Saving the California Condor

Years of effort are paying off in renewed hope for the species' survival

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For wildlife biologist Shawn Farry, that hot July day last year along the Vermilion Cliffs in northern Arizona started normally. The California condors that Farry and his colleagues were monitoring had awakened from their nightly rest, preened a bit, and then launched themselves into the air, just as they had done countless times since their release to the wild. The condors quickly found a warm thermal rising off the cliffs and circled up into the bright blue sky.

But this was not to be a typical day for the condors, for Farry, or for the California condor release project that Farry manages for the Peregrine Fund near the Grand Canyon. One condor, known simply as number 19, a three-and-one-half-year-old captive-hatched female released to the wild in May 1997, soon disappeared, not only from sight but also from within range of the radio antennas that the scientists use to track the birds' movements.

Perhaps digging deep into the ancestral memory of her species, possibly because she was hungry, or maybe simply out of curiosity, condor number 19 had set off on a voyage of discovery. Unknown to Farry at the time, she apparently followed the Colorado River northeast to Canyonlands National Park, in Utah, and then the Green River north to Flaming Gorge National Recreation Area, in southwestern Wyoming. There, someone who recognized the bird as a condor called to tell Farry and his colleagues where number 19 had gone. More amazing, after the 12-day trip north she returned to the Vermilion Cliffs, making the 310-mile, one-way journey in only 2 days.

"We thought at first we had lost her," Farry says of number 19's sojourn. "We searched the canyons and flew all over the release area looking for her. But she wasn't lost. She knew exactly where she was. She showed us that condors can and will fly long distances over unfamiliar territory looking for food."

California condor number 19's odyssey also shows how far one of the most intensive, expensive, and successful endangered species programs has come. Despite numerous setbacks, bitter controversies, and remaining uncertainties, the US Fish and Wildlife Service–run program has reversed decades of declining numbers, restored the majestic birds to the wild in three different areas, and aided a recovery program for Andean condors in South America.

The condor program has also led to new techniques for breeding endangered birds in zoos and teaching their captive-hatched offspring how to become wild again, as well as to insights into the behavior of condors and other birds. And it has provided a model for how to organize a joint program among federal and state agencies, zoos, academic institutions, and private conservation groups.

Starting from a low of 22 birds in 1983, the number of California condors alive today—160 at last count—is probably higher than it has been in at least a century. More important, 49 of 88 captive-hatched condors released to the wild since 1992 are still flying free—20 in Los Padres National Forest northwest of Los Angeles, 20 along the Vermilion Cliffs in Arizona, and 9 at the Ventana Wilderness Sanctuary along the Pacific coast south of Monterey, California.

"The program has been a success to this point, especially considering everything [wrong] that could have happened that hasn't," says a cautious Robert Mesta, condor program coordinator in FWS's Ventura, California, office. "Some of the released birds are finding food on their own, traveling their species' historical routes, and beginning to display courtship behavior. I feel good [about their chances of long-term success], but it's still early. We have a long way to go."

Why look at condors?

Unlike Andean condors, with their white neck fluff, or king vultures, with their brilliant black-and-white feathers, California condors are not much to look at. Their dull black color—even when contrasted with their white underwings—naked head and neck, oversized feet, and blunt talons are hardly signs of beauty or strength. Nor have their carrion-eating habits endeared them to many people.

The condors' appeal becomes more evident when they take flight. With a nine-and-one-half-foot wingspan, condors can soar almost effortlessly for hours over hundreds of square miles a day. Only occasionally do they flap

their wings to take off, change direction, or find a thermal. Although slightly smaller than their Andean cousins, California condors are North America's heaviest fully flighted bird, weighing up to 24 pounds.

In prehistoric times, California condors ranged from southern British Columbia to Baja California and across the southern United States to Florida. But by the time Europeans arrived in North America, the birds' range was limited to the mountains along the Pacific Coast. Only 100 or so of the birds remained by 1940, all confined to a U-shaped region in the mountains and foothills north of Los Angeles.

No one really knows why California condors almost disappeared. Extinction of the large Ice Age mammals on whose carcasses they once fed, habitat changes, human development, and shooting or poisoning by ranchers who mistakenly thought that the birds had killed livestock have all been blamed. Whatever the reasons, by the late 1970s the condors' numbers had shrunk to a mere 25–30. Alarmed, the American Ornithologists' Union and the National Audubon Society urged a massive research and conservation program to save the condor.

For years, though, wildlife biologists, conservationists, and government officials had wrangled over how best to save the birds. Some argued that the condors' only hope for survival lay in strict habitat protection and in being left undisturbed by humans. Others urged that at least some condors be captured and brought to zoos for breeding. It took a tragedy to force a decision. The tragedy also suggested one reason for the continued decline in condor numbers even after their habitat was protected.

Scientists had long suspected that environmental pollutants might be killing condors. Then, in 1985, 6 of the 15 remaining wild condors disappeared. Only one of the bodies was ever found. Autopsies on that bird and two others that died later implicated lead poisoning as the cause of death. Most likely, the condors had swallowed bullet fragments left by hunters in unrecovered deer and other carcasses. In retrospect, at least some of the earlier condor decline was probably due to lead poisoning, says David Clendenen, a former FWS condor biologist who now manages Wind Wolves, an 87,000-acre private nature preserve in California.

As a result of the 1985 events, FWS biologists and the condor recovery team—a group of outside advisers from government agencies, universities, and conservation groups—decided to round up the remaining wild California condors and breed them in captivity. The scientists had already removed some eggs and juveniles from the wild beginning in 1983. The eggs and birds were taken to either the Los Angeles Zoo or the San Diego Wild Animal Park. In 1987, with the total population numbering 27, the last remaining wild California condor was captured and brought into captivity.

Increasing condor numbers

The first order of business was to try to increase the birds' numbers as quickly as possible. Normally, adult females lay one egg every other year. If the egg breaks or the chick dies, they often lay a second egg. Using that knowledge, gained from studying the birds in the wild, condor biologists and zookeepers removed the first and sometimes the second egg, leading the captive condors to lay an extra egg or even two. The removed eggs were artificially incubated, and the chicks were raised by keepers using hand puppets to mimic adult birds. Keepers also removed those chicks that had been allowed to hatch naturally from their parents after several months, thereby inducing the adults to breed every year.

The techniques worked. Since the first chick was conceived and hatched in captivity in 1988, the number of California condors raised at the zoos each year has gradually risen, to a record 20 in 1998. More than 90 percent have survived, a figure higher than for any other captive-bred bird. As space for condors filled at the Los Angeles Zoo and the San Diego Wild Animal Park, a third captive breeding facility was built at the Peregrine Fund's World Center for Birds of Prey in Boise, Idaho, in 1993. As a result, condor numbers have grown from 27 in 1987 to 52 in 1991 and 160 in 1999.

In 1992, with the captive population expanding, FWS and zoo biologists were ready to start releasing California condors to the wild. An earlier experimental release of Andean condors in Los Padres National Forest had shown that captive-hatched condors could survive in the wild, suggesting that zoo-raised California condors could too. The experiment also allowed the biologists to hone their release and monitoring techniques on the more common Andeans before testing them on rare California condors.

Eight zoo-hatched California condors were set free in 1992, and five more were released the next year, in the 53,000-acre Sespe Condor Sanctuary, a protected area within Los Padres' 1.9 million acres. But problems arose almost immediately. As they explored new territory, both within and outside the sanctuary, the condors landed on houses and garages, walked across roads and highways, and begged food from picnickers. More seriously, one died after drinking antifreeze dumped along a highway, and four others were killed either by collisions with power lines or after landing on the poles and touching the wires with their wings. Consequently, the remaining birds were all returned to captivity in 1994.

Rethinking release techniques

The failure of the first releases led scientists and keepers to rethink the way the birds were managed in the zoos and trained for release to the wild. "We learned our lesson," says Michael Wallace, chairman of the condor recovery team and the San Diego Zoo's reintroduction specialist. "It makes a difference how we rear condors, what experiences we give them, how we prepare them for release, and where we release them," he says.

To test his theory that the condors needed better pre-release conditioning, Wallace put power-line poles into

their pens at the Los Angeles Zoo, where he was then curator of birds. He rigged the poles to deliver a mild, 6-volt shock every time a condor landed on one. "We couldn't eliminate every danger, but they don't land on power-line poles any more," Wallace says. Indeed, there has been only one confirmed and a second possible death due to power-line collisions since 1994.

Wallace and other zookeepers also began teaching the condors to avoid humans by harassing the birds every time someone cleaned the pens, dropped off food, or captured the birds for a medical exam or to add wing tags. At first, the condors did not react much when a half-dozen or more keepers ran at them yelling and with arms flailing. Later, however, the condors became frightened and sought to avoid the keepers. Their eyes bulged out and they vomited whatever food was in their crops. "A good day is when you have condors throwing up all over at the mere sight of a person," Wallace says of the human-aversion training.

Now, most released condors "do better at staying away from humans," Wallace says. Not all, though. One condor that repeatedly visited fishermen's camps along the Colorado River in Arizona was recently captured and brought back into captivity. Some biologists think that maturity may have been more important than training in resolving the condors' people problem. "As the birds have gotten older and closer to breeding age, they become more interested in each other and less interested in people," says Lloyd Kiff, the Peregrine Fund's science director. "We have to let them get beyond their people phase."

Yet another solution to the people problem was advocated by Clendenen. He argued that the problem lay with raising condor chicks in zoos with hand puppets. Clendenen urged keepers to allow parent condors to raise their chicks in pens placed in the wild at Sespe. That would give young condors slated for release a chance to learn how to be a condor from their parents. It would also let them experience their environment longer before they were set free.

The idea of raising chicks in pens in the wild was tested in 1996 on four captive-hatched condors scheduled for release at the Ventana Wilderness Sanctuary. But instead of putting the birds under the care of their parents, as Clendenen had urged, the birds brought to Sespe were put under the care of field technicians and volunteers who had no experience managing condors in captivity, Wallace says. The young condors, which were puppet-reared, were underweight and failed to learn how to socialize with one another. After they were released, the birds had to be captured and released again a total of 14 times because they visited people and buildings too often. All four were eventually brought back to the zoos.

In this case the lesson learned, Wallace says, was that more than being raised in pens in the wild, young condors need adults or older juveniles to teach them how to behave and keep them from acting like "goofy teenagers," as he puts it. Now, condors scheduled to be released at Ventana are placed in a specially designed building with artificial caves and later moved to a large outside flight pen. An adult is placed in the pen to act as a mentor to help keep the juveniles in their place and socialize them properly. "The younger condors follow the older one like puppies," Wallace says.

This approach has been successful. Five parent-raised condors that were released at Ventana in 1998 all remain in the wild. None has had contact with people or touched a power line. Nor have any landed on roofs since a house in the area was wired to give the birds a slight shock when they landed on it. The condors have learned to find air currents, roosting sites, and food by following local turkey vultures.

Furthermore, both the condors released at Ventana in 1998 and those released earlier at Los Padres, some of whom are now 4 and 5 years old, are acting as mentors for the younger, more recently released birds. The success of the recent releases "shows that parent-reared condors are better able to adapt to the wild," Clendenen states. "They are better behaved." Two puppet-raised birds released in Los Padres, on the other hand, had to be returned to captivity for what James Davis, executive director of the Ventana Wilderness Society in Carmel Valley, California, calls "maladaptive behaviors."

Wallace, long a proponent of puppet-rearing condors to increase their numbers quickly, now agrees that leaving chicks with their parents leads to better-adapted juveniles. He worries that the approach will reduce egg laying by 80 percent, although he supports raising as many parent-reared chicks as possible. Wallace also proposes that juveniles slated for release be placed with mentors and not with each other until they are ready to fledge, thus postponing when and how they establish their social hierarchy.

Before condors were removed from the wild, chicks stayed with their parents for several months until they fledged. Only then did they begin to socialize with other chicks and older juveniles. In captivity, condor chicks scheduled for release to the wild were placed in pens with others of the same age. With Wallace's approach, the chicks "will learn from the older birds first and their own age group later," he says.

Whether condors are parent- or puppet-raised, Wallace and Clendenen agree, the site where the birds are released affects their success in the wild. "We learned that Sespe was not far enough away" from people, even though condors used the area before the last ones were brought into captivity in the 1980s, Wallace says. All releases in Los Padres since 1994 have taken place at the more remote Lions Canyon and Castle Crags sites.

Expanding release sites

In addition to establishing the importance of mentoring for young condors, the 1998 Ventana experiment opened a second release site in California. The condor recovery plan's goal is to have 150 birds in each of three populations—in the zoos and other captive breeding facilities, in California, and in the Grand Canyon. Once that goal is

The last wild California condor, shown here, was captured and brought into captivity in 1987. Condors can soar with ease for hours and can cover hundreds of square miles in a day. Photo: Michael Wallace.

Zookeepers use hand puppets resembling adult condors to feed California condor chicks hatched and raised in captivity. Photo: Michael Wallace.

achieved, the birds are eligible to be downlisted from endangered to threatened under the Endangered Species Act. And by releasing condors at two places in California, the wild population can be built up more quickly, Wallace says.

Davis hopes to further expand the condors' range and hasten their recovery by releasing birds at even more sites in California. He plans to release birds inland from Ventana, in the Diablo Mountains, in the next few years and eventually farther east, in the Sierra Nevada Mountains. Both sites are within the condors' historic range. "The more areas [in which] you have condors, the greater the chance they will come back and set up nesting sites in different places," Davis says.

For his part, Wallace hopes one day to release California condors along the Baja Peninsula in Mexico. Condors were reported in Baja until the 1940s. "It feels like condors should be there," Wallace says of Baja's 10,000-foot mountains and 30- to 40-foot-wide ridges, and its plentiful sea lion, bighorn sheep, and other potential food sources for the birds.

The Ventana release also added a new player to help pay for what has become, at $25 million spent to date, the costliest recovery program for an endangered species. "We have to seek out partnerships," FWS's Mesta says. "The federal government cannot do it alone. That is my biggest lesson learned from the program." FWS provides only approximately $500,000 of the $1.7 million that Mesta estimates is spent on all aspects of California condor recovery each year. The Los Angeles Zoo, the San Diego Wild Animal Park, and the Peregrine Fund each chips in approximately $250,000 from funds they raise privately. At various times, the state of California, the National Audubon Society, and other groups and foundations also contributed money for condor recovery.

The Ventana Wilderness Society, which manages condor releases at the sanctuary, adds another $200,000 a year. "Private, not-for-profit organizations can raise more money for condor releases than the feds can," Davis says. "They [FWS] can only release five or six birds a year. That won't come close to reaching the goal of 150 birds in the wild in California."

Problems and uncertainties

Beyond money, other problems and uncertainties have to be resolved as well. One is lead poisoning. Although banned for waterfowl hunting, lead bullets are still used to shoot deer and other wildlife. As the condors have been finding more of their own food rather than depending on dead calves put out by biologists, their blood lead levels have risen. In fact, biologists have had to recapture and treat five birds for lead poisoning, one of which nearly died. All have since been returned to the wild.

Condor biologists hope that new, non-lead bullets can be developed. Tests done on turkey vultures in 1997 by Andrew Mason, a toxicologist and analytic biochemist at California State University–Long Beach, showed that neither copper nor a tungsten–tin–bismuth alloy causes any behavioral or neurological problems. None of the vultures died or even became sick, despite being fed doses of the alternative metals equivalent to lead levels sufficient to kill the birds. The lead alternatives "were entirely benign to turkey

California condors can weigh up to 24 pounds and are North America's heaviest fully flighted bird. Photo: David Clendenen, courtesy of US Fish and Wildlife Service.

These juvenile California condors feeding on a calf carcass at the Castle Crags release site in Los Padres National Forest were hatched and raised in captivity and reintroduced to the wild as part of the US Fish and Wildlife Service's condor recovery program. Condor biologists have learned that young condors such as these, which were raised in pens with their parents, are better able to adapt to the wild than are puppet-reared birds. Photo: David Clendenen, courtesy of US Fish and Wildlife Service.

vultures, so we assume they would be [benign] to condors," Mason says.

Another remaining uncertainty is whether the released condors will mate and reproduce in the wild. Condor biologists assume they will, but it has not happened yet because the released birds are still too young. The oldest birds in the wild are now 5 years old, and condors usually do not begin reproducing until they are 6 or 7. However, some of the older males have begun displaying toward females—a typical prelude to mating. "Their hormones are beginning to kick in," says Michael Barth, a FWS wildlife biologist who manages the Los Padres condors.

A third uncertainty is whether people will honor the laws that protect condors. Several condors have been shot at and two were hit, says Jane Hendron, an education specialist in FWS's Ventura office. One condor suffered a shattered leg and later died while being treated. The second was killed in Arizona earlier this year. The Arizona shooter was caught and fined $3200, given a 1-year probationary sentence, and ordered to forfeit his gun and do community service at Grand Canyon National Park.

An exciting beginning

Uncertainties aside, the California condor project has served as a model for releasing captive-hatched Andean condors in areas of South America where the birds were rare or eliminated due to habitat loss. Wallace and other US wildlife biologists are working with researchers and conservationists in Argentina, Venezuela, and Colombia to restore condors. In Colombia, 57 Andean condors have been released since 1989, 35 of which still survive. The Colombian releases included Andean condors that had been used in California to test methods for rearing and releasing California condors.

And despite the controversies, problems, and uncertainties, the California condors are expanding their range and exploring new territory—part of the process of learning how to be wild condors. Not only has an Arizona condor journeyed to Wyoming, but three others have flown 250 miles from the Vermilion Cliffs to Grand Junction, Colorado, and back. And several Los Padres condors have followed the ridge lines of California's transverse ranges north of Los Angeles 150 miles northeast to Sequoia National Forest in the Sierra Nevada Mountains.

Of greater note, perhaps, a 4-year-old female condor from Los Padres, known as Y-30, flew north along the California coast more than 100 miles last spring and joined the Ventana condors. She stayed for 2 weeks and then returned to Los Padres. Interestingly, the Ventana condors followed her as far south as Morro Bay. Y-30's adventure, like that of Arizona's condor number 19, suggests that the time when California condors from different release sites intermingle and form one continuous wild population may come sooner than many people had dared to hope. "It's an exciting new beginning," Wallace says. ❑

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