreasing, and unless the needed protection is given, this bird will undoubtedly follow the Great Auk."[117]

Finley's writings and photographs initially failed to ignite broader concern about the fate of the California condor. For the next several decades, members of the Cooper Club continued to gather scattered information about the species,