CALIFORNIA CONDORS IN THE PACIFIC NORTHWEST

JESSE D'ELIA and SUSAN HAIG

Foreword by Noel Snyder

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IN THE PACIFIC NORTHWEST

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California Condors in the Pacific Northwest

JESSE D'ELIA AND SUSAN M. HAIG

Illustrations by Ram Papish

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For Mason and Quinn

May you one day have the pleasure of gazing upward at a sky alive with the splendid evolutions of the mighty California Condor

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Foreword

Presently the largest and most astonishing bird in the skies of North America, the California Condor was one of our most highly endangered species by the 1980s, when it persisted only in a region just north of Los Angeles. By the late 1980s it endured only in captivity, but it has since been returned to the wild in selected regions. Fossil evidence from Pleistocene times shows that it inhabited not only California but a continent-wide range stretching from northern Mexico to Florida, New York, and the Pacific Northwest.

The condor was likely a breeding bird in most regions where its fossils have been found, but so far, breeding has been confirmed only in California, Baja California, and Arizona. In Arizona, paleontological research has revealed that the species once nested in caves perforating the many formations of the Grand Canyon and, following releases begun in 1996, it has again returned to nest in these sites. Whether the species ever nested in Oregon and Washington, however, has been a subject of controversy. It was frequently reported seen in this region in the nineteenth century, starting with the epic journey of Lewis and Clark in 1805, but no one has ever documented a contemporary or historic condor nest north of California. This book discusses suggestive evidence that condors were indeed breeders in the Northwest and presents a careful analysis of causes of disappearance of the species from this region by the early twentieth century—efforts that serve as a prelude to a potential program to revive a wild population in the region.

Should a consensus develop that the condor was indeed once a full-time resident and breeder in the Northwest, and should agreement be achieved that the past and present causes of the species' decline in this region have been reliably identified and countered, it may well prove feasible to reestablish this species as a wild creature in the region. This book goes a long way toward justifying such an effort, although it also thoroughly discusses the information gaps and resistance factors still remaining that could prevent success in such a project.

The last wild condor in the remnant historic population in California was trapped into captivity in 1987, joining twenty-six other condors taken from the wild as eggs or otherwise trapped from the wild. Captives have bred readily, and the total captive population, now maintained in part by the Oregon Zoo, has increased rapidly. Numbers of birds have been sufficient to allow the initiation of release programs to the wild in several locations in California, Baja California, and northwestern Arizona. These release populations, which now collectively include several hundred individuals, have been maintained in part on subsidies of carrion food and have all initiated breeding activities. However, none of these populations has yet attained demographic viability because of a variety of problems, the most important of which has been poisoning stemming from the birds feeding on carcasses of hunter-shot game containing lead ammunition fragments.

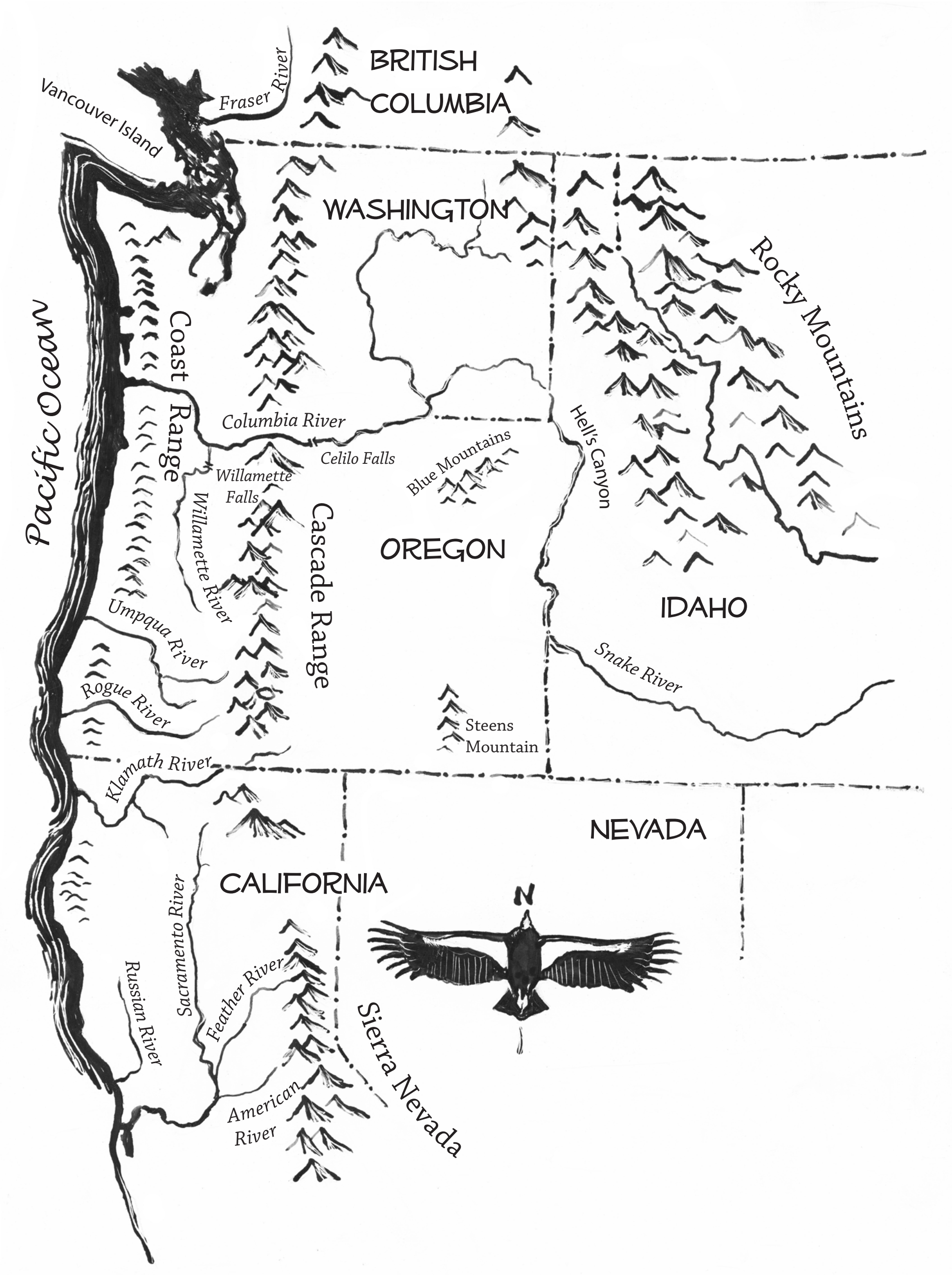
California passed legislation outlawing the use of lead ammunition in the condor's range in 2007, but the poisonings in this state continue because of difficulties in enforcing the legislation and the wide availability of lead ammunition across the country. It seems likely that an effective solution to the lead-poisoning problem may necessitate national legislation that truly removes the sources of lead ammunition and substitutes other equally effective ammunition that is nontoxic. As lead ammunition also contaminates humans to some extent, especially through ingestion of hunter-shot game, such legislation would also be a significant benefit for human health, to say nothing of the benefits to wildlife species other than condors that also suffer from lead poisoning. The insidious sublethal effects of lead contamination on our own species have already led to a banning of lead in paints, gasoline, and plumbing.

Thus, success in reestablishing condors in the Northwest may well depend on success in national efforts to solve the lead contamination problem. But it will also presumably depend on the development of effective solutions to other problems considered in this book. Success in such efforts will surely demand a continued commitment toward conservation of the species by the public and on well-conceived research and management programs to overcome resistance factors.

The re-creation of a viable population of condors in the Northwest would constitute an achievement of substantial importance, not just for those with a special interest in birds, but perhaps especially for the many Native Americans living in the region, whose cultural traditions have always honored this species as a supreme master of the skies.

Noel Snyder
Former US Fish and Wildlife Service biologist in charge of condor research

The Pacific Northwest



Preface

i•con (ī´kŏn´) *n.* An important and enduring symbol.

Fig. 1. Portrait of an endangered species icon: the California Condor. Photo by Michael Durham, Oregon Zoo.

The California Condor (*Gymnogyps californianus*), North America's largest avian scavenger and one of the largest flying birds in the world, is an iconic species by any measure (figure 1). Although commonly depicted as a bird of southern California and the desert Southwest, condors once soared the skies of the Pacific Northwest and were deeply woven into the fabric of many Native American cultures in the region. Described by Captain Meriwether Lewis as the "beatifull Buzzard of the columbia [river]," condors were observed and collected by members of the Lewis and Clark Expedition and other explorers, trappers, fur traders, naturalists, and settlers in many parts of the Northwest during the nineteenth century. Soon after 1900, however, the condor disappeared from its northern haunts and its population and range continued to contract throughout the twentieth century until only a small remnant population remained in the mountains of southern California.

Despite the extensive volume of literature published on California Condors and the Herculean conservation struggle to bring the condor back from the brink of extinction (reviewed by Snyder and Snyder 2000), to date relatively little attention has been paid to the history of condors in the Pacific Northwest and opportunities for restoring them to the region (but see Koford 1953; S. Wilbur 1973; Moen 2008; Sharp 2012). With the acceptance of the Oregon Zoo into the California Condor recovery program in 2001, and increasing interest in restoration of condors from a number of Native American tribes and the general public throughout the Northwest (see chapter 1), the need for a thorough review of the condor's history in the region has been building.

Understanding the history of condors in the northern half of their historical range is more than a curiosity. It is vital to the US Fish and Wildlife Service in defining recovery objectives and is a first step toward evaluating the potential for future reintroductions to the region. In its most basic sense, the history of a species' distribution and range collapse establishes context and helps one gauge the magnitude of anthropogenic changes over the last several hundred years rather than shifting the species' baseline condition to the current crisis situation (see Pauly 1995). It may also provide basic life history information of the species across its former range (e.g., historical breeding sites and movement patterns) that is important in setting appropriate recovery objectives. Finally, a species' natural history provides insights into the timing, magnitude, and causes of range collapse or population decline—information that is fundamental to assessing the restoration potential of imperiled species.

In this book, we document the California Condor's history in the Pacific Northwest through a review of anthropological, archaeological, paleobiological, and other historical information from myriad sources. We consulted published literature, unpublished reports, museum records, historical photographs, newspaper archives, early American journals, and documents at museums and state and federal resource management agencies, including the US Fish and Wildlife Service California Condor Recovery Office in Ventura, California, and the Santa Barbara Museum of Natural History. Our primary goal in writing this book is to provide an integrated and comprehensive synthesis of the condor's history in the region. However, it is also our hope that this book informs future dialogue concerning the role the Pacific Northwest might play in the recovery of this iconic species.

This book would not have been possible without the generosity and insights of many people. First and foremost, we thank Sanford Wilbur, principal condor researcher from 1970 to 1980, for his role as a key source of information on the historical occurrence records of California Condors in the region, something he has been investigating for decades. He also provided many constructive comments on draft chapters of this book. Sandy's continued work toward understanding the history of condors throughout their former range and sharing his knowledge with others is a testament to his undying commitment to this species.

We are indebted to Noel Snyder, principal condor researcher in the 1980s, for providing the foreword to the book and for suggesting several important corrections and additions that made the book more accurate and complete.

We also give special thanks to Jan Hamber. Jan's vast firsthand knowledge of the history of the condor recovery program and the extensive files she keeps at the Santa Barbara Museum of Natural History were most helpful. We also thank Jesse Grantham, California Condor Recovery Coordinator (2004–2012), for stimulating discussions on condor ecology and hosting us on a number of occasions to view condors in the wild and to sift through the official condor recovery files housed at the US Fish and Wildlife Service's Condor Recovery Office in Ventura, California.

When we could not find a copy of a report, book, or journal article, David Liberty, librarian at the StreamNet Regional Library in Portland, Oregon, was always willing to offer help. We are indebted to him for acquiring hard-to-find books and documents. We also thank the US Fish and Wildlife Service National Conservation Center Library and the Oregon Historical Society for their assistance in locating important documents.

Numerous archaeologists, paleontologists, anthropologists, and museum curators provided photographs and information related to condor bones and the use of condor parts in Native American cultures. Specifically, we thank Pamela Endzweig, Amanda Kohn, Martina Steffen, Patricia Nietfeld, Alison Stenger, and Jacob Fisher. We also thank Rich Young of the US Fish and Wildlife Service for his help in digitizing historical tribal boundaries, and Pepper Trail of the US Fish and Wildlife Service Forensics Lab for help in identifying feathers in historical photographs.

Many other people deserve recognition for sharing their knowledge of California Condors and guiding us to see condors in the wild. For this we thank Joseph Brandt, Joe Burnett, Eddie Feltes, Daniel George, Matthew Johnson, Chris Parish, Scott Scherbinski, Kelly Sorensen, and Mike Tyner.

We also thank Oregon Zoo personnel—Jane Hartline, David Shepherdson, David Moen, Kelli Walker, Michael Durham, Anne Warner, Shawn St. Michael, and Tony Vecchio—who provided information on the history of the zoo's entrée into the recovery program, as well as photos and access to the zoo's captive breeding facility.

We further thank Rolf Koford, Clint Epps, Bruce Marcot, David Shepherdson, Carrie Phillips, and Bruce Dugger for their helpful comments on earlier drafts of this book. Finally, we thank Ram Papish for providing texture to the book with his wonderful California Condor drawings. Support for our research was provided by the US Fish and Wildlife Service and US Geological Survey Forest and Rangeland Ecosystem Science Center. This book has been peer reviewed and approved for publication consistent with US Geological Survey Fundamental Science Practices (http://pubs.usgs.gov.circ/1367). The findings and conclusions are those of the authors and do not necessarily represent the views of the US Fish and Wildlife Service. Sections authored entirely by non-USGS authors do not represent the views or position of the US Geological Survey. Any use of trade or firm names is for descriptive purposes only and does not imply endorsement by the US government.

CALIFORNIA CONDORS

IN THE PACIFIC NORTHWEST

Chapter 1
Background

con•dor (kŏn'dôr'-dər) *n.* [Sp. *condor* < Quechua *kúntur*.] A very large New World vulture, *Vultur gryphus* of the Andes or *Gymnogyps californianus* of western North America.[1]

Evolution and Life History of the California Condor

Condors are often defined by their remarkable size. They are the largest of the seven New World vultures that form the Cathartidae family (sometimes referred to as the Vulturidae family; Livezey and Zusi 2007). Although New World vultures look similar to Old World vultures (Accipitridae family), this resemblance is the result of convergent evolution rather than a close phylogenetic relationship (Seibold and Helbig 1995; Wink 1995; Hackett et al. 2008).

California Condors have a truly spectacular wingspan (2.74 m)—larger than any other North American land bird. This large wingspan gives them the ability to soar long distances in a single day (at up to 40–70 km per hour), expending minimal energy while searching for food along Pacific Ocean beaches (figure 2) or inland over rivers, grasslands, and shrublands. However, their wingspan—and more specifically, the large surface area of their wings and weak wing musculature—limits their ability to sustain flapping flight for extended periods of time, as the immense amount of energy required to displace such a large quantity of air quickly exceeds their metabolic output (H. Fisher 1946; Pennycuick 1969). This means that they are restricted to foraging over areas where there is enough upward air movement, or lift, to keep them aloft. Such upward air movement is typically generated by thermals, which form when the sun heats the ground

1 Definitions are adapted from Webster's II New Riverside University Dictionary (1984) and have been abbreviated for clarity.

Fig. 2. California Condor soaring along the Big Sur coast, California. Photo by Jesse D'Elia, US Fish and Wildlife Service.

and the heated area causes a pocket of warm air to rise, or through ridge lift, whereby air is pushed upward as winds collide with mountains or cliffs.

Condor movements are influenced by the location of nests and foraging habitat. Breeding birds are necessarily tied to nest sites but may travel up to 180 km from the nest in search of food. Nonbreeding birds can move over enormous home ranges. For example, Meretsky and Snyder (1992) reported home ranges in southern California averaging approximately 7,000 km^2. California Condors do not undertake long-distance migrations but sometimes exhibit shorter seasonal movements to exploit traditional food resources or favorable atmospheric conditions.

Condors are obligate scavengers,[2] feeding primarily on medium to large-sized mammal carcasses, often including those of domestic livestock as well as native terrestrial and stranded marine mammals. Obligate scavengers are an example of extreme specialization in the animal kingdom, with several adaptations critical for species that rely on finding carrion, a relatively unpredictable and highly transient resource:

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2 However, there was a recent case of a condor preying on an abandoned dying sea lion pup, and it is likely that condors occasionally take advantage of similar situations elsewhere (M. Tyner, Ventana Wildlife Society, pers. comm., 2011). Historical observations also suggest that condors once fed upon dead and dying salmon that were stranded as they attempted to move upstream toward spawning grounds (Audubon 1840). McGahan (2012) indicated that Andean Condors will apparently kill prey on rare occasions.

1. large size and large crops, which are necessary to compete at carcasses and sustain individuals for relatively long periods between meals;
2. soaring flight and excellent eyesight, which help condors efficiently find food;
3. hooked bills, long necks, and largely naked heads, which allow condors to access muscle tissue deep within a carcass and to rip pieces of meat from a carcass, while minimizing the potential for feather fouling;
4. feet with short claws adapted for walking and running, which may provide a competitive advantage at carcasses;
5. intelligence, which is necessary for finding and competing for food in a complex social environment; and
6. resistance to bacterial toxins, which is necessary for species that rely on carcasses.

Aerial scavengers can outcompete terrestrial scavengers for food because flight allows them to efficiently search a much larger area (Ruxton and Houston 2004). Soaring scavengers like the condor have an additional advantage over those that use primarily flapping flight because the energetic cost of soaring is so much less than that of flapping flight (Ruxton and Houston 2004).

Condors do not have a well-developed olfactory tract or sense of smell (Stager 1967), so they rely on their keen vision to find food. In addition to locating food from a distance, condors will also use sentinel species, such as Turkey Vultures (*Cathartes aura*) or Common Ravens (*Corvus corax*), to help them find food. This communal searching for food allows condors and other avian scavengers to greatly improve the efficiency with which they find a meal (Houston 1985, 1988). It also means that condors can be found congregated in large groups at a carcass or water hole. Condors are typically the dominant avian species at a carcass unless Golden Eagles (*Aquila chrysaetos*) are present.[3] As a social foraging species, they develop a pecking order at carcasses, with juveniles subordinate to adults. This may be a mechanism to reduce intraspecific aggression, but it also means that juveniles depend on their parents for an extended period to obtain sufficient food.

3 The Golden Eagle's dominance at carcasses is not absolute. Condors will occasionally challenge Golden Eagles and aggressively displace them from carcasses.

Condors' massive wingspans dictate their need for open spaces, good winds, and high places from which to launch flights. These factors are particularly important in selecting nest sites, where fledglings must learn how to fly. Nests are generally placed on the floor of small caves on cliff faces, on rock ledges, or occasionally in a cavity or broken top of a large tree. Breeding pairs mate for life and are intensely devoted to the care of the single egg they lay and the resulting chick. Maximum productivity for a pair appears to be two surviving chicks in three years, as clutch size is always one, full nesting cycles take more than a year, and pairs are slow to reinitiate breeding when they still have a dependent fledgling (Meretsky et al. 2000). Condors will double clutch if their egg is removed or destroyed (Snyder and Hamber 1985).[4]

California Condors are long-lived (Mace 2011).[5] Yet population growth rates are slow, as birds generally do not successfully breed until they are six to eight years old. Their slow maturation, slow breeding cycle, and low fecundity make condor populations sensitive to increases in adult mortality (Meretsky et al. 2000). These factors also make recovery of the species a relatively long and expensive proposition.

Readers looking for a more thorough review of the evolution and life history of the California Condor are directed to Koford (1953), Snyder and Snyder (2000, 2005), and Snyder and Schmitt (2002). For an overview of the evolutionary adaptations of scavengers, see Houston (1979, 1985, and 1988) and Ruxton and Houston (2004).

A Brief History of the Condor Recovery Program

The California Condor Recovery Program is one of the oldest and most renowned recovery efforts in the history of endangered species conservation. It is also one of the most controversial. Below we give a brief overview of the Condor Recovery Program, beginning with the development of the

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4 Although *apparent* double clutching in condors was first reported by Harrison and Kiff in 1980, their paper showed only that two nesting events took place in the same year in the same cave. Because the adults were never identified, evidence from this paper was insufficient to get permission to take eggs from nests to start a captive flock. It was not until 1982 that conclusive evidence of replacement clutching was obtained (Snyder and Hamber 1985), allowing the start of egg removal operations to form a captive population the next year.

5 Topa-Topa (studbook #1), a male condor and the oldest condor in captivity, hatched in the wild in Ventura County in 1966. He was captured in 1967 and, as of 2012, was still alive at the Los Angeles Zoo (Mace 2011).

first US Fish and Wildlife Service recovery plan in 1975. Additional details are given in table 1, which provides a concise timeline of important events in the history of the California Condor and its recovery. Readers seeking a more thorough treatment of the history of the recovery program and the early field studies of California Condor natural history are directed to Koford (1953), McMillan (1968), S. Wilbur (1978), Snyder and Snyder (2000), S. Wilbur (2004), Alagona (2004), and Walters et al. (2010).

In retrospect, it is remarkable that the California Condor did not end up as yet another entry in the long ledger of extinct birds (see Fuller [2001] for a detailed accounting of those birds that have been lost). At the time the first recovery plan for the California Condor was published in 1975—the first recovery plan for any species under the US Endangered Species Act of 1973— there were only about forty condors remaining (S. Wilbur 1978). By 1980 that estimate was reduced to twenty-five to thirty-five individuals (S. Wilbur 1980). Clearly the species was in jeopardy of going extinct if something was not done quickly to reverse the decline. The plan's population objectives were modest, calling for the maintenance of "at least 50 California Condors, well distributed throughout their 1974 range" (USFWS 1975, 12). The recovery team noted the possibility that recovery efforts in the wild might fail and suggested developing a contingency plan that included captive breeding.

> While the condors' inherently low reproductive capacity makes it appear a less likely candidate for captive propagation than some other species, recent successes at the Patuxent Wildlife Research Center and elsewhere propagating South American condors (*Vultur gryphus*) gives some hope for the future of this technique. Patuxent personnel plan a continuing investigation of South American condor propagation and subsequent release to the wild, and this may have application to the California condor should current plans fail to improve its population status. (USFWS 1975, 11)

In 1976, the US Fish and Wildlife Service California Condor Recovery Team, faced with continuing declines in condor population estimates and the very real possibility that the condor was vanishing, drafted a contingency plan that included provisions for initiating a captive-breeding program, with a view toward future reintroductions, a suggestion that was

Table 1. Timeline of events in the history and recovery of the California Condor.

Year/ time period	Event	No. of wild California Condors*
Pleistocene	Several species of *Gymnogyps* occur in North America. The California Condor is distributed from British Columbia to Baja California, and inland to Arizona, New Mexico, Texas, and central Mexico. It also occurs along the east coast from New York to Florida.	Unknown
Late Pleistocene	All species of *Gymnogyps* aside from the California Condor go extinct. The California Condor's range contracts and it is now limited to the West Coast of North America from British Columbia to Baja California. Paleo-Indians begin populating North America.	Unknown
1602	First recorded sighting of a California Condor by European explorers—Father Antonio de la Ascension in Monterey Bay, California.	Unknown
1790s	Type specimen taken near Monterey, California, by Archibald Menzies. This condor skin is now housed at the British Natural History Museum at Tring.	Unknown
1805	Lewis and Clark and the Corps of Discovery observe California Condors along the lower Columbia River from Celilo Falls to the coast.	Unknown
1849	California Gold Rush—massive influx of people to northern California.	Unknown
1850	California Condors no longer regularly reported from the lower Columbia River. Still sporadically collected and reported from elsewhere in the Pacific Northwest.	Unknown
1904	Generally regarded as the last reliable report of condors north of San Francisco, CA. However, there are a few other plausible reports of condors in the region into the 1920s.	Unknown
1905	Killing or collecting condors or their eggs is banned by the California Legislature and Fish and Game Commission.	Unknown
1906	William L. Finley and Herman T. Bohlman make the first study of a condor nest. Finley takes the chick captive and raises him as a pet in Oregon before transferring him to the New York Zoological Park.	Unknown
1939	Carl Koford begins his landmark study of the California Condor.	150
1940s	San Diego Zoo is breeding Andean Condors successfully and demonstrates that pairs can produce more than one egg a year through replacement clutching.	150
1949	Belle Beachy of the San Diego Zoo proposes captive breeding of California Condors to the California Department of Fish and Game. Although the department approves the zoo's proposal to capture two immature condors, trappers fail to catch any birds.	150
1953	Carl Koford completes the first major natural history study of the California Condor (Koford 1953).	150
1954	California Legislature expressly forbids taking any California Condors from the wild. San Diego Zoo trapping efforts cease.	150
1966	The US Congress passes the Endangered Species Preservation Act on 15 October 1966.	60

Year/ time period	Event	No. of wild California Condors*
1967	California Condor designated an endangered species under the Endangered Species Preservation Act.	60
1969	Locke et al. (1969) discover that Andean Condors are susceptible to lead poisoning and suggest that California Condors might also be susceptible.	60
1973	Endangered Species Act (ESA) of 1973 passed and additional protections given to species listed in 1967 under the Endangered Species Preservation Act.	35–60
1975	The California Condor Recovery Team is established and the Condor Recovery Plan is adopted. It is the first recovery plan for any species under the US Endangered Species Act.	25–35
1976	Designation of California Condor critical habitat under the Endangered Species Act—all in southern California.	25–35
1980	First revision to the California Condor Recovery Plan adopted. Recommends captive breeding and identification of release sites by surveying areas of former occupation—including areas in the Pacific Northwest.	25–35
1982	Nadir of the California Condor population (considering both captive and wild birds, only 22 remain).	20
1983	Taking eggs from wild nests for artificial incubation and captive rearing initiated.	< 20
1984	Second revision to the California Condor Recovery Plan adopted. The primary objective of the plan is to increase and maintain a self-sustaining population of 100 individuals, including 60 adults. Recommends captive breeding and multiple clutching of wild nesting pairs.	< 20
1985	Catastrophic loss of 40 percent of the remaining wild condors (cause of death unknown). Discussions initiated regarding trapping all remaining wild condors.	< 10
1987	Last wild California Condor (AC-9) trapped for captive breeding. The California Condor is extinct in the wild. At this time, 27 condors are in captivity (10 reared in the wild, 17 reared in captivity).	0
1988	Experimental releases of Andean Condors into southern California initiated.	0
1991	California Condor Recovery Team recommends releases in northern Arizona in addition to releases in southern California.	0
1992	Releases of Andean and California Condors on the Sespe Condor Sanctuary. Congress passes an appropriations rider granting federal money to the Peregrine Fund to breed condors and release them near the Grand Canyon, Arizona.	7
1993	Third captive breeding facility established—World Center for Birds of Prey in Boise, Idaho, operated by the Peregrine Fund.	9

Year/ time period	Event	No. of wild California Condors*
1994	California Condors retrapped due to behavioral problems.	3
1995	Release of California Condors that had undergone aversion training to reduce behavioral issues. The three condors that remained in the wild in 1994 were trapped to ensure they did not negatively influence the newly released birds that underwent aversion training.	14
1996	Second revision to the California Condor Recovery Plan adopted. Drops mention of identifying release sites in the Pacific Northwest. Focuses on building population levels to at least 150 birds in southern California and 150 birds in Arizona. Does not identify actions needed to achieve recovery; only identifies downlisting to threatened status criteria under the ESA. The USFWS publishes a final experimental population rule designating northern Arizona, southern Utah, and a small corner of southeastern Nevada as a "non-essential experimental population." Condor releases begin in December 1996 at Vermilion Cliffs, northern Arizona.	17
1997	Condor releases begin near Big Sur, Monterey County, California.	29
1998	Condor releases begin at Hurricane Cliffs in northwestern Arizona, 65 miles west of the Vermilion Cliffs release site (later discontinued due to logistical issues).	38
2001	Oregon Zoo presents its proposal to breed condors to the Condor Recovery Team with the ultimate goal of reintroducing them to Oregon. The proposal is accepted by the Recovery Team.	58
2002	Condor releases begin in Baja California, Mexico.	71
2003	Condor releases begin at Pinnacles National Monument, California. First captive condors arrive at the Oregon Zoo's Jonsson Center for Wildlife Conservation.	83
2004	First California Condor egg hatched at the Oregon Zoo's Jonsson Center for Wildlife Conservation.	96
2007	The Yurok Tribal Council passes a resolution to develop a California Condor reintroduction site.	144
2008	The US Fish and Wildlife Service provides funds to the Yurok Tribe to study the feasibility of reintroducing California Condors to northern California.	167
2010	California Condor review panel commissioned by the American Ornithologists' Union and the Audubon Society publishes its review of the recovery program (Walters et al. 2010).	181
2011	First meeting of the Pacific Northwest California Condor Coordination Team, an interdisciplinary and interagency team organized by the USFWS to evaluate remaining issues that need to be resolved prior to establishing a Pacific Northwest condor release site.	205

* Population estimates through the 1980s are based on Snyder and Snyder (2000). The numbers of wild condors from the 1990s through 2011 are based on California Condor Recovery Program records.

later supported by a panel of ornithologists and the National Audubon Society (Ricklefs 1978), and by a report prepared for the US Forest Service (Verner 1978). On 2 November 1978, the director of the US Fish and Wildlife Service met with representatives of the National Audubon Society, who presented their recommendations for modifying the condor recovery strategy (USFWS 1979). This meeting resulted in the formation of a task force charged with charting a course for implementing a captive breeding program and identifying areas appropriate for future releases (USFWS 1979). Consequently, when the first revision to the condor recovery plan was published in 1980, it included the need to initiate captive breeding and identify potential reintroduction sites "in the states occupied by condors in the recent past (Oregon, Washington, California, possibly Arizona)" (USFWS 1980, 50).

Although captive breeding was initially meant to supplement the wild population (USFWS 1984), a catastrophic loss of 40 percent of the remaining population in the winter of 1984–1985 left only a single breeding pair in the wild. This led the recovery team and partners to reevaluate whether the wild population should be supplemented or integrated with the captive population to maximize genetic diversity (Snyder and Snyder 2000). Geneticists advising the Condor Recovery Team agreed that because of the limited number of individuals and family lines remaining, all remaining wild birds should be immediately added to the captive flock (Snyder and Snyder 2000). However, disagreements among the US Fish and Wildlife Service, the Audubon Society, the Condor Recovery Team, and the California Fish and Game Commission—and ultimately, litigation brought by the Audubon Society—delayed that decision (Snyder and Snyder 2000).[6]

Although capturing all remaining wild condors to form a captive breeding population was extremely controversial (L. Miller 1953; Pitelka 1981;

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6 The US Fish and Wildlife Service, at the urging of the Audubon Society, did not support trapping all remaining birds at the beginning of 1985; instead, it advocated trapping only three birds and simultaneously releasing three captive birds. At the time, the USFWS apparently thought that mortality risks for the remaining birds could be significantly reduced through an intensive food provisioning program with lead-free carcasses (Snyder and Snyder 2000). Lead poisoning of a condor (AC-3) in December of 1985 on Hudson Ranch—where lead-free carcasses were being provided—ended the debate over the efficacy of food provisioning in reducing mortalities (Snyder and Snyder 2000). Litigation by the Audubon Society delayed the final trapping of all remaining birds until the spring of 1986.

Snyder and Snyder 2000; Alagona 2004), it was the only hope of preserving the species (Snyder and Snyder 2000). At the time the last wild condor was trapped, on Easter Sunday 1987, only twenty-seven California Condors remained in the world.

With all California Condors in captivity there was an urgent need to work out the most effective methods for minimizing mortality in future releases (Wallace 1989). Fortunately, Mike Wallace, curator of birds at the Los Angeles Zoo and a member of the California Condor Recovery Team, had completed a dissertation based on captive releases of Andean Condors (*Vultur gryphus*) in Peru from 1980 to 1984. Beginning in 1988, Wallace assisted with experimental releases of Andean Condors in southern California as surrogates for future California Condor releases.

Captive breeding and double-clutching protocols for California Condors were established by the early 1990s (Meretsky et al. 2000). In December 1991, the Condor Recovery Team recommended that releases also be conducted in northern Arizona in an area geographically separate from the southern California flock (USFWS 1996a).

Surveys of suitable habitat were never conducted in Oregon, Washington, or northern California, and subsequent revisions to the recovery plan dropped any mention of reintroductions to the Pacific Northwest (USFWS 1984, 1996b). Although significant progress had been made in captive breeding and release techniques through the early 1990s, there were only seventeen condors in the wild at the time of the last recovery plan revision in 1996. Furthermore, the plan did not address full recovery. Instead, its emphasis was on how to improve the species' status to the point where it could be reclassified from endangered to threatened under the Endangered Species Act by maintaining a captive flock and establishing self-sustaining populations in southern California and Arizona (USFWS 1996b). Specifically, the recovery criteria for reclassification from endangered to threatened read:

> The minimum criterion for reclassification to threatened is the maintenance of at least two non-captive populations and one captive population. These populations (1) must each number at least 150 individuals, (2) must each contain at least 15 breeding pairs and (3)

> be reproductively self-sustaining[7] and have a positive rate of population growth. In addition, the non-captive populations (4) must be spatially disjunct and non-interacting, [and] (5) must contain individuals descended from each of the 14 founders. (USFWS 1996b)

Since the 1996 recovery plan, captive breeding efforts have proven extremely fruitful in boosting condor numbers. Since 1993, over three hundred condors have been raised in captivity and released into the wild and there are now five active release sites: Big Sur, California; southern California mountains; Pinnacles National Monument, California; northern Arizona; and Sierra San Pedro Mártir, Baja California, Mexico (Walters et al. 2010). With growing numbers of condors in captivity and in the wild, years of experience from several release programs, and a greater understanding of condor biology, population threats, and conservation needs, there is now growing interest by conservation organizations and Native American tribes in reestablishing the condor in the Pacific Northwest (Shepherdson et al. 2007; The Nature Conservancy, in litt. 2007; Yurok Tribe 2007; Walters et al. 2010).

Bringing Condors Back to the Pacific Northwest: The Birth of an Idea

As captive breeding techniques were worked out in the 1980s and 1990s and the captive population began to grow, the capacity of zoos in the program to breed and house condors became a limiting factor. Consequently, in the late 1990s and early 2000s, the Condor Recovery Team began looking for additional zoos that were interested in joining the conservation breeding program. Adding another conservation breeding partner would have the benefits of spreading the risk to the captive population (e.g., containing a disease outbreak to only a portion of the population), increasing capacity to produce condors, and sharing the substantial costs associated with captive breeding and rearing. Several zoos expressed interest in joining the recovery effort, including the Bronx Zoo, the National Zoo, and the Oregon Zoo.

The Oregon Zoo's interest in condor conservation and the notion of California Condor reintroductions to the Pacific Northwest stemmed from

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7 Although the recovery plan used the term "self-sustaining," it also recognized (and allowed) that in some areas, reestablished condor populations might require continued artificial feeding to supplement natural food resources and/or to protect birds from exposure to contaminated carcasses.

planning sessions for the Lewis and Clark bicentennial (Koch 2004). In preparation for the bicentennial, Jane Hartline, then marketing manager for the zoo, suggested reintroducing California Condors to Oregon. Jane's idea was sparked by her recent trip to Ecuador, where she visited Hacienda Zuleta, a hotel on a colonial working farm that hosts an Andean Condor rehabilitation and educational facility.

As an outgrowth of the bicentennial planning sessions, the Oregon Zoo initiated discussions with the Condor Recovery Team in 2000 and presented a proposal to join the recovery program as a captive breeding facility in February 2001, with hopes of eventually reintroducing condors to Oregon (Koch 2004). After considering proposals from a number of zoos, the Condor Recovery Team accepted the Oregon Zoo's proposal later that year.

Upon acceptance into the recovery program, the zoo immediately began the process of selecting an offsite location for breeding condors. Because condors develop behavioral problems when they have contact with humans, the zoo sought a property that was out of view of the public. This ultimately led to the construction of a state-of-the-art condor breeding and veterinary facility at the Jonsson Center for Wildlife Conservation, in an undisclosed rural location near Portland, Oregon (figure 3). The first pair of condors arrived at the facility on 19 November 2003, and the first egg hatched there the following spring (Koch 2004). It is now one of four facilities that breed condors for release into the wild.[8]

The Oregon Zoo is not the only organization interested in returning condors to the northern portion of their historical range. In 2007, the US Fish and Wildlife Service (USFWS) received a grant proposal from the Yurok Tribe in northwestern California to assess the feasibility of reintroducing condors to their ancestral lands (Yurok Tribe 2007). The Yurok believe that reintroduction of condors to the tribe's ancestral territory will help restore spiritual balance to their world (Yurok Tribe 2007). The Yurok Tribe and the Oregon Zoo formed an informal partnership to promote the idea of reintroductions and in April 2010, the tribe and the zoo hosted a Pacific Northwest Condor Summit (with sponsorship from the Confederated Tribes of Grand Ronde), bringing together over 140 participants from other

8 The others are the San Diego Wild Animal Park, Los Angeles Zoo, and the World Center for Birds of Prey, the latter operated by the Peregrine Fund in Boise, Idaho.

Fig. 3. California Condor at the Oregon Zoo's Jonsson Center for Wildlife Conservation, just outside of Portland, Oregon. Photo by Susan Haig, US Geological Survey.

Northwest tribes, federal and state agencies, and conservation groups, as well as representatives from the California Condor Recovery Program.

With growing interest in returning condors to the Pacific Northwest, a number of questions remain: What was the historical distribution of condors in the region? Were they breeding here, or simply seasonal migrants? When did they disappear? What caused their extirpation? What is the potential for restoration (i.e., have the primary threats been identified and ameliorated and would ongoing management be necessary)? Where are the best places for a reintroduction in the Pacific Northwest? And, are there lessons that might be learned from other vulture reintroduction projects throughout the world? In the next few chapters we hope to provide answers to some of these questions.