

**A Review of the First Five Years
of the
California Condor Reintroduction Program
in Northern Arizona**



Reintroduced California Condor Soaring Over the Grand Canyon
Photo by: Chris Parish

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List of Preparers

This report is prepared for the California Condor Recovery Team and U.S. Fish and Wildlife Service, California/Nevada Operations Office, Sacramento, California, in fulfillment of the requirements of the Federal-rule (61 FR 54044-54059) allowing for the reintroduction of California condors under a nonessential experimental designation in northern Arizona and southern Utah.

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INTRODUCTION

The U.S. Fish and Wildlife Service (FWS) is now completing the fifth year of releases of California condors (*Gymnogyps californianus*) in northern Arizona. This reintroduction was conducted under a special provision of the Endangered Species Act (ESA) that allows for the

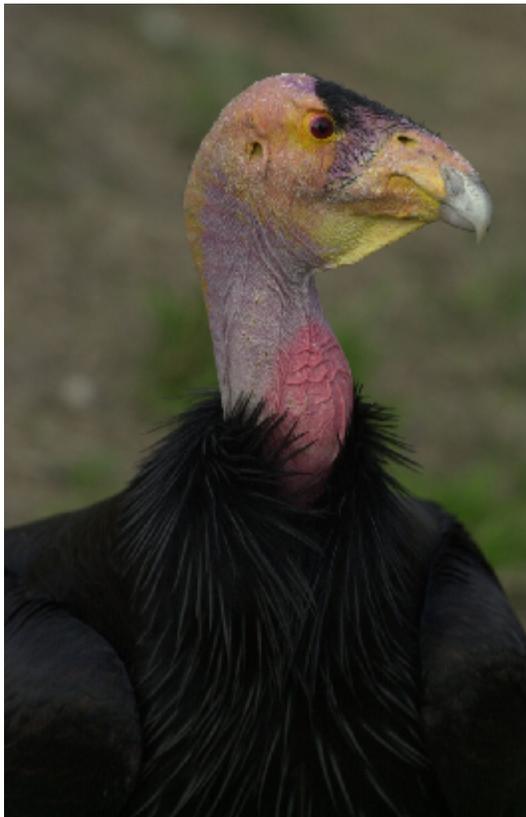


Figure 1. Portrait of an adult California condor.
Photo by: Scott Frier.

designation of a “nonessential experimental” population. Under this designation (often referred to as the “10(j) rule” or “10(j) area” for the section of the ESA allowing this provision) the protections for an endangered species are relaxed, providing greater flexibility for management of a reintroduction program. As part of the Federal rule-making process that established the nonessential experimental designation (61 Federal Register 54044-54059; 16 October 1996), the FWS agreed to a formal evaluation of the progress and public acceptance of this reintroduction within the first five years of the program. In addition to the final rule establishing the nonessential experimental designation, FWS entered into a “Memorandum of Understanding” (MOU) with various cooperators, including state and federal agencies, Native American nations, and private organizations, and an “Implementation Agreement with Local Governments.” These documents outlined commitments by FWS and cooperators in the implementation of the condor reintroduction program, and the application of federal regulation. This report evaluated the progress of the condor reintroduction program in northern Arizona and compliance with commitments established for this program.

BACKGROUND

The program of releasing California condors in northern Arizona (for the purposes of this report, unless otherwise indicated, reference to “northern Arizona” also includes condor activities in

southern Utah) has been entered into by the FWS as a partnership among various federal agencies (primarily: Bureau of Land Management [BLM]; National Park Service [NPS]; U.S. Forest Service [USFS]) and state agencies (primarily: Arizona Game and Fish Department [AGFD]), and The Peregrine Fund, a private/nonprofit organization. The Peregrine Fund manages the day-to-day operations of the field program, including release, monitoring the birds' movements, working with local land owners and land managers, and providing any additional care for the birds. The Peregrine Fund also maintains a condor breeding facility at the World Center for Birds of Prey in Boise, Idaho. Representatives of these agencies and organizations, together with others identified in the interagency MOU, form the "Arizona Condor Working Group," facilitating coordination among the agencies and organizations.

The first condor release occurred on 12 December 1996, and through January 2002, 47 condors have been released to the wild in northern Arizona from nine release events. Reintroduction efforts have been complicated by predation, lead poisonings, bird-human interactions, and a shooting; 18 birds have died and 4 have been returned to captivity due to behavioral concerns (two of which may be re-released at some time in the future). After five years of the release program, there are 25 free-flying condors in northern Arizona, and eleven additional birds held since November 2001 in the flight pen in anticipation of a release early in 2002. In March 2001, a reintroduced bird produced the first confirmed condor egg laid in the wild since 1986. The egg was laid in a shallow cave in Grand Canyon National Park.

The nonessential experimental population status applies to condors only when they are within the geographic bounds of the designation in northern Arizona and southern Utah, which is defined by: Interstate Highway 40 on the south, U.S. Highway 191 on the east (parallel to the New Mexico and Colorado state borders), Interstate Highway 70 in central Utah on the north, and Interstate Highway 15 to U.S. Highway 93 near Las Vegas Nevada on the west (61 FR 54044). When condors leave this area they receive full protection of the ESA, which may have regulatory implications. The condors have been known to fly widely, but generally remain within the Grand Canyon Ecoregion/Colorado River corridor. However, condors have left the nonessential experimental area on several occasions, flying as far as Flaming Gorge, Wyoming, 310 miles from the release site. All of the far-wandering condors returned to the release area on their own, usually within a few days. For detailed information on the chronology of the condor reintroduction program in northern Arizona see Appendices A and B.

REVIEW PROCESS

This review was conducted by a team (referred to within this report as the review team, and as listed on page i) that included condor biologists, representatives of local land and wildlife management agencies, and FWS, with input from local governments and the public. This report, prepared by the review team, is submitted to the California Condor Recovery Team, an advisory panel of scientists providing oversight of the California Condor Recovery Program for FWS. The Recovery Team reviews and forwards the report and their recommendations to the FWS California/Nevada Operations Manager (Sacramento, California). The FWS is responsible for making the final decision regarding the continuation of this reintroduction program and adoption

of recommendations. This process fulfills the five-year review requirement as stated in the final rule establishing the nonessential experimental population of California condors in northern Arizona.

The guidelines under which the review was conducted comes from the final rule establishing the nonessential experimental designation:

Final Rule, Endangered Species Act, Section 10(j) (61 FR 54044-54059). Special Rule 10, p. 54058. (10) *The status of the reintroduction project is to receive an informal review on an annual basis and a formal evaluation within the first 5 years after the initial release, and every 5 years thereafter. This evaluation will include, but not be limited to: a review of management issues; compliance with agreements; assessment of available carrion; dependence of older condors on supplemental food sources; post release behavior; causes and rates of mortality; alternative release sites; project costs; public acceptance; and accomplishment of recovery tasks prescribed in California Condor Recovery Plan. The number of variables that could affect this reintroduction project makes it difficult to develop criteria for success or failure after 5 years. However, if after 5 years the project is experiencing a 40 percent or greater mortality rate or released condors are not finding food on their own, serious consideration will be given to terminating the project.*

The review guidance from the final rule basically poses two questions: 1) have condors been provided a reasonable opportunity for survival, and not put at too great a risk due to either ecological factors or a lack of protections of the ESA under the nonessential experimental designation? and 2) did the FWS and other agencies comply with their various commitments regarding the application/relaxation of federal regulation?

This report examined each of the major issues brought forward from comments from the public or identified by review team members, in the context of the review guidelines from the final rule. In addition, issues addressed in the final rule were re-assessed. Each topic was individually addressed, and grouped in one of two categories: biology and management, or administration. Recommendations to improve the effectiveness of the program were included.

PUBLIC PARTICIPATION

The review team met on 20 September 2001, to develop a framework for the evaluation process. To fully evaluate all aspects of the condor reintroduction program in northern Arizona and southern Utah, the review team sought the comments and participation of local affected individuals, governments, Tribes, agencies, business owners, and organizations; environmental and industry groups; and condor and endangered species experts. The public was notified of the review process, responses to specific questions were solicited from targeted groups, telephone interviews and meetings with affected/interested parties and experts were conducted, and input was accepted through electronic and traditional mail.

Two public open houses were hosted, first in Kanab, Utah, on Thursday, 1 November 2001 (7 - 9 p.m. at the Shilo Inn, 296 West 100 North) and then in Flagstaff, Arizona, on Monday, 5 November 2001 (7 - 9 p.m. at the Arizona Game and Fish Department Office, 3500 South Lake Mary Road). These meetings included presentations reviewing the reintroduction experiment in northern Arizona and discussions on various aspects of the program. Eight attendees registered at the Kanab meeting and five registered at the Flagstaff meeting. A summary of comments and discussion from each open house is provided in Appendix C.

Comments were requested through direct mailings, a four state distribution of a news release (and three known resultant news articles in Flagstaff, Arizona, and St. George and Kanab, Utah, newspapers), radio news network contacts, a website posting, and a national California condor recovery electronic mail listserve. Additionally, review team members offered to meet with and brief area agencies, land management advisory groups, county/local government groups, and some tribes. Deadline for submitting comments was 23 November 2001, and then extended through 7 December 2001.

Comment letters were received from a county (3), a state agency (1), federal agencies (4), utility company (1), private citizens (2), and conservation organization (1). All letters expressed optimism for the continued success of the program and each provided responses to questions posed by the evaluation team, suggestions for improving the program, and some requested topics to be included in the review process. Generally, respondents innumerate how they had contributed to the program, met their commitments under various agreements and understandings, and discussed local perception or acceptance of the program, condor management considerations, and how condor management had or had not affected land use in the area. Some stated various reasons requesting an expansion of the nonessential experimental area. Appendix C includes a summary list of issues raised by commenters. Written comment letters and the list of attendees at each public open house are included in the administrative record for this review and is available upon request from the Arizona Ecological Services Office, 2321 W. Royal Palm Road, Suite 103, Phoenix, Arizona, 85021, Phone: (602) 242-0210.

The review team met 11-13 December 2001, to review all comments received, to determine additional information needs and sources, and to outline the content of this review. The team met again on 29 January 2002. All written and oral comments are addressed within the body of this review.

BIOLOGY and MANAGEMENT

Release Strategies

California condors were first reintroduced in northern Arizona on 12 December 1996, when six birds were released from the western end of the Vermilion Cliffs on BLM administered land. The Vermilion Cliffs release site on the Paria Plateau has been the primary condor holding site and release area (Figure 2). Of the nine total condor release events between December 1996 and December 2000, seven have been at Vermilion Cliffs, where 31 condors have been released. Reintroductions generally involved transporting five- and six-month old (fledging age) captive produced condors to the release site where they were held in an acclimation pen (dimensions of the flight pen are 40 x 20 x 5.5 feet, and an adjacent 40 x 8 x 5 feet semi-enclosed box structure for protection from the elements). A mock power pole fitted with a low voltage electrified crossarm was placed near the acclimation pen (and later when the flight pen was enlarged moved inside the pen) for adverse conditioning of condors to teach them to avoid perching on power poles (Figure 3). The condors would spend a week- to sometimes a month- in the acclimation pen prior to release. Food was provided to birds while in captivity and supplemental food was provided after release. There were also two releases of a total of nine two year old birds in May of 1997.



Figure 2. Vermilion Cliffs, the primary release area for the reintroduction of California condors in northern Arizona. Photo by: Bruce Palmer.



Figure 3. Enlarged condor flight pen at Vermilion Cliffs with mock power pole. Photo by: Bruce Palmer.

By the fourth release, in November 1997 (of 4 birds), biologists noticed increased visitation to the acclimation pen/feeding area by the free-flying flock which took full advantage of the supplemental feedings provided for recently released condors. This made it increasingly difficult to ensure that the young birds were obtaining enough food. Not wanting to encourage now-wild condors to loiter around human built structures (i.e., acclimation pen), the caged juvenile condors, and/or the carcasses within the pens, it was decided to establish a second release site.

The goal of establishing a second release site was to create two groups of free-flying condors, each with their own activity center, in order to reduce competition among condors at releases and protect against loss of the entire

population to mass mortality (e.g., disease or poisoning). The Hurricane Cliffs release site, approximately 65 miles west of the Vermilion Cliffs, was established in the fall of 1998. This release site is also on BLM administered land. An acclimation pen similar to that at the Vermilion Cliffs was constructed.

Releases occurred at the Hurricane Cliffs site in the winters of 1998 (9 birds) and 1999 (7 birds) in much the same way as had been done at Vermilion Cliffs. The 1998 release cohort found their way to the South Rim of the Grand Canyon, finding condors previously released at Vermilion Cliffs. They then followed the older birds back to Vermilion Cliffs and joined with that group of birds. The following year's release at Hurricane Cliffs proved to be very problematic. Several juvenile condors, without the benefit of older and more experienced free-flying "mentor" birds, demonstrated various behavioral problems including approaching people. The Hurricane Cliffs site was last used for condor releases in 1999. However, a few of the free-flying condors still frequent the Hurricane Cliffs corridor.

Four of the eight condors released at Vermilion Cliffs on 29 December 2000, demonstrated improved behavior patterns over condors released in past years, being more wary of humans and requiring less intervention (e.g., flushing from undesirable locations) by field biologists. They also ranged less widely than young birds in previous years, returning to the release/feeding site every two to four days where they usually took advantage of the regular supplemental feedings.

With approval from FWS and the California Condor Recovery Team, experimental releases of adult condor pairs were conducted at Vermilion Cliffs in December 2000. The condor pairs consisted of two nine-year-old (condor #74 and #82), and two ten-year-old (condor #60 and #70)



Figure 4. Condor #70 captured by Chris Parish for return to captivity due to inappropriate roosting behavior, 29 Dec 2000. Photo by: Bruce Palmer.

birds from the World Center for Birds of Prey breeding facility. Both pairs had copulated and produced infertile eggs in captivity. The intent was to release the pairs just prior to the breeding season, with the hope that one or both pairs would breed in the wild. The previous release of two-year-old condors had been successful, and it was hoped that the nine- and ten-year-old birds would acclimate to the wild in a short time. The first pair was released after several weeks in the holding pen; the second pair was released soon after.

Almost two weeks following release, the female from the first pair was killed by coyotes in House Rock Valley just over a mile from the release site.

Three days later, the male of that pair was found dead, presumably killed by coyotes. Within the next two days, biologists recaptured the second pair after observing that these birds were also roosting on the ground (Figure 4). This pair was returned to the captive breeding program, as it seems their survival skills for the wild had not developed due to being in captivity their entire lives.

During the first five years of the condor reintroduction program in northern Arizona, there have been nine separate releases for a total of 47 condors, 31 at the Vermilion Cliffs and 16 at the Hurricane Cliffs. Of these, 25 are free-flying as of 31 January 2002; 18 have died; and 4 have been returned to captivity (Table 1; Appendix B).

Table 1. Summary of California condor releases in northern Arizona.

Release Date	Location	Number of Condors Released	Status of Condors as of 31 Jan 2002		
			Dead	Captivity	Wild
12 Dec 1996	Vermilion Cliffs	6	3		3
14 May 1997	Vermilion Cliffs	4	2		2
26 May 1997	Vermilion Cliffs	5	1		4
20 Nov 1997	Vermilion Cliffs	4	2		2
18 Nov 1998	Hurricane Cliffs	9	4		5
7 Dec 1999	Hurricane Cliffs	7	3	1*	3
7 Dec 2000	Vermilion Cliffs	2 (adult pair)	2		
19 Dec 2000	Vermilion Cliffs	2 (adult pair)		2	
29 Dec 2000	Vermilion Cliffs	8	1	1	6
Totals		47	18	4	25

* Transferred to Vermilion Cliffs holding pen in November 2001 with 10 juvenile condors in anticipation of a release early in 2002.

Incorporating ideas and experience from condor reintroduction experiments at both California and Arizona release sites, several changes in holding and release strategies have been made since the end of 1999, including:

1. Releases have taken place at the Vermilion Cliffs site in the presence of free-flying condors.
2. Prior to release, juveniles are held in a substantially larger flight pen (40 x 60 x 14 feet). Higher perches were installed in the large flight pen to encourage young condors to select appropriate perches off of the ground to avoid predators after release. A mock power pole for adverse conditioning was moved inside the flight pen. For the December 2000 release, adult condors were also held in the flight pen with the juveniles which may have facilitated the young birds' integration into the condor flock.

3. The condors were held longer in the flight pen before being transported to the release pen situated on the edge of the Vermilion Cliffs, allowing more time for physical and behavioral development, and being able to observe and interact with the free-flying birds.
4. Supplemental food was placed at the release site every three to four days throughout the year, maintaining a constant, contaminant-free food supply.
5. With a large holding pen, sick or problem birds could be recaptured or held back for extended periods in the holding pen, providing a new facet to the management of the flock. Recapturing and holding problem birds removes poor examples from which other birds may learn.

Although crowding does not yet appear to be a problem at the Vermilion Cliffs site, additional release and feeding sites will likely be necessary in the future as more condors are reintroduced. Furthermore, the potential expansion of the nonessential experimental area would provide an opportunity to develop additional groups of free-flying condors with separate activity centers (e.g., condor release and/or feeding sites) by maintaining the option to use the Hurricane Cliffs site and/or other potential sites, for holding and/or release of birds. Management flexibility is an important part of responding to new challenges in the reintroduction program.

Monitoring and Data Collection

Prior to release, each condor was fitted with patagial (wing)-mounted number tags and two conventional radio telemetry transmitters (and/or occasionally a tail mounted transmitter) to aid biologists in monitoring and tracking individual birds. Redundant transmitters provided added security in case of failure of one of the units; the birds were recaptured every six months and transmitters replaced as needed (about once a year). In addition, blood samples were taken to check for potential lead poisoning. The field crew of usually four to six biologists intensively monitor the birds aided by traditional radio telemetry. Biologists made daily contact with each bird by radio signal and/or visual observation over 80 percent of the time. Various data were recorded concerning the birds' location, feeding activities, and behavior. Condor activity was closely monitored so biologists could intervene as necessary in response to behavior (e.g., perching on a human structure; approaching people) or health needs (e.g., malnutrition; poisoning; injury) of a bird. However, many of the details regarding the birds' activities remained unknown due to rugged terrain, limited road access, and long-distance flights that condors are capable of making. On 24 August 2001, a solar powered Platform Transmitter Terminal (PTT unit) that is monitored by satellite, was placed on the most wide-ranging condor, #176. This condor was at one point completely on her own for five months. During that time biologists were rarely able to locate her, even with the aid of fixed-wing aircraft. The satellite transmitter is programmed to emit signals once an hour over an eight-hour period during daylight hours. Readings are received daily. The satellite transmitter has proven to be a valuable and efficient tool in tracking the movements of this bird. Additional tracking techniques under development by The Peregrine Fund include sophisticated satellite/GPS (Global Positioning

System) location monitoring and recording systems. However, improved methods of data recording, summarization, and reporting need to be implemented.

Behavior

Like many scavengers, California condors are exceptionally curious. Curiosity and associated “play” behavior are most likely adaptive traits that developed over the condor’s evolutionary history and may have helped ensure its survival (perhaps enhancing learning and memory in a long-lived species). In a human-dominated world, such curiosity can be manifested as an overall fearlessness of humans. Historic accounts suggested that some wild condors were unwary and sometimes even drawn to human activity (Snyder and Snyder 2000). In released condors, excessive curiosity and unwariness can be undesirable when it places the birds at risk or results in the destruction of human property. Despite being extremely gregarious, condors exhibit individual personalities and show varying degrees of curiosity and wariness. During the last five years, the majority of released condors in Arizona exhibited acceptably curious behaviors, while only a few individuals showed unacceptable levels of curiosity.

Acceptably curious behaviors included frequent fly-bys near people, persistently perching close to people or perching in populated areas, and playing with trash and other anthropogenic objects. Condors that exhibited these curiosity levels typically would have an escape route and did not physically interact with humans. On rare occasions (e.g., five times documented in 2000 and at



Figure 5. California condor soaring past visitors at Grand Canyon National Park. Photo by: Chris Parish

least three times in 2001), such free-flying condors engaged in destructive behavior, such as tugging on and ripping tents at unattended back-country campsites. Despite the undesirability of such behaviors, manipulating and pulling on objects may teach important survival skills and are “natural” exploration, learning, and play behaviors for condors. Unacceptably curious birds would place themselves in situations of increasing jeopardy, perching in dangerous areas with no escape routes, and either initiating or allowing human contact. Such birds appeared to have no awareness for their own safety.

Excessive curiosity and its associated “bad” behaviors are typically most prevalent in juveniles. Young released birds were more likely to show excessive curiosity, unwariness of humans, and other behavioral problems than were older birds. Such undesirable behavior seemed to peak when the birds’ were first exposed to humans or developed areas. Over the course of five years of releases in Arizona, there appeared to be a natural decrease in excessively curious behavior with increased age, time in the wild, and overall experience of the bird. Nevertheless, biologists worked to hasten this process and to maximize the number of behaviorally “successful” birds in

the wild. Because birds were released without their parents, biologists had to act as surrogates in shaping desirable condor behavior. Birds exhibiting acceptable condor curiosity were (and continue to be) consistently and persistently hazed to flush them from undesirable perches (e.g., human structures and perches near humans) or to discourage undesirable behavior. Hazing of condors consisted of yelling or clapping, running toward the birds, using noisemakers, or spraying water at the condors. As condors aged and gained experience in the wild, they typically required less hazing before leaving an unacceptable area and, in general, were less likely to repeatedly frequent unacceptable areas. The placement of perching deterrents (e.g., nixolite) at locations where condor use is not desirable (e.g., Orphan Mine, Grand Canyon; utility poles at Grand Canyon Village) has been successfully used. However, once condors are regularly perching/using a site, it is much more difficult to stop that behavior than to prevent it from happening in the first place. Generally, the summer months provided good flying conditions (e.g., thermals; long day-light hours) when the condors tended to range farther and encounter more opportunities to engage in inappropriate behavior.

Condors exhibiting unacceptable curiosity and unwariness of humans were typically recaptured for either short- or long-term (greater than several months) “time-outs.” Temporarily removing such birds from the free-flying population typically disrupted the negative behavior pattern in the problem bird, allowed the bird some important “growing-up” time, and removed a bad influence on other condors that were exhibiting desirable behavior. Temporary “time-out” was a frequently used management technique with 26 condors being captured and temporarily held at least once (Table 2). This often resulted in marked improvement in the behavior for almost all of these condors.

Table 2. Condors temporarily held in captivity (through January 31, 2002) due to behavioral concerns.
WCBP = World Center for birds of Prey, Boise, Idaho.

Condor	Capture Date	Reason for Time-out	Time-out Duration	Re-release Date	Post-holding Status
70	29 Dec 2000	Improper roosting	---	---	Captive breeding program
60	30 Dec 2000	Improper roosting	---	---	Captive breeding program
114	19 Aug 1999	Modify group behavior	18 days	6 Sept 1999	Currently free-flying
123	12 Aug 1999	Modify group behavior	25 days	6 Sept 1999	Currently free-flying
126	4 June 1007 20 June 1997 13 July 1997	Behavior problems Behavior problems Fed by humans	4 days 11 days 899 days	8 June 1997 1 July 1997 29 Dec 1999	Free-flying 12 days Free-flying 12 days Currently free-flying
127	17 Aug 1999	Modify group behavior	22 days	8 Sept 1999	Currently free-flying
136	21 Aug 1999	Modify group behavior	16 days	6 Sept 1999	Currently free-flying
142	21 Dec 1996	Behavior problems	6 days	27 Dec 1996	Free-flying 5 months-dead
149	12 Aug 1999	Modify group behavior	28 days	8 Sept 1999	Currently free-flying

150	12 Aug 1999	Modify group behavior	25 days	6 Sept 1999	Free-flying 9 months-dead
158	12 Aug 1999	Modify group behavior	45 days	26 Sept 1999	Currently free-flying
162	12 Aug 1999	Modify group behavior	45 days	26 Sept 1999	Currently free-flying
176	28 July 1999	Modify group behavior	52 days	18 Sept 1999	Currently free-flying
182	28 July 1999	Modify group behavior	52 days	18 Sept 1999	Free-flying 9 months-dead
184	28 July 1999	Modify group behavior	60 days	18 Sept 1999	Free-flying 12 mos.-dead
186	26 Mar 1999 7 April 1999 23 May 2001	Behavior problems Behavior problems - handled by people Negative influence on juveniles	6 days 634 days 205 days	2 April 1999 29 Dec 2000 14 Dec 2001	Free-flying 5 days Free-flying 5 months Currently free-flying
187	12 Aug 1999 9 July 2000	Behavior problems Behavior problems	87 days 86 days	7 Oct 1999 3 Nov 2000	Free-flying 9 months Currently free-flying
191	28 July 1999	Modify group behavior	52 days	18 Sept 2000	Free-flying 9 months-dead
193	17 Aug 1999	Behavior problems	82 days	7 Nov 1999	Currently free-flying
195	11 April 2000	Behavior problems	661+ days	---	In captivity at WCBP Expected release 16 Feb02
196	15 April 2000	Behavior problems	330 days	12 Mar 2001	Currently free-flying
198	13 April 2000	Behavior problems	333 days	12 Mar 2001	Currently free-flying
203	14 April 2000 14 May 2001	Behavior problems Behavior problems	332 days 214 days	12 Mar 2001 14 Dec 2001	Free-flying 2 months Currently free-flying
224	16 Jan 2001 14 May 2001	Behavior problems Behavior problems - fed by humans	15 days 214 days	31 Jan 2001 14 Dec 2001	Free-flying 2 weeks; held for health 24 days; free-flying 63 days Currently free-flying
227	30 Jan 2001	Behavior problems	41 days	12 Mar 2001	Currently free-flying
232	4 Jan 2001 1 Feb 2001	Behavior problems Behavior problems	27 days 365+ days	31 Jan 2001 ---	Free-flying 1 day In captivity at WCBP

Releasing condors at a site where older birds were present also seemed to improve the behavior of juveniles. Compared to juvenile birds released at Vermilion Cliffs in 1996 (when no free-flying birds were present) and 1997 (when no adults were present), and at Hurricane Cliffs in 1998 and 1999 (where no free-flying birds were present), the cohort released at Vermilion Cliffs in 2000 (with adults present) exhibited fewer behavioral problems (however, additional factors may have also influenced this result). Although these juveniles still frequented “people-areas” such as Grand Canyon National Park’s South Rim, they typically selected better perches from the outset, or they moved to desirable perches and did not persist in unacceptable behavior when hazed.

To most effectively manage the condor population, biologists must be proactive in modifying the behavior of released birds. Persistent and consistent hazing should continue in the field for birds exhibiting normal curiosity, while recaptures and time-outs (and subsequent re-releases) should continue for problem birds. Hazing and/or placement of perching deterrents should occur as soon as a problem situation is identified. Problem birds should be returned to captivity before they become an adverse influence on other free-flying birds. Expanding the opportunities to educate the public about the natural behavior patterns of condors and to not approach or feed the birds has been a major component of the program.

Courtship and Egg Laying

The age of first breeding for captive California condors is usually between five and seven years of age. The year 2001 marked the first year that any of the condors in Arizona were of breeding age. While courtship activities have been observed in previous years, courtship displays intensified during the winter of 2000-2001, and by the end of February as many as five males had been observed displaying to females. This was also the first time cave exploration was observed. The highlight to date of the condor reintroduction program in northern Arizona occurred on 25 March 2001, when it was confirmed that one of the condors had laid an egg—the first confirmed condor egg laid in the wild since 1986. Unfortunately, the egg broke sometime within the first week of incubation, and the nesting attempt failed. Nonetheless, first nesting attempts often fail with condors in the wild and in captivity. The egg laid in 2001 remains a positive sign that condors are exhibiting normal behaviors and that successful breeding in the wild may occur in the near future.



Figure 6. Site of first nesting attempt by reintroduced condors, Grand Canyon National Park. Photo by: Chris Parish.

Movements

Condor activity in Arizona has been, as expected, centered inside the designated nonessential experimental area. Condors of all ages, but especially older birds, travel throughout the Grand Canyon complex and along the Colorado River corridor. More recently, condors have been foraging on the Kaibab Plateau, and occasionally flying into southern Utah. However, on at least six occasions (Table 3) condors have moved outside the experimental population area. The longest movement recorded so far was about 310 miles to the northeast, to the Flaming Gorge Reservoir on the Wyoming/Utah border. Other significant movements include three birds venturing to Grand Mesa and two to Mesa Verde National Park in western Colorado, one bird traveling as far as Milford, Utah, and most recently, one bird to an area near Parker Dam on the

Arizona/California border (Figure 6). Four long-distance flights involved young birds (4 years old or less) apparently following major river corridors (i.e., Colorado, Green, and San Juan rivers). These appeared to be exploratory flights, being of short duration (less than 7 days) and generally isolated incidents (Table 3). However, a single condor (#176), originally released at Hurricane Cliffs, has repeatedly frequented areas near Cedar City, Utah, and on at least two occasions ventured west of the experimental area boundary. This is the only location near the experimental area boundary that has been regularly visited by a condor, and where movements outside the experimental area did not follow major river corridors. Nonetheless, the proportion of time condors are known to have spent outside the experimental population area over the past five years is minimal. Of a total of 29,636 free-flying condor days, an estimated 48 condor days (0.16%) were spent outside the experimental area. Other movements outside the nonessential experimental area could have occurred, but were not confirmed by the field crew.

Table 3. Summary of confirmed condor movements outside of the nonessential experimental population area.

Condor	Age (yrs)	Departure Date	Departed From	Approx. Distance (miles)	# Condor Days Outside 10(j) Area*	Farthest Point (General Area)
119	3	31 July 1998	Vermilion Cliffs	310	5	Flaming Gorge Res., WY
176	1	22 May 1999	Hurricane Cliffs	125	5	Cedar City/Milford, UT
116 122 123	4	23 June 1999	Vermilion Cliffs	275	9 - 15	Grand Mesa, CO
176 191	1	28 June 1999	Vermilion Cliffs	200	4 - 6	Mesa Verde NP, CO
176	3	3 Sept 2001	Vermilion Cliffs	80	2	South of Cedar City, UT
198	2	21 Nov 2001	Vermilion Cliffs	210	15	Parker Dam, AZ/CA

* Number of condors multiplied by the maximum number of days (liberal estimate) outside the 10(j) area.

Although movements by condors outside the experimental area have, in the past, been relatively rare, with growing numbers of free-flying condors and the increasingly experienced birds in Arizona, the frequency of significant movements and the likelihood of dispersal is expected to increase. As the previous flights have shown, condors are capable of traveling very long distances in a short period of time (e.g., 200+ miles/day), making such movements difficult to track. With continued release of condors in Arizona, consideration should be given to: 1) expanding the nonessential experimental area to include at least, the entire states of Utah, Colorado, New Mexico, and Arizona, and a portion of southwestern Wyoming, to allow for the wide-ranging exploratory flights and dispersal by condors; and 2) expanding the use of satellite telemetry to better track the flights of wide-ranging birds.

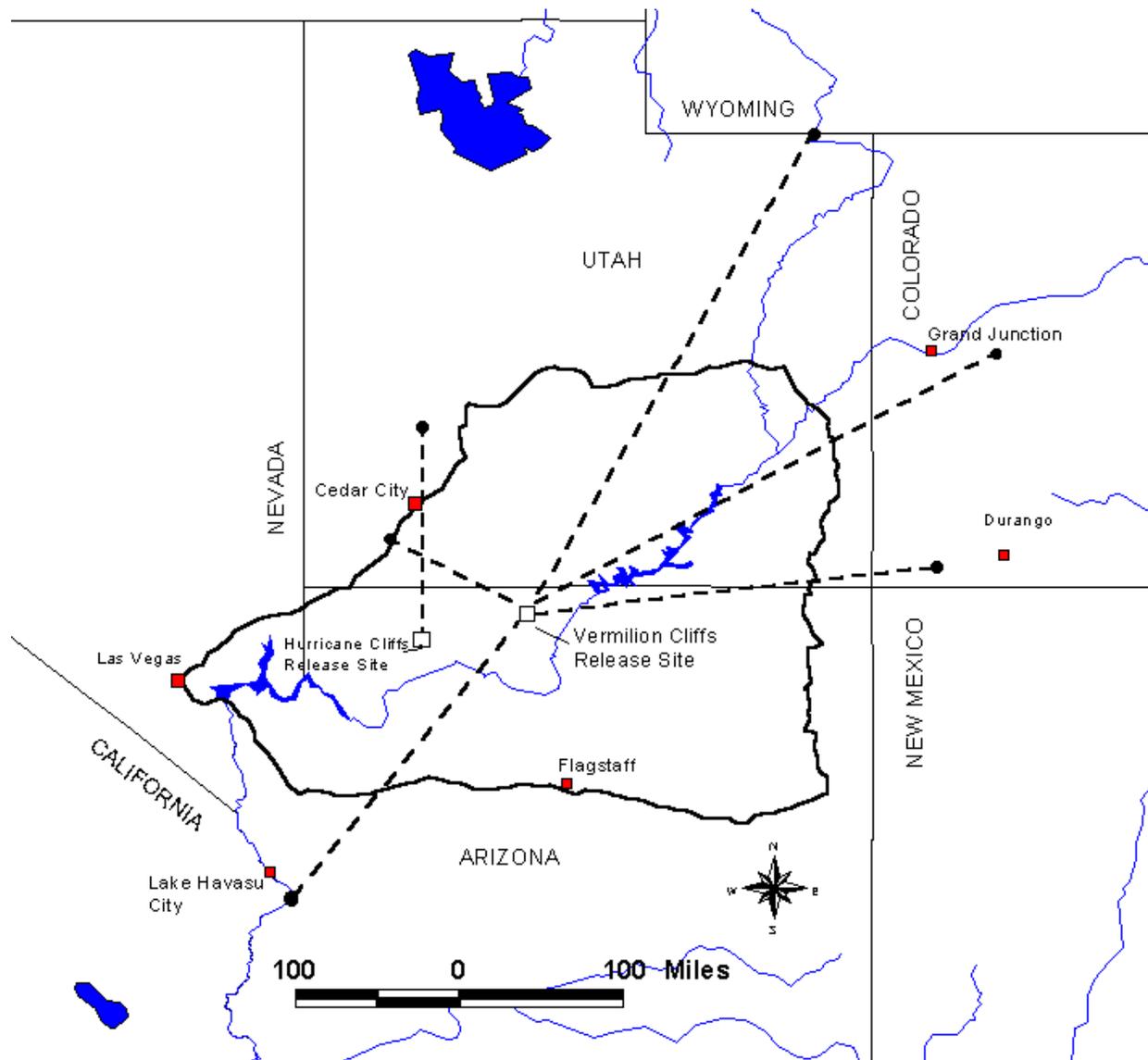


Figure 7. Known movements of condors outside the designated nonessential experimental population area.

Feeding

California Condors feed exclusively on carrion, and mainly on the carcasses of large mammals. Amid concerns that condors lacked the food-finding skills necessary to survive without supplemental food, and that there was an inadequate prey base in northern Arizona, the initial strategy of the supplemental feeding program was to encourage “natural-like foraging.” Food (i.e., carcasses) was provided within the vicinity of the release site, but in unpredictable locations and only when birds were present for extended periods. Consequently, many birds ranged widely and were self-sufficient for varying lengths of time. This was especially true during the summer. Condors fed commonly on naturally-occurring carcasses including bighorn sheep, mule deer, elk, range cattle, dog, horse, squirrel, fish, and duck. Although natural foraging was, at the time, seen

to be very positive, the feeding management strategy abruptly changed following the spring and summer of 2000 when several condors perished and many others were stricken by lead poisoning. In this case, several condors had ingested lead shotgun pellets while feeding on a contaminated carcass. From that time forward, a constant food source has been provided at the Vermilion Cliffs release site. Lead shot and bullet fragments remaining in game animal carcasses pose a potential health threat to condors. Carcasses of still-born dairy calves are provided in an attempt to reduce the bird's movements and minimize the occurrence of natural feeding, thereby reducing the potential exposure to lead. This, it seems, has reduced the overall amount of time spent away from the release site and reduced the ranging behavior of many of the condors. Still, birds commonly feed on naturally-occurring carcasses. Also, the practice of providing road-killed carcasses to feed condors at the release site was not initiated because of the possibility of contamination (see "Health").

There have been several important findings over the past five years relative to the original concerns regarding feeding and food availability. First, condors of all ages, but especially the older birds, have demonstrated a remarkable ability to find food. For example, between April and November 2001, the birds discovered at least 17 large carcasses, and many more were likely fed upon during this time. Additionally, although birds have and continue to find non-proffered carcasses, feeding by condors along roadsides on road-killed animals has not been a problem. There are only a few instances of condors being attracted to and/or scavenging road-killed animals (elk, deer, and squirrel). Despite supplemental feeding at the release sites, condors of all ages continuously make short trips away from the site, and some have traveled widely. Several birds have moved away from the site for extended periods (for up to five months), during which time they have been entirely self-sufficient in finding food. Therefore, mounting evidence suggests that condors are not only capable of finding enough food, but that some birds will continue to forage naturally and travel widely regardless of the amount and regularity of supplemental food provided at the release site. Nonetheless, providing a stable and safe food source at the release site is critically important.

Dairy calf carcasses are provided as a supplemental food source for condors at the release site. At the rearing facilities young condors are fed a variety of smaller foods; these young birds are not introduced to larger carcasses until after being transported to the release site in Arizona. Although most young birds adjust to the different food source quickly, exposure to larger carcasses while at the breeding facility might better facilitate this transition.

Mortality

Mortality in a wild population can be considered in two ways: physical mortality (i.e., actual deaths), or ecological mortality (i.e., birds permanently removed from the population by being placed into captivity). Of the 47 condors released in northern Arizona, 25 remain and constitute the free-flying flock. This reflects a loss of 22 birds (including deaths and returns to captivity) or a "mortality" rate of 47 percent. However, the release of four adult condors (two mated pairs) was part of an experiment to test how well adult birds raised in captivity could survive in the wild (see "Release Strategies"). Upon release, inappropriate roosting behavior of these adult

birds left them more vulnerable to predation by coyotes. Two birds were killed by coyotes; the other two captured and returned to captivity. The removal of these four birds from the free-flying population has been excluded from the general comparisons with mortalities of condors released as juveniles.

Excluding the release of the adult pairs, there has been a loss of 18 birds from the free-flying population (16 deaths and 2 currently held in captivity), or a 42 percent “mortality” rate. Since the two birds being held in captivity may still be re-released to the wild (one is scheduled for release in early 2002), they will not at this time be considered “ecological mortalities,” and so be removed from the calculation of mortality rate.

Of the 43 condors released as juveniles there have been 16 deaths (37%). Of the 16 physical mortalities, five deaths were confirmed or suspected as caused by lead poisoning, three condors were killed by golden eagles, one confirmed and one suspected killed by coyotes, one by collision with a transmission line, one by gunshot, one by starvation, and one by lethal aspiration (suffocation suspected to have followed gorging by a very hungry bird); two condors were lost and presumed dead due to unknown causes (Table 4).

Table 4. Sources of mortality for 16 subadult and 2 adult condors released in northern Arizona (modified from Woods *et al.* 2001, and The Peregrine Fund 2001 Annual Report to FWS). Birds are listed by the number of days free-flying prior to death.

Condor	Source of Mortality	Sex	Age at Release (yrs)	Age at Death (yrs)	Days Free-flying
82	Coyote	F	9	9	19
74	Coyote	M	9	9	22
142	Golden eagle (probable)	M	<1	<1	22
177	Coyote	M	<1	<1	39
207	Lethal aspiration	M	<1	<1	39
228	Starvation	F	<1	<1	43
197	Golden eagle	F	<1	<1	59
128	Lost	F	2	2	62
211	Lost	F	<1	1	119
151	Transmission line collision	F	<1	1	157
169	Coyote (unconfirmed)	M	<1	1	315
191	Lead poisoning	F	<1	2	518
182	Lead Poisoning (unconfirmed)	M	<1	2	519
184	Golden eagle	F	<1	2	535

124	Gunshot	F	2	2	608
165	Lead poisoning	M	<1	3	927
116	Lead poisoning	M	2	5	1006
150	Lead poisoning (unconfirmed)	F	<1	4	1260

Nine birds died within the first year of their release (discounting the release of the adult pairs). Of these, four died from depredation (golden eagle and coyote), one from a collision, and one due to starvation. These deaths are attributed to factors related to inexperience in the wild. The collision with a transmission line appeared to be mid-span, suggesting that the aversion training against perching on power poles was not at issue. The collision may have resulted from: 1) poorly developed flying skills; 2) lack of knowledge of the habitat; and/or 3) poor visibility of transmission lines due to weather, lighting conditions, or line reflectiveness. For birds that were free-flying for more than one year, the single greatest mortality factor was lethal exposure to lead contaminants (lead shot or lead fragments from spent ammunition ingested by feeding condors). Five birds are known or suspected to have died due to lead poisoning (Table 4); seven other condors had high lead levels in the blood upon re-capture (over 200 ug/dl blood lead and/or ingested shot pellets) and likely may have died had they not been treated with chelation therapy (chemical method of removing lead contaminants from the circulatory system) (Table 5; see “Health”). It is important to note however, that four of the five birds whose deaths are attributed to lead poisoning, and likewise nine chelated birds, died or were treated within a single period in June-July 2000, possibly representing a single poisoning incident. Five of these condors were known to have ingested lead shotgun pellets (birdshot size). How lead shot came to be in the carrion fed upon by condors is unknown. The carrion and source of lead shot were never determined. Fatalities by causes other than poisoning were limited for the experienced birds (free-flying for more than one year) to one condor that was shot and another killed by a golden eagle. Although natural mortality accounted for several deaths of younger condors, all but one death of older, more-experienced birds was directly related to anthropogenic factors, most notably lead poisoning (modified from Woods *et al.* 2001). It is unknown if condors which have experienced high lead exposure levels and/or have been chelated may develop physiological or neurological problems.

With intensive management, especially within the first 60 to 90 days following release, it may be possible to prevent some types of natural mortality. Experimenting with methods such as holding birds on-site in flight pens for longer periods, and providing exposure of pre-release condors to older “mentor” birds, may improve behavioral survival skills and the physical condition of the birds upon release. However, while every bird is critically important, adult mortality has a greater effect on the long-term population growth rate than the loss of juveniles (Verner 1978; Meretsky *et al.* 2000; Woods *et al.* 2001). Therefore, while efforts to minimize natural mortality factors during the first year post-release must continue, measures need also to be taken that would reduce anthropogenic mortality, especially those affecting older condors such as shooting and lead poisoning. To minimize overall condor mortality, general recommendations include: 1) intensive daily monitoring of the condor population; 2) expanded use of satellite

telemetry and other location monitoring devices (e.g., GPS units) to identify condor movement patterns and flight corridors; and 3) intensive monitoring of roost-site selection by recently released birds. Specifically regarding the threat of lead poisoning, recommendations include: 1) continued provision of contaminant-free carcasses, and feeding site management; 2) continued monitoring of blood-lead levels in free-flying condors at least twice a year; 3) gather data on potential lead exposure sources (e.g., game carcasses and gut piles), contaminant levels in carcasses, and potential pathways of lead in the environment, possibly using surrogate species; 4) increased public education regarding the effects of lead on wildlife; and 5) establishment and maintenance of an on-site medical treatment center near each release location. Additional actions that could influence condor survival include: 1) behavioral conditioning trials with trained dogs (surrogate coyote); 2) coordination with utility companies and placement of visual markers on transmission lines at critical locations; 3) modifying captive management for longer holding periods; 4) continuing to provide elevated perches and mock power poles within the holding pen; and 5) expanding on the use of adult mentors.

Health

Various contaminants, poisons, and diseases pose serious health risks for condors. The natural food of condors is one potential source of contaminants and disease, even though condors have remarkable immune and digestive systems. Proffered carcasses were available for condors at the release site on a dependable basis. This food was carefully selected and only the carcasses of dairy calves obtained from a select group of dairies in the Phoenix, Arizona, area were provided to condors. All carcasses were kept frozen until just prior to feeding and were free of injections of artificial hormones or antibiotics.

If, through close monitoring of the birds, any condor was suspected of health related concerns, it was captured, and tested, treated, and/or cared for as necessary (Table 5).

Table 5. Condors captured for health related reasons, including capture for testing of blood lead levels (through 31 Jan 2002). Lead values are for blood (unless otherwise indicated) as tested in the laboratory; field test kit values within brackets []. Only maximum blood lead level is reported for a holding period.

Condor	Capture Date () Release Date	Holding Duration (days)	Reason / Treatment
114	19 Aug 1999	–	Lead 9 ug/dl
	19 April 2000	7	Lead 3 ug/dl
	11 July 2000	54	Lead [36.1 ug/dl] 45 ug/dl
	(3 Sept 2000)	--	Lead [10.3 ug/dl]
	6 May 01	--	Lead [8.8 ug/dl]
	7 Oct 2001	--	Lead [2.6 ug/dl]
116	2 Mar 2000	Dead	Lead 3200 ug/dl liver

119	15 April 2000	26	Lead	109 ug/dl	Treated at Phoenix Zoo Radiographed Chelated
	13 May 2000	--	Lead	[10 ug/dl]	
	13 July 2000	52	Lead	52 ug/dl 1 pellet	Radiographed Chelated
	(3 Sept 2000)	--	Lead	[10.1 ug/dl]	
	6 May 2001	--	Lead	[17.8 ug/dl]	
14 Oct 01	--	Lead	[18.1 ug/dl]		
122	16 April 2000	5	Lead	10 ug/dl	Chelated
	11 July 2000	54	Lead	210 ug/dl	
	(3 Sept 2000)	--	Lead	[16.2 ug/dl]	
	6 May 2001	--	Lead	[18.6 ug/dl]	
	14 Oct 2001	--	Lead	[25.2 ug/dl]	
123	31 Aug 1999	--	Lead	10 ug/dl	Chelated
	21 April 2000	6	Lead	1 ug/dl	
	2 July 2000	63	Lead	322 ug/dl	
	(3 Sept 2000)	--	Lead	[12.4 ug/dl]	
	18 Feb 2001	--	Lead	[16.1 ug/dl]	
	6 May 2001	--	Lead	[19.7 ug/dl]	
	7 Oct 2001	--	Lead	[22.5 ug/dl]	
124	20 July 1997	45	Emaciated	Treated at San Diego Wild Animal Park	
126	20 April 2000	6	Lead	9 ug/dl	
	10 July 2000	47	Lead	[4.1 ug/dl] 6 ug/dl	
	6 May 2001	--	Lead	[4.6 ug/dl]	
	7 Oct 2001	--	Lead	[3.6 ug/dl and 7.4 ug/dl]	
127	17 Aug 1999	--	Lead	7 ug/dl	Chelated
	16 April 2000	5	Lead	1 ug/dl	
	29 June 2000	96	Lead	136 ug/dl	
	3 Oct 2000	--	Lead	[6.6 ug/dl]	
	6 May 2001	--	Lead	[5.6 ug/dl]	
	7 Oct 2001	--	Lead	[7.2 ug/dl]	
133	16 April 2000	5	Lead	3 ug/dl	Treated at Phoenix Zoo Radiographed, Endoscopy, Gizzard flushed, Chelated
	11 July 2000	50	Lead	150 ug/dl 1 pellet	
	(30 Aug 2000)	--	Lead	[13 ug/dl]	
	18 Feb 2001	--	Lead	[11 ug/dl]	
	6 May 2001	--	Lead	[15.4 ug/dl]	
	7 Oct 2001	--	Lead	[18.7 ug/dl]	

134	19 April 2000 29 June 2000 (3 Oct 2000) 18 Feb 2001	7 96 -- --	Lead 0 ug/dl Lead [32.5 ug/dl] 46 ug/dl Lead [4.8 ug/dl] Lead [9.2 ug/dl]	
136	21 Aug 1999 16 April 2000 13 July 2000 (30 Aug 2000) 6 May 2001	-- 5 48 -- --	Lead 32 ug/dl Lead 11 ug/dl Lead 118 ug/dl 2 pellets Lead [3.5 ug/dl] Lead [12.5 ug/dl]	Radiographed, Chelated
149	12 Aug 1999 15 April 2000 13 July 2000 (3 Oct 2000) 6 May 2001 14 Oct 2001	-- 6 83 -- -- --	Lead 15ug/dl Lead 1ug/dl Lead 101ug/dl Lead [10ug/dl] Lead [11.3 ug/dl] Lead [22.2 ug/dl]	Chelated
150	12 Aug 1999 15 April 2000 25 June 2000	-- 6 Dead	Lead [11 ug/dl] Lead 2 ug/dl Lead - unconfirmed	
158	12 Aug 1999 16 April 2000 2 July 2000 (3 Oct 2000) 18 Feb 2001 14 Oct 2001	-- 5 94 -- -- --	Lead 8 ug/dl Lead 1 ug/dl Lead 390 ug/dl 6 pellets Lead [5 ug/dl] Lead [26.3 ug/dl] Lead [16.6 ug/dl]	Treated at Phoenix Zoo Radiographed, Endoscopy, Surgery Chelated
162	12 Aug 1999 15 April 2000 9 July 2000 (3 Oct 2000) 18 Feb 2001 6 May 2001 7 Oct 2001	-- 6 87 -- -- -- --	Lead 8 ug/dl Lead 10 ug/dl Lead 285 ug/dl Lead [9 ug/dl] Lead [5.1 ug/dl] Lead [11.8 ug/dl] Lead [11.5 ug/dl]	Chelated
165	16 April 2000 12 June 2000	5 Dead	Lead 1 ug/dl Lead 3400 ug/dl liver 17 pellets	
176	28 July 1999 15 April 2000 25 June 2000 (27 Aug 2000) 6 May 2001 14 Oct 2001	-- 6 63 -- -- --	Lead 14 ug/dl Lead 1 ug/dl Lead [14.9 ug/dl] 25 ug/dl Lead [3.4 ug/dl] Lead [14.7 ug/dl] Lead [23.9 ug/dl]	
182	28 July 1999 19 April 2000 20 June 2000	-- 7 Dead	Lead [5 ug/dl] Lead 0 ug/dl Lead - unconfirmed	

184	28 July 1999 19 April 2000 29 June 2000 (27 Aug 2000)	60 7 59 --	Botulism Lead 0 ug/dl Lead [5.2 ug/dl] 9 ug/dl Lead [0 ug/dl]	Treated at Phoenix Zoo
186	7 Oct 2001	--	Lead [7.5 ug/dl]	
187	12 Aug 1999 16 April 2000 9 July 2000 (3 Nov 2000) 18 Feb 2001 6 May 2001 14 Oct 2001	-- 5 (held for behavior) -- -- -- --	Lead 10 ug/dl Lead 6 ug/dl Lead [28.7 ug/dl] 44 ug/dl Lead [8.1 ug/dl] Lead [10.2 ug/dl] Lead [13.8 ug/dl] Lead [25.5 ug/dl]	
191	28 July 1999 16 April 2000 15 June 2000 16 June 2000	-- 5 2 Dead	Lead 8 ug/dl Lead 14 ug/dl Lead 50 ug/dl Lead	Transported to Phoenix Zoo
193	17 Aug 1999 15 April 2000 29 June 2000 (30 Aug 2000) 6 May 2001 7 Oct 2001	-- 6 62 -- -- --	Lead 10 ug/dl Lead 7 ug/dl Lead 34 ug/dl Lead [3.2 ug/dl] Lead [7.5 ug/dl] Lead [28 ug/dl]	
195	11 April 2000	--	Lead 6 ug/dl	
196	15 April 2000 14 Oct 2001	-- --	Lead 1 ug/dl Lead [18 ug/dl]	
198	13 April 2000 14 Oct 2001	-- --	Lead 9 ug/dl Lead [4.3 ug/dl]	
203	14 April 2000 6 May 2001 14 Oct 2001	-- -- --	Lead 10 ug/dl Lead [5 ug/dl] Lead [2 ug/dl]	
210	6 May 2001 7 Oct 2001	-- --	Lead [3 ug/dl] Lead [1 ug/dl]	
223	6 May 2001 7 Oct 2001	-- --	Lead [0 ug/dl] Lead [3.3 ug/dl]	
224	16 Feb 2001 6 May 2001 7 Oct 2001	24 -- --	Malnutrition Lead [0 ug/dl] Lead [4 ug/dl]	
227	6 May 2001 7 Oct 2001	-- --	Lead [0 ug/dl] Lead [3.6 ug/dl and 7.4 ug/dl]	
228	9 Feb 2001	Dead	Starvation	

234	6 May 2001 14 Oct 2001	-- --	Lead [0 ug/dl] Lead [24 ug/dl]
235	6 May 2001 7 Oct 2001	-- 30	Lead [0 ug/dl] Lead [50.6 ug/dl] 62 ug/dl

Nutrition

With increasing numbers of condors at the release/feeding site, it is becoming increasingly difficult to ensure that condors, especially recently released birds, are receiving a full crop and that their nutritional requirements are met. Although adequate food was available, one condor (#228) died at the release site from starvation six weeks after release during the winter of 2000/2001; two others were recaptured due to low body weight six and eight weeks following release (condors #224 and #124, respectively). Expanding on, and improving individual bird assessments and health-related measurements (e.g., weight, condition, behavior) both pre- and post-release, will help identify health (and behavior) related problems for treatment and/or management.

Contaminants and Poisoning

With condors often feeding on non-proffered carcasses, the potential for condor health problems and death from contaminants, poisons, and/or diseases is increased. During the five years of condor reintroductions, only the contaminant lead (possibly from lead bullet fragments, shot, and/or fishing equipment) has contributed to known toxicological condor morbidity and mortality (see "Mortality"). Considering the number of game animals harvested each year (and associated gut piles left behind) within the current foraging range of the condor, and the number of animals that likely go unrecovered by hunters, there is a substantial and ongoing risk of lead poisoning in condors. At the start of the reintroduction program in Arizona, it was anticipated that road-killed game animals would be collected and used to feed condors. However, road-killed animals are not used due to the difficulty in determining if these animals contain lead fragments (e.g., a deer with a pre-existing bullet wound) or other contaminants or diseases (e.g., a piece of chrome was found in one road killed deer while preparing the carcass to feed condors).

Following the death of four condors attributed to lead poisoning in the summer of 2000 (see "Mortality"), all 16 remaining free-flying birds were brought into captivity. These birds were held for six to twelve weeks to test for lead poisoning, provide any necessary treatment, and also to prevent them from returning to a contaminated carcass. Nine condors underwent chelation therapy; the most serious were transported to the Phoenix Zoo for treatment. Since that time due to the risk of lead poisoning, blood lead levels of free-flying condors were regularly tested (with the goal of testing each bird a minimum of twice a year). Blood samples would be tested with a field test kit (which had a maximum blood lead reading of 65 ug/dl), and based on the results of the field testing a sample would then be sent to a laboratory for additional analysis. Often, condors were held in

captivity while awaiting laboratory results. Blood lead levels are reported in Table 5, with the number of days each bird was held due to health related concerns (including holding awaiting laboratory results).

Condors are naturally curious and tend to thoroughly explore their environment, potentially exposing them to various health risks. Though poisons and environmental contaminants have yet to cause a known condor death in Arizona, this remains a potential threat. For example, five cattle and two ravens were found dead on 15 February 1997, 12 miles north of the Vermilion Cliffs release site. Laboratory analysis (reported by BLM) indicated probable, but not confirmed, organophosphate poisoning. The BLM, The Peregrine Fund, AGFD, Utah Division of Wildlife Resources, and FWS jointly participated in an investigation. No source of the poison was found. At the Orphan Mine in Grand Canyon National Park, condors have been perching on the tower above the mine shaft (Figure 7) and from there investigating the associated ground debris and structures. The area surrounding this abandoned uranium mine is designated a hazardous waste site. Condors have been observed with their heads thoroughly coated in mine residue, potentially exposing them to various environmental contaminants. The Park has successfully excluded condors from the site.



Figure 8. Condors perched at Orphan Mine, Grand Canyon. Photo by: Bruce Palmer

The use of poisons, traps, and snares is outlawed on federal and state land in Arizona (Arizona Revised Statute 17-301 D-1); private lands and Indian Reservations are not affected by this State law. Various predator control devices are used legally (and illegally) within the geographic area used by reintroduced condors, including southern and southeastern Utah. Carcasses of dead predators could draw condors into an area and these anti-predator devices could also kill condors. As condors are social birds and often forage together, a number of mortalities could potentially occur in a single event. No known condor mortalities in the experimental population area have been attributed to anti-predator devices. However, the use of poisons and traps in the environment are a continuing risk to the condor reintroduction program.

In concordance with the nonessential experimental designation, no additional restrictions for the protection of condors within the designated area can be placed on currently-legal activities, such as using lead ammunition for hunting or legal placement of anti-predator devices. However, since lead poisoning continues as a substantial threat for the condor

restoration project, several steps should be taken to reduce the risk of lead poisoning. There is a need for increased public education on the hazards of lead (ammunition, fishing equipment, and other sources) in the environment (to condors, eagles, other species, and people), and steps individuals can voluntarily take to reduce this hazard. Using notices in the annual publication of hunt regulations in Arizona and Utah, and other outreach materials, hunters could be encouraged to bury/cover gut piles and voluntarily use less-toxic (e.g., copper) or non-toxic ammunition as it becomes available. Various actions can be taken to manage the risk to condors from lead poisoning and environmental contaminants, as has been identified in the recommendations in the “Mortality” section. In addition, as soon as any potential risk of poisoning or environmental contaminant exposure is identified, take all necessary actions (including law enforcement involvement, as appropriate) to immediately address the problem with priority given to protection of surviving condors.

Disease

Free-flying condors are potentially exposed to various diseases and infections. No condor death in Arizona has yet been diagnosed as the result of an infectious disease. Diseases such as botulism, West Nile Virus, and foot-and mouth disease have been suggested as a possible concern for the condor reintroduction project in the future.

Botulism

One condor (#184) almost died from botulism in August 1999 while being held in the flight pen at Hurricane Cliffs. Usually fatal, botulism was diagnosed early and the condor was successfully treated at the Phoenix Zoo.

Additionally, between 17-25 August 1999, six mules belonging to the trail ride concessionaire at the North Rim of Grand Canyon National Park either died or were euthanized because of Type C botulism toxicity. This was within two weeks of the diagnosis of botulism in the condor. Botulism is caused by toxins produced by the bacteria *Clostridium botulinum*, which is closely related to bacteria that cause tetanus. Ravens were implicated as the mechanical carrier of the toxin from an infected carcass to the feeders/waterers used by the mules.

The mule owner initially believed that his mules contacted the disease from ravens which contaminated his feed and that the ravens probably got the botulism from calf carcasses which had been put out for the reintroduced condors. However, no link to the condor reintroduction program was established. because: 1) condors did not feed on proffered calf carcasses in 1999 between 15 May and 1 September; 2) the condor release site atop the Hurricane Cliffs is more than 80 miles distant from the mule barn; 3) the botulism organism commonly occurs in the soil; and 4) botulism can also occur in any carcass, including even a dead mouse in hay.

In resolving this issue, condor program personnel from BLM, The Peregrine Fund, FWS, and AGFD met several times with the owner and/or his representative, and contacted Grand Canyon National Park, the Zoological Society of San Diego's Director of Pathology, the Arizona Veterinary Diagnostic Lab, and the Phoenix Zoo veterinarian. The owner of the mules also contacted additional authorities including Dr. Robert Whitlock, Director of the Botulism Laboratory at the University of Pennsylvania.

The source of the botulism in the mules or the condor was never identified. As a precaution, the remains of proffered carcasses at feeding sites are now regularly removed from the area and buried. No further recommendations regarding the botulism issue appear warranted at this time.

West Nile Virus

West Nile Virus (WNV) is a disease which first appeared in the United States in 1999, and is caused by a flavivirus, similar to the yellow fever virus. Initially, people in Queens, New York, and birds at the Bronx Zoo became infected. The disease is generally spread by mosquitos, however it has also been shown that this disease can be transmitted from bird to bird without the need for an infected mosquito. The virus can infect (and be fatal to) birds, amphibians, and mammals; it is not host-specific. The WNV has now spread to 27 states, mostly east of the Mississippi River. According to Dickson Despommier, an authority on this disease at Columbia University, WNV is expected to spread to California by next year. He believes the disease is being spread by highway vehicles and trains, as well as by migrating birds (Despommier 2001; pers. comm. with Mike Small, 10 January 2001).

From a condor recovery perspective, WNV could be devastating. It has caused the death of at least 16 people and hundreds of thousands of corvids in the eastern United States. It has now been found in approximately 80 species of birds, including raptors.

Weather patterns often determine if a given pathogen succeeds or not. The southwestern United States appears to be an ideal climate for this disease with wet springs and long, hot, dry summers. The virus may be here shortly.

New World species of birds are especially vulnerable, apparently except for geese. Avian species from Europe, Africa, and Asia have some resistance. There is no vaccine. In the short term for the condor program, surveillance is key. Because WNV also attacks humans, the Center for Disease Control and Arizona State Health Department are on the alert for the virus to show up in Arizona.

Foot-and-Mouth Disease

Foot-and-mouth disease (FMD) is an acute, highly communicable disease chiefly confined to cloven-footed mammals. Cattle, swine, sheep, goats, bison, deer, and antelope are all susceptible in approximately the order listed. Horses are resistant to infection. This disease is not established in North America, Great Britain, and Australia where strict control and eradication measures are implemented. However, FMD is enzootic in certain parts of Europe, Asia, Africa, and South and Central America (Merck Veterinarian Manual 1967).

FMD is of concern for condors because if this disease were to become established in this area, the prey base of the condors could become significantly restricted. It is also possible that the condors themselves could spread the disease, as it is spread by contact with infected animals or contaminated fomites (abiotic carrier of disease). A rare outbreak of this disease occurred last year in Great Britain, or led to thousands of livestock being destroyed and millions of dollars in property losses. It is not currently a problem, but it has potential to become a very big problem in a short time.

ADMINISTRATION

Coordination Among Program Cooperators and Compliance with Commitments

The MOU established a framework for cooperation among the various state and federal agencies, tribal governments, and private organizations involved in the reintroduction of California condors in northern Arizona. Not all signature agencies/organizations had (or expected to have) the same level of involvement in the program at the time of signing. The agencies identified in the nonessential experimental rule as the “primary cooperators” with FWS and The Peregrine Fund were AGFD and BLM. These agencies were involved from the beginning stages of the program and have provided consistent support to the project. Primary coordination for this project for FWS was through the Arizona Ecological Services Office, with support from the Ventura Fish and Wildlife Office (FWS’s condor program coordinator). The AGFD hired a condor coordinator whose primary duties included working with the field crew, public outreach efforts, and coordination among all program partners. This proved to be a very important position, and while it remained unfilled during personnel changes, the vacancy was evident throughout the program. The BLM provided the environmental documentation, and biological and archeological clearance work necessary for establishing release sites and associated facilities, as well as significant logistical and coordination support (see sections “ESA Compliance” and “Project Costs”). As the releases of condors progressed and the bird’s activity patterns brought them more and more often to Grand Canyon National Park, it became evident that the Park had an ever increasing role in the reintroduction program. Though not originally identified as a primary cooperator, the Park has provided extensive logistical and program support, and even hired a biologist during the summer of 2001 to assist in monitoring the birds in the Park and to provide information about condors to Park visitors. The direct and active participation of AGFD,

BLM, and NPS in coordination with FWS and The Peregrine Fund has proved critical to the condor reintroduction program in northern Arizona.

Coordination among all cooperators has not been as consistent. The Forest Service identified deficiencies in communication regarding condor related activities with the Kaibab National Forest. And coordination with Native American tribes has at best, been ad hoc. Various management agencies identified that specific permits required for condor related activities under areas of their jurisdiction have not been applied for or issued to field personnel. Permits required for condor related activities include, NPS-Grand Canyon (and several NPS units in southern Utah), AGFD, Arizona State Land Department, FWS, and BLM. Special permits or other mechanisms are required if it is necessary for the field crew to enter tribal lands. In general, coordination among the cooperators occurred on an as-needed basis. This has not proved to be fully satisfactory.

The MOU was established in 1996 for a period of five years. It has now expired, though the agencies and organizations continue to coordinate and cooperate in the spirit of that MOU. In that the MOU has been an important vehicle for support of the condor reintroduction program, a new MOU should be developed. As the condor reintroduction program expands, it would be appropriate that several potential cooperators in a new MOU take a more active role in the program, including the Utah FWS Office, Utah Division of Natural Resources, Kaibab National Forest, and APHIS-Wildlife Services, and that there is closer coordination with others, including Navajo Nation, Hopi Nation, Havasupi Tribe, Hualapai Tribe, Kaibab Paiute Tribe, and Dixie National Forest. The MOU should clearly identify the expectations of each signature agency/organization of the program as well as each agency's/organization's contribution to or role in the program. For some agencies, simply identifying contact personnel or offices could facilitate resolving a field management issue. For example, cooperators can expedite issuance of permits; and perhaps the MOU could provide a mechanism to facilitate efficient fund transfers among program partners. Participation in the program through the MOU can provide a means of coordination and information to cooperators about the current status of the program. Renewed annual coordination meetings with all program cooperators may facilitate information exchange and better allow for evolving levels of participation by each cooperator as the condor reintroduction program progresses.

The "Arizona Condor Working Group" is comprised of those MOU cooperators involved in the active management of the program. To provide the greatest support to the program, this group needs to meet regularly and work to address issues before problems arise. Though all cooperators are welcome to participate on the working group, there must be active participation by those agencies that have special information needs for management decisions or actions. The working group is the appropriate forum to identify and prioritize new data needs (e.g., condor movement patterns and specific movement corridors) and determine how to participate/assist in collecting and/or compiling the data. The working group is also an appropriate forum to coordinate program funding opportunities and requests.

The MOU, with the “Implementation Agreement with Local Governments” and nonessential experimental rule, established various commitments to be carried out with the implementation of the condor reintroduction program. Primary among those commitments was that there were to be no regulated changes in land uses due to the presence of condors. No land use changes on account of condors have occurred on BLM or USFS administered lands. The BLM did report that certain accommodations for the condors (and those who come to view the condors) have been made (e.g., road grading, sign postings, restricting entry immediately surrounding the condor holding pens, and modifying certain open topped water storage tanks to protect condors), but not through any regulatory action or at additional cost or restrictions on permittees. At Grand Canyon National Park, action was taken to include provisions for protection of condors during construction activities, and a temporary closure of the stairs at Mather Point occurred while condors perched at the site for about three hours, until permitted hazing of the birds could be conducted. The AGFD reports that they are not aware of any changes in land use practices due to condors and that the implementation of the Federal rule had gone well, with program cooperators adhering to the letter and spirit of the commitments. There has been no infringement on private property rights.

Certain prescribed program activities did not occur or were delayed. The FWS outlined in the final rule a strategy to include a hunter education program in order to address the potential threat of lead poisoning by condors. This was to be initiated in the first two years of the reintroduction efforts in cooperation with AGFD, BLM, and USFS; it has not yet occurred, but should be revisited by program cooperators. The FWS had not fully adhered to the coordination/information requirements under the “Implementation Agreement with Local Governments.” The lack of regulatory or other problems associated with the condor reintroduction program reduced the priority (for FWS and local governments) for annual formal meetings to that of occasional phone calls and other conversations. Local government representatives and other parties of the Implementation Agreement could be invited to renewed annual MOU meetings to keep everyone up to date on the reintroduction program. Additionally, the stated objective of FWS to propose an expansion to the nonessential experimental area has been delayed (for a complete discussion of this issue see “Expansion of Nonessential Experimental 10(j) Population Area”).

Compliance of Federal Agencies with Sections 7(a)(1), 7(a)(2), and 7(a)(4) of the Endangered Species Act

As part of the five year review process, federal agencies within the range of the reintroduction of California condors in northern Arizona were asked the following questions regarding compliance with the ESA.

A. If the lands you manage are within the National Wildlife Refuge System or the National Park System, please answer the following questions. If the lands you manage are not within either of those systems, please go to B.

1. Reintroduction of California condors in Northern Arizona was done through the designation of a nonessential experimental population. Nonessential experimental populations located within National Wildlife Refuge System or National Park System lands are treated, for the purposes of section 7 of the Endangered Species Act, as if they are *threatened* species. Thus, for such populations, two provisions of section 7 would apply within such lands; section 7(a)(1), which requires all federal agencies to use their authorities to conserve listed species, and section 7(a)(2), which requires federal agencies to *consult* with the FWS on actions that may affect listed species. Have you been aware of these responsibilities under the Act since the nonessential experimental population was designated?

2. Please list and describe any actions you accomplished for the conservation of California condors under the requirements of section 7(a)(1).

3. Please list and describe any projects you implemented that required, with the results of, consultations conducted with the FWS under the requirements of section 7(a)(2).

B. If the lands you manage are outside of the National Wildlife Refuge System and the National Park System, please answer the following questions.

1. Reintroduction of California condors in Northern Arizona was done through the designation of a nonessential experimental population. Nonessential experimental populations located outside National Wildlife Refuge System or National Park System lands are treated, for the purposes of section 7 of the Endangered Species Act, as if they are *proposed* for listing. Thus, for such populations, two provisions of section 7 would apply outside such lands; section 7(a)(1), which requires all federal agencies to use their authorities to conserve listed species, and section 7(a)(4), which requires federal agencies to informally *confer* with the FWS on actions that are likely to jeopardize the continued existence of a proposed species. Have you been aware of these responsibilities under the Act since the nonessential experimental population was designated?

2. Please list and describe any actions you accomplished for the conservation of California condors under the requirements of section 7(a)(1).

3. Please list and describe any projects you implemented that required, with the results of, conferences conducted with the FWS under the requirements of section 7(a)(4).

The review received the following responses to the questions regarding section 7(a)(1) of the ESA, which requires all federal agencies to use their authorities to conserve listed species.

No responses were received from Glen Canyon National Recreation Area, the southwest Utah National Parks and Monuments; the USFS did not report any activities.

No activities were reported by the Arizona Strip Field Office of the BLM (see “Project Costs”).

The Southeast Utah Group of National Parks and Monuments reported that, aside from monitoring for condor presence during annual bird surveys and other field work, no other conservation actions have been identified or implemented.

The BLM reported that USDA Wildlife Services conducted their activities on the Arizona Strip in a manner to ensure that condors were protected. For example, Wildlife Service’s predator control activities have been closely coordinated with BLM, and certain areas near the release site on the Hurricane Rim have not been flown for aerial gunning of coyotes in order to avoid possible aerial conflict with condors. In addition, Wildlife Services uses only steel shot in its aerial gunning program, and they do not use traps, snares, or poisons on BLM lands on the Arizona Strip. Wildlife Services also collected coyote liver tissue samples which were analyzed for lead concentration (see “Wildlife Services Activities”).

Grand Canyon National Park reported several actions including:

- raptor-proofed power lines within the developed zone where condors frequently perch and roost;
- affixed perching and roosting deterrent device to the Orphan Mine tower to prevent condors from frequenting the mine area;
- provided a condor technician to aid in the monitoring of condors and to prevent human/condor interactions;
- developed a standard operating procedure to ensure the safety of NPS and The Peregrine Fund staff while hazing and monitoring condors;
- developed an observation record for the Fire and Aviation Program;
- developed guidelines for interdivisional and interagency use pertaining to management of condors within park boundaries;
- developed a response and protection protocol for construction contractors to follow should condors perch, roost, or forage at or near a construction site; and
- developed a protocol for the removal and relocation of wildlife road mortalities to ensure that condors are not feeding in areas of risk or hazards associated with roads.

The review received the following responses to the question(s) regarding section 7(a)(2) and 7(a)(4) of the ESA which requires federal agencies to consult with the FWS on actions that may affect listed species.

No responses were received from Glen Canyon National Recreation Area, the southwest Utah National Parks and Monuments, and the USFS.

The Arizona Strip Field Office of the BLM responded that it was aware of its responsibilities to confer and implied that that responsibility has been carried out informally. Specifically, the condor has been considered in consultations on an existing land use plan, routine road grading of the House Rock Valley Road, and it will be considered in development of a new land use plan. They stated that almost all of the determinations of effect have been “no effect.” The BLM stated that, in the future, they will take steps to better document those determinations with the proper contact for condor-related issues. They also mentioned the fact that the new Parashant National Monument is being jointly managed by both BLM and the NPS (as condors within National Park System administered lands receive protection as a threatened species under 10(j) of the ESA.

The Southeast Utah Group of National Parks and Monuments reported that they are aware of NPS responsibilities under section 7 of the Act. They stated the condor will be included, as appropriate, in consultations on actions that may affect the species. They reported that no projects have been undertaken that have required section 7 consultation for the condor.

Grand Canyon National Park reported that they are fully aware that condors of this nonessential experimental population are treated as a threatened species while in park boundaries. Condors were considered in consultations for several projects including the following that were reported by the Park:

- Greenway Trail
- Desert View Housing
- Grand Canyon National Park Mule Barn Construction
- Vista Fire
- Outlet Fire
- Tower Fire

During the review, Grand Canyon National Park also recognized a need to plan for future condor activities. For example, consideration should be given to the question of what management should occur if condors nest in a high use visitor area.

In late 1999 and early 2000, a formal section 7 consultation (2-21-97-F-085) was conducted by Grand Canyon National Park and the FWS Arizona Ecological Services Office regarding new flight rules for commercial air tours in the vicinity of the Park. That consultation resulted in a 26 January 2000, biological opinion addressing the effects of the proposal on, among other species, the California condor. That biological opinion concluded that the proposed project was not likely

to jeopardize the continued existence of the California condor. The biological opinion included an incidental take statement which anticipated take of condors in the form of harassment or accidental displacement when startled individuals are flushed from a perch site by the proposed low-level flights, and take in the form of one individual killed in five years from collisions. The incidental take statement included one reasonable and prudent measure and several terms and conditions intended to minimize the anticipated take of California condors.

On 26 December 2001, a biological opinion (2-21-96-F-368) was issued by the FWS Arizona Ecological Services Office to the Environmental Protection Agency regarding the effects of the Proposed Navajo Nation Water Quality Standards on, among other species, the California condor. Due to the nonessential experimental designation, the condor was considered as a proposed species during the formal section 7 consultation. The resulting biological opinion concluded that the proposed action was not likely to jeopardize the continued existence of the condor. Incidental take was not anticipated, and there were no conservation recommendations specific to the condor in the biological opinion.

Because the response to the section 7 questions was uneven, it may be appropriate for FWS to issue a memorandum to the federal agency units which clearly outlines responsibilities and identifies appropriate FWS contacts. In addition, for example, the memorandum could include a description of the determinations of effect that are appropriate for each of the units (including NPS lands jointly or otherwise managed by BLM), and suggestions of general protective measures that have been developed through consideration of other projects. Additional items may be relevant and appropriate for inclusion in the recommended memorandum.

Unofficial Cooperator Initiatives

Assistance provided to the program by parties outside of the official cooperators listed in the reintroduction program MOU and the Implementation Agreement has been invaluable. Foremost, we acknowledge and thank Maggie Sacher, owner of Vermilion Cliffs Lodge, for her commitment and countless quiet contributions to the condor recovery program in northern Arizona. We recognize the importance of contributors to The Peregrine Fund; in addition to supporting The Peregrine Fund's captive rearing efforts, they continue to make possible transport, release, and field monitoring of condors in northern Arizona and southern Utah. Norm Freeman, director of "Elemental Technologies, Incorporated" of Phoenix, Arizona, has repeatedly provided flight services for field personnel searching for condors and has transported condors in need of medical attention. He is presently underwriting and overseeing the development of data recording devices that promise to provide immeasurable benefit for scientific and management data collection for condor recovery in Arizona and throughout its range. Grand Canyon Trust provided assistance in the public events surrounding the initial release of condors in Arizona. Salt River Project, Phoenix, Arizona, and Papillon Grand Canyon Helicopters, Tusayan, Arizona, have responded to requests to airlift condors and personnel to the release site. As a local promotional effort, the U.S. Post Master at Page, Arizona, contributed time and resources to develop and promote a California condor postal cancellation stamp in conjunction with the issuance of a California condor stamp and anniversaries of the condor

release in Arizona. The Steven H. Rich Family and Ira Schoppmann Family, local landowners and ranchers, have provided accommodations for the field crew and water and sewage disposal hookups, biologists and public access across their land for field monitoring and public viewing of condors, and have assisted in developing program acceptance among locals. This is an incomplete list of the gracious support local residents, business owners, and elected representatives have provided to the condor program. However, the review team recognizes that local efforts and contributors have not only assisted greatly in condor recovery in the Southwest, but they are by a credible measure *the success* of the program. Their voluntary acceptance of, and exceptional commitment to the condor recovery program demonstrate a commendable natural resource ethic and stewardship responsibility for the biological resources of the area.

Public Acceptance and Interest

Levels of public acceptance of the condor reintroduction seem to vary among population segments and geographic area. Levels of enthusiasm and criticism have changed over the course of the reintroduction program. Most respondents to review team inquiries indicated an overwhelming and almost uniform acceptance of the program with few exceptions.

During the reintroduction planning and Federal rule development, the majority of commenters were supportive of the reintroduction effort. However, individuals from northern Arizona and south-central Utah communities (“locals”) with historically or traditionally resource-based economies expressed vocal distrust of the Federal government, expressly criticizing FWS’s intentions and lack of specific commitment to accommodating their concerns in the special rule. The FWS withdrew from its initially proposed schedule for the transport and release of condors until it could identify a consortium of local businesses and elected officials that could negotiate special rules for management of the condors within and outside of the nonessential experimental area. Once these concerns were met, local opinion leaders agreed to an at least tacit acceptance of the condors. These county and local leaders today express that “they don’t have any opposition to the release of the condor as long as [they] are protected by the 10(j) area.”¹ Leaders and governments on the periphery or outside of the 10(j) area continue to emphasize that expansion of the 10(j) area is a requirement for their continued acceptance of the program.

Over the course of the reintroduction, local publics have become increasingly accepting and supportive of the program due to increased understanding of the regulatory relief provided by 10(j) designation, program agencies’ improved communications with local leaders, The Peregrine Fund personnel interactions within local communities, local presentations provided by principal cooperator agencies, and locals’ exposure to condor-watcher tourists and project supporters. However, a local land owner, though stating local support for condor reintroduction success, did take issue with the “urban beliefs” of a few condor field team members. There are apparently still some concerns that the condor reintroduction could be used to limit private property and water rights. One individual expressed that an increase in bird watcher tourists, field crews, and

¹Washington County Commissioners (Aldred, Gardner, Eardley). Correspondence of 26 November 2001.

release event attendance in the area is perceived as diminishing their traditional enjoyment of House Rock Valley for its remote characteristics.

Landowners and ranchers in the immediate area of the release were contacted well before the first releases so that we could understand and attempt to address their concerns. Most of the grazing operators were concerned that federal agencies from whom they lease grazing privileges would change the way they were permitted to run cattle on the land to accommodate the condors. For this reason, the FWS designated an extensive area where condors were to be released as “nonessential experimental.” This designation guarantees that land management agencies (e.g., BLM; USFS) need not change land uses to accommodate the condors (except on National Park System or National Wildlife System lands). Additionally, some landowners and ranchers were concerned that biologists and bird watchers/tourists would leave cattle gates open, trespass, or get vehicles stuck on their land in pursuit of birds. The condor biologist staff operating in the area and local ranchers and landowners have become well acquainted, assist each other with monitoring people in the area, keeping roads in repair, and even identifying livestock in trouble. A livestock operator was concerned that bird watchers drawn to interpretive panels constructed below the Vermilion Cliffs release site would damage ground cover with vehicle traffic in the viewing area; The Peregrine Fund and BLM staff placed boulders in the area to limit vehicle access to land outside of the kiosk area. Because the immediately affected local ranchers and landowners were identified early in the program planning and had their concerns heard and met early in the process, we’ve been privileged in having them as program supporters.

Where/when people and condors meet too closely, there can be problems, both for the condors and humans (or at least their property). As scavengers, condors as a group have been successful for eons at locating food by being curious and seeking out locations of activity (e.g., coyote, saber-tooth cat, or raven assemblages; herd [mastodon or cattle] movements; water holes). Human congregations are active; and curious condors approach and can mix. This curiosity has brought condors to back-country campsites where they have ripped into tents and ice chests. Hopefully there is no food reward for birds that approach humans. Fishing guides, NPS rangers, and hotel and tourism professions in the area have all learned how to direct their clientele to maintain a respectful distance from condors (for the sake of birds and human property). One hiking/fishing guide and party sought compensation from The Peregrine Fund and FWS for equipment damaged by condors in Grand Canyon National Park. Under federal tort claims law, claimants entering an area of presumed wilderness and wildlife presence assume such risks, particularly if federal agencies are not found to be at fault in such events.



Participating agencies have given hundreds of presentations to tourists, schools, local governments, elder hostels, and civic, industry and environmental organizations. There were daily condor presentations during the summer months at Grand Canyon National Park. Requests for such presentations and enthusiasm of audiences continue to be high. Grand Canyon National Park visitor correspondence frequently lists condor viewing as a

highlight. Public attendance at condor release events has diminished, yet in December 2000, there were over 100 attendees, some having traveled from as far away as California and Wisconsin for the expressed reason of viewing the event (Figures 9a,b,c). Visitors stated satisfaction at release events and viewing at the Grand Canyon continues to be high.



Figures 9a,b,c. Viewing the condor release at Vermilion Cliffs , 29 Dec. 2000. Photos by: Bruce Palmer.

Economic Opportunities

Aside from local ranchers, most of the local business owners rely entirely or largely on tourism (Grand Canyon viewers and hikers, river rafters, or trout anglers). Many of these business owners and employees understand or appreciate the condors as an additional attraction for customers. Some people come to the area (and eat, lodge, buy gas, etc.) with condor viewing as their principle destination, others extend an already scheduled trip so that they can see condors, and others are persuaded to come to the area because of the “value added” benefit condors provide to tourism in the area. Even business owners (hotel, restaurant, and gas station operators, tourism boards and chambers of commerce) such as an auto mechanic from Fredonia, Arizona, and a Kanab, Utah, coffee shop owner have reported that they have customers who have done business with them (or their members) as the result of a condor destination vacation or a trip extended to accommodate condor viewing.

Law Enforcement

On 11 March 1999, condor # 124 was shot and killed within Grand Canyon National Park. The defendant in this case, Ronald Tenney Owens (age 24), turned himself in to law enforcement authorities, and was ultimately convicted on one count of violation of the ESA, and one count of violating park regulations restricting the possession and discharge of firearms. Owens was sentenced to one year of supervised probation; 200-hours community service; and payment of \$3,200 in fines. This case is unique in that it marked the first successful prosecution under the ESA of a violation occurring within Grand Canyon National Park.

This shooting, as well as the condor lead poisoning event in the summer of 2000, also brought to light a number of deficiencies in the condor interagency MOU and resultant relationship between the FWS, NPS, AGFD, and personnel from The Peregrine Fund. Difficulties arose regarding various issues, including: chain of evidence; responsiveness of the forensic laboratory; investigation confidentiality; management of surviving condors; and law enforcement authorities.

Land Management Agency Law Enforcement Authorities

Clarification regarding jurisdictions and responsibilities of the major land management agencies involved in the reintroduction process include the following:

U.S. Fish and Wildlife Service

By statute, Special Agents of the FWS retain and may assert primary criminal jurisdiction over violations of federal wildlife law throughout the United States, generally without regard to other jurisdictions, including on Tribal lands. These agents may assert their authority with or without the concurrence of another federal agency that may also have jurisdiction (such as the NPS, BLM, or USFS). Similarly, they may assert their authority with or without the concurrence of any other state or local agency, and can supercede the authority of the state or local government where that sovereign's laws or activities conflict with federal law or interfere with lawful FWS activities.

In all cases, Special Agents of the FWS have and may assert primary jurisdiction over violations of the ESA, Lacey Act, and the Migratory Bird Treaty Act which may relate to the reintroduction of California condors.

Unless otherwise indicated in a local agreement, other federal agencies have a responsibility to confer with FWS before taking enforcement action for crimes otherwise under the primary jurisdiction of FWS.

National Park Service

Under the Organic Act (16 USC 1) and the General Authorities Act (16 USC 1a-6), NPS law enforcement personnel (Special Agents and U.S. Park Rangers) are empowered to take enforcement action (up to and including arrest) for violations of any federal law that occurs within the National Park System. Significantly, this investigative and other enforcement authority extends beyond the boundaries of the parks so long as the violation(s) being investigated occurred within the National Park System. The broad nature and scope of laws enforceable by NPS officers is unique among federal land management and resource protection agencies.

Included among the laws and regulations enforceable by NPS officers are NPS regulations at 36 CFR Chapter 1, including the regulations that specifically protect wildlife within a park (36 CFR 2.1 and 2.2). Further, NPS law enforcement personnel are empowered to investigate violations of any federal wildlife law (e.g., Lacey Act, Migratory Bird Treaty Act, Bald and Golden Eagle Protection Act, or the ESA) that occurs within the boundaries of a National Park System unit. In the case of the latter, FWS Special Agents have the authority to assume the lead investigative role in cases involving a violation of federal wildlife laws, since such laws are applicable nationwide. Where the violation of such a nationally applicable federal wildlife law occurs in a park, NPS and FWS may share this role, as spelled out in agreements or other written understandings.

Within NPS, sites governed by either proprietary or concurrent criminal jurisdiction, state wildlife officers may concurrently exercise state law enforcement authority within those park areas, enforcing their own non-conflicting state laws. That is, these officers may independently enforce (and investigate violations of) those state wildlife laws that do not conflict with superceding federal wildlife laws, regulations, and even policies, with concurrence from the State Attorney General. Absent a local agreement to the contrary, these officers do not need permission or authorization from NPS to engage in their own law enforcement activities, so long as their enforcement (or other) activities do not conflict with federal laws or other authorized federal activities of any kind.

The legal requirement that state wildlife enforcement and management activities not contradict or interfere with federal wildlife enforcement and management activities is uniquely at issue within national park sites. This potential for conflict arises directly from the statutory (and judicially reiterated) NPS mandate to protect and preserve wildlife, and to actively manage park resources in a manner consistent with those goals. This particular mandate and the related potential for conflict with state law enforcement and wildlife management activities gives rise to heightened importance for the establishment of clearly articulated and legally supportable agreements between parks and state wildlife management agencies.

Within NPS, sites under the exclusive jurisdiction of the Federal Government (e.g., Yellowstone, Mesa Verde NP; not Grand Canyon NP), state officials will generally have no law enforcement (or other) jurisdiction, and may not engage in enforcement or regulatory activities of any kind. In these areas, either NPS or FWS (and technically, the FBI) must assume the lead and act as the sole enforcement authority for criminal wildlife laws.

In practice within most NPS sites, NPS law enforcement officers generally assume the lead and are the primary enforcement entity for violations of wildlife laws within those sites.

Bureau of Land Management and U.S. Forest Service

As suggested above, law enforcement and resource management authorities and responsibilities delegated to both BLM and USFS are somewhat more limited than those authorities and responsibilities delegated to FWS or NPS. Law enforcement authorities of personnel employed by BLM and USFS are specifically limited by statute, and generally encompass enforcement of regulations promulgated by those agencies respectively, as well as specific criminal statutes relating to those resources under the primary jurisdiction of those agencies (e.g., minerals, horses and burros, timber). Also, in the case of the USFS, specific authority to enforce federal drug laws has been delegated to their law enforcement personnel (to help combat the cultivation or production of controlled substances on USFS lands). Consequently, responsibility for the enforcement of wildlife laws on both BLM and USFS lands generally falls upon state wildlife officers, to the extent that they do not interfere with or conflict with specific federal laws (including those under the jurisdiction of FWS) as advised by the State Attorney General. Similarly, wildlife management efforts are generally coordinated by the state, to the extent that they do not conflict with or interfere with the primary mission and activities of either BLM or USFS.

Federal Laws

Several federal laws that pertain to the recovery of the California condor include:

Airborne Hunting Statute, 16 U.S.C. 742j-1.
Endangered Species Act, 16, U.S.C. 1531-1544.
Fish and Wildlife Conservation Act, 16, U.S.C. 2901-2012.
Fish and Wildlife Coordination Act, 16, U.S.C. 661-667d.
Lacey Act and the Lacey Act Amendment of 1981, 16 U.S.C. 3371-3378.
Migratory Bird Treaty Act, 16 U.S.C. 715-715s.

Application of these laws must be considered when determining effects of expanding versus not expanding the nonessential experimental area as well as during law enforcement investigations.

The five-year review of the California condor reintroduction program in northern Arizona recommends that the partners in the program review the law enforcement protocols and include coordination of this review as a priority for the next interagency working group meeting in order to ensure complete and timely cooperation pertaining to incidents involving condors. This review of law enforcement protocols may result in: 1) revised protocols; 2) field forensic training for personnel; 3) improved coordination among law enforcement personnel, field biologist, and public affairs personnel, and the development of a “contacts” list; 4) defining a balance between the need to manage surviving condors and compromising an investigation; and 5) better communications and response from the FWS Forensic Laboratory.

Aviation

Air safety is of critical importance to the condor recovery program. As the Grand Canyon Ecoregion serves as a high-density tourist area for sight-seeing flights, every precaution to eliminate near misses and collisions with tour and administrative flights must be addressed.

Over areas of designated wilderness on BLM lands, aircraft are “advised” to be 2,000 feet above the ground level, but this is only advisory. Over Grand Canyon National Park, air tours and overflights have been a concern for years primarily because of noise related issues, and the Grand Canyon National Park Special Flight Rules Area has been established to regulate overflights up to 18,000 feet above sea level. The Special Flight Rules Area is focused on the National Park, but extends somewhat over adjacent land ownerships. Aircraft flight corridors and flight free zones have been established. The air tour industry is very active in the Grand Canyon area, but with the rules regulating how they can operate and appropriate awareness of the presence of condors, they pose little risk for the condors. In the five years of the condor reintroduction program there have been no reported condor strikes or near misses by air-tour operators. In some cases the condors have become one more interesting resource the air tour pilots can mention to their customers.

Agency aircraft, when conducting agency missions such as fire fighting, search and rescue, or game surveys, may fly relatively close to the ground and along canyon rims. At times, due to how and where these aircraft operate, there is a potential for conflict between the condors and these aircraft. Special care needs to be taken by agency personnel to be aware of the possibility that condors may be in the area. Several flight-path diversions of Grand Canyon National Park administrative helicopter flights have occurred due to the presence of condors in the air space.

Grand Canyon National Park has developed an observation record for the Fire and Aviation Program that records near misses and flight path diversions. Additional coordination protocols for helicopter activities in the Park could facilitate information exchange regarding the location of condors. A better system of recording condor activity and coordination with the air tour industry could be implemented to ensure not only the safety of the birds, but also of the aircraft.

On the Arizona Strip in June of 1998, while two BLM specialists were attempting to secure a cultural clearance for a new proposed California condor release site on the Hurricane Rim near Diamond Butte, two very low and fast-flying U.S. Air Force F-16s roared overhead. It turned out that the initially proposed site was directly under two existing military training routes (IR 126 and IR 266). The condor release site location was moved eight miles to the north. This incident called attention to the fact that a number of military aviation training routes exists in northern Arizona and southern Utah.

It is recommended that the Air Force be advised of all existing and future condor release sites, and possibly other condor concentration sites, in order to have these locations marked as hazards on military training route maps (specifically Department of Defense’s flight planning publication AP/1B which is published twice annually).

Airborne Hunting Statute 16 USC 742j-1

Prohibitions in this act that pertain to the condors include the use of “aircraft to harass any bird, to shoot or attempt to shoot any bird. Penalties include \$5,000 fine and/or 1 year in jail. Forfeiture of all birds, fish or other animals shot or captured contrary to the provisions of this section... and all guns, aircraft, and other equipment used to aid in the shooting, capturing or harassing shall be subject to forfeiture to the United States.”

There has been one incident regarding the harassment of condors by aircraft which resulted in a fine to a helicopter tour operator. In addition, military or civilian aircraft have either flown low near the condors or been spotted flying low over designated BLM wilderness areas and NPS administered areas. However, the observers have not always secured information necessary to identify the aircraft. It is further recommended that all condor field personnel report all potential condor/aviation incidents and be trained to record aircraft identification numbers, to be knowledgeable of wilderness or special land management aviation guidelines, and other pertinent information. A review with air tour operators should be conducted on an annual basis to ensure compliance with the Airborne Hunting Statute and potential violation of the ESA.

USDA APHIS-Wildlife Service’s Activities

Periodically on lands administered by the BLM on the Arizona Strip (in Arizona north of the Colorado River), USDA APHIS-Wildlife Services has conducted preventive wildlife damage management. This work has consisted of coyote population suppression through the use of aerial gunning, chiefly in response to either predictable predator-caused livestock damage in late winter or to improve rates of pronghorn fawn survival in the spring. When discussing condor reintroduction efforts, predator control activities by Wildlife Services on the Arizona Strip has often been perceived as an issue (and was raised as part of the original 10(j) rule). Due to these concerns, Wildlife Services activities were carefully evaluated as part of the five-year review of the condor reintroduction program in northern Arizona. However, during the five-year period of actual experience, from December 1996, when the condors were reintroduced to January 2002, no conflicts between condors and Wildlife Services activities on BLM administered public lands on the Arizona Strip, or at other locations have been noted.

It is believed that all such activities on the BLM lands in the last five years have been in accordance with the national MOU between BLM and APHIS-Wildlife Services and the local work plan, as well as having been coordinated with the Arizona Game and Fish Department. Wildlife Services is not a party to the existing condor reintroduction MOU.

Since the first California condors were released in 1996, Wildlife Services has consistently contacted BLM prior to initiating their planned work on the Arizona Strip in order to accommodate BLM resource and safety management concerns. Special attention has been given to the condor reintroduction program. Wildlife Services personnel have also contacted The Peregrine Fund each time to ensure the condors were adequately protected.

The Wildlife Services aircraft, typically fixed-wing, used in aerial gunning fly close to the ground. Typically aerial gunning works best and is only applied in relatively large, flat, open, treeless expanses. It is not attempted in areas with significantly rough terrain or heavy vegetative cover. Certain areas near the condor release site on the Hurricane Rim were not flown by Wildlife Services in order to avoid any possible aerial conflict with the condors.

In addition, as the Wildlife Services aerial gunning program on the Arizona Strip employs only steel pellet shot fired from shotguns aboard the aerial platforms, there is no risk of lead poisoning from the aerial program. From the standpoint of protection of non-target species including the condor, it is felt that shooting is always far preferable to traps, snares, poisons, or M-44's because the human holding the gun can decide whether or not to pull the trigger. Inanimate devices such as those listed above do not make decisions; however, it should also be added that none of these devices are presently authorized for use on BLM public lands on the Arizona Strip.

Wildlife Services also calls and shoots by rifle some predators, chiefly coyotes, from the ground. While the rifle bullets used vary, they are generally small and fast copper-jacketed hollow point bullets that contain lead. (Predator calling and shooting by the public also occurs on BLM administered lands, usually during the winter months; it is believed that the kinds of bullets used by the public varies widely). A number of factors would influence the degree to which bullet or bullet fragments might be retained in coyote carcasses.

In 1999, because coyotes are scavengers as are condors and at BLM's urging, Wildlife Services, at no cost to BLM, had seven samples of coyote liver tissues collected on the Arizona Strip west of Kanab Creek analyzed for lead. Six of the seven had no detectable levels of liver lead concentration; one sample had 0.52 ppm (52 ug/dl). It would be good to do future additional sampling for lead on the Arizona Strip, perhaps at different times of the year.

The Grand Canyon-Parashant and the Vermilion Cliffs National Monuments were recently designated on the Arizona Strip. The Vermilion Cliffs National Monument in particular is often used by the condors and contains the primary release site. According to current BLM policy, Wildlife Services activities within the Monuments are limited to the taking of individual coyotes within the immediate vicinity after verified livestock kills, and no prophylactic measures to control coyotes are allowed. This policy essentially eliminates aerial gunning of coyotes within the Monuments.

There have also been additional efforts by Wildlife Services in the 10(j) area outside the Arizona Strip. For example, Wildlife Services has conducted aerial gunning operations for coyotes in the spring for three consecutive years north of Flagstaff in order to increase pronghorn fawn survival rates. Wildlife Services recently took a couple of problem mountain lions in the Mt. Elden area north of Flagstaff. To date, these areas are rarely used by the condors, some of the previous observations apply, and no condor concerns have been noted.

Efforts by Wildlife Services outside the existing 10(j) area but where condors may be found become more problematic. Several years ago in California, a condor was reportedly killed by a

M-44 device. Apparently two M-44 devices were set out approximately 30 feet apart. The first one attracted and killed a coyote, but the coyote moved close to the second device before it died. The condor was attracted to the body of the dead coyote and was killed by the second M-44. In Utah along the Green River and outside the 10(j) area, an environmental organization attempted to use the condors as a reason to prevent Wildlife Services from using M-44 devices.

Recognizing that Wildlife Services will continue to conduct predator control work where the reintroduced condors will be living, and that good communications between the Wildlife Services and the condor reintroduction program is essential, it is recommended that Wildlife Services be invited to become a condor program cooperators and party to any revised MOU.

Expansion of the Nonessential Experimental 10(j) Population Area

When the 10(j) rule was published in the Federal Register in October 1996 (61 FR 54044-54059), it was believed by most specialists involved that the designated area would be large enough to adequately contain the condor population. However, the discussion of issues within the Federal rule (Issue and Response 14; 61 FR 54055) acknowledged that should the designated area prove to be inadequate, FWS has the option to revise the rule to increase the size or change the configuration of the designated area. Also, as established in the "Implementation Agreement" with a coalition of county and local governments, FWS will relocate any California condors that move outside the experimental population area. By late 1996 (as the 10(j) rule was being finalized) the management advantages of the condor's nonessential experimental designation were quite apparent to community leaders in southern Utah who at the same time were frustrated with endangered species issues involving other listed species. The 10(j) designation was vital for local acceptance of the condor reintroduction program, making the release of an endangered species politically acceptable.

In July 1998, was the first known instance of a condor exceeding the designated nonessential experimental boundaries; within the next year there were several other instances to both the north and east outside the 10(j) area. The birds returned to the release area within a few days (see "Movements"). Additionally, when the second release site was proposed on the Hurricane Cliffs in 1998, only about 30 miles from St. George, Utah, and I-15 (the 10(j) boundary), the concern was raised that the birds would readily exceed the 10(j) boundary in Washington County, Utah. In order to allow the second release site to become politically feasible, FWS agreed that the 10(j) area would be proposed for expansion to include all of Utah. The intent of FWS and most cooperators is and has been since about 1997-98 to expand the existing nonessential experimental designation. However, even through the California Condor Recovery Team had twice recommended this expansion, it has been delayed due to various reasons (including FWS personnel changes, and unresolved efforts for assistance in completing the required environmental documentation prior to publication of the proposed rule).

While the condor reintroduction effort overall is working well, the delay by FWS to expand the 10(j) area was noted in several of the evaluation letters received, including those by two primary cooperators (AGFD and BLM), as well as by the Washington County Commission.

Because California condors released in northern Arizona have exceeded the nonessential experimental area by flying to Flaming Gorge, Wyoming; several points in central and western Utah; Grand Junction, Colorado; and, most recently, to Parker, Arizona (see "Movements"), expansion of the 10(j) area should include all of Arizona, Utah, Colorado, and at least a portion of Wyoming. In addition, while the condors in the Grand Canyon Ecosystem have not yet flown to New Mexico, the 10(j) area should also be expanded to include New Mexico in anticipation of wide-ranging condor flights following topographic features connecting an increasing Arizona population with New Mexico, and because New Mexico is being seriously considered as a condor release site to expand the southwestern condor population.

It is strongly recommended that the existing California condor nonessential experimental population area be broadly expanded as soon as possible. There is currently political support for this expansion within the State of Utah. The 10(j) expansion could be accomplished to include all five states in one Federal rule-making process, with measurable progress before the end of Fiscal Year 2002. However, if there is opposition to the expansion in certain areas which would significantly delay expanding the 10(j) area where immediately needed, then some commenters recommended FWS should secure the expansion of the 10(j) area in the states where it is possible to do so.

Critics of the nonessential experimental designation point out that condors inside the 10(j) area receive a reduced level of protection under the ESA. In practice, condor management is little affected by many existing land uses, and what may have been lost in regulatory application is more than made up for in positive acceptance and cooperation. Condors in northern Arizona spend a large proportion of time on National Park System lands where there is a higher level of protection under the 10(j) designation. In addition, during the five years of this reintroduction program, the lack of regulatory controls has not been demonstrated to be detrimental to the condor population. A very strong redeeming value of the condor program is that, by applying the 10(j) designation, the program in Arizona and Utah has only been used to save the condors, and not to advance (or be perceived to advance) other agendas. As condors range beyond the 10(j) boundary, there remains the risk of inappropriate application of regulatory issues.

It should be noted that the recommended broad expansion of the nonessential experimental area does not expand to the west where it may bring the condors from the southwest population into contact with the fully protected free-flying population in California. Maintaining geographically separate populations is required for an ESA 10(j) designation. While a portion of southern Nevada south and east of I-15 and US 95 is included in the existing experimental area, either a very limited or no expansion is suggested in Nevada.

Project Costs

Many of the personnel costs reported by agencies for the condor reintroduction program were provided as estimates. Often, the added workload associated with condors was generally absorbed into existing positions, with little or no increase in actual incurred costs. Nonetheless, the time allocated to the condor program by each agency reflects real costs.

No responses concerning any costs incurred due to condors were received from Glen Canyon National Recreation Area, the southwest Utah National Parks and Monuments, and USFS. The Southeast Utah Group of National Parks and Monuments reported that no additional funds have been spent in response to condor issues.

The AGFD reported the following expenditures through 1 December 2001:

Condor coordinator supported by Section 6 (75%) and AZ match (25%)	\$189,506 ¹
Condor coordinator supported by Heritage Fund	\$12,000
Nongame specialist supported by Heritage Fund (total of 0.93 FTE)	\$40,700
Nongame birds program manager supported by Pittman-Robertson funds	\$10,000
Chief of nongame and endangered wildlife supported by Arizona Nongame Wildlife Checkoff Fund	\$5,000
Other Department personnel (e.g., law enforcement and public outreach) supported by State Game and Fish funds and Heritage Fund	\$10,000
Total	\$267,206

¹ FWS grants to states under section 6 of the ESA provided 75% of funding.

The BLM Arizona Strip Field Office reported the following expenditures:

Wildlife biologist (5 years @ 20% FTE per year)	\$50,000
Transport of birds from captive rearing facilities (\$5,000/yr)	\$25,000
BLM aircraft from the National Interagency Fire Center for transport	NFR
Travel attending meetings and workshops	\$10,000
Ceremony for first release	\$10,000
Installation of informational kiosks	\$8,500
Condor brochures	\$2,500
Radios (three) for The Peregrine Fund	\$2,800
Installation of "Bird Balls" in water tanks	\$10,850
Installation of two Remote Automated Weather Stations (RAWS) atop Vermilion Cliffs	\$30,000
Annual maintenance of two RAWS weather stations	\$15,000
Total (conservative estimate)	\$164,650

The FWS reported the following expenditures on the condor recovery program in northern Arizona for years 1995-2001 from Field, Regional, and Washington offices based on existing FTEs (does not include consultation or law enforcement activities):

Arizona Ecological Services Office total	2.18 FTE
Region 1 total	1.03 FTE
Region 2 total	0.12 FTE
Region 6 total	0.13 FTE

Washington Office total	0.05 FTE
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Total	3.51 FTE ²
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² FWS funding under ESA section 6 grants to states, and congressional appropriations are included under A GFD and The Peregrine Fund, respectively.

Grand Canyon National Park reported the following expenditures:

Condor technician supported by Grand Canyon National Park Foundation and Grand Canyon Association funds	\$39,000
Trailer rental space for The Peregrine Fund supported by Grand Canyon National Park Fee Demo (20%) funds	\$3,000
Travel for a certified radiation officer to assist in affixing deterrents to the Orphan Mine tower structure	\$3,000
Wildlife biologist and wildlife program manager	\$28,000
Total estimated trough FY 2002	\$78,000

Jacob Lake Inn reported the following expenditures:

Space for living accommodations for The Peregrine Fund monitoring personnel	NFR
Water and sewage disposal hookups	NFR
Horse killed when a news helicopter panicked it during early publicity	\$2,200
Lost isolation and privacy	NFR
Travel to testify in favor of reintroduction	\$500
Total	\$2,700

Arizona Public Service utility company reported the following expenditures:

Installation of raptor protection devices on utility lines and poles	\$32,939
Total	\$32,939

The Peregrine Fund reported the following expenditures:

Operating expenses for fiscal years 1993 through 2001 for condor reintroduction program in northern Arizona	\$4,486,242 ³
Total	\$4,486,242

³ FWS pass through of congressionally appropriated funds approximately \$2,817,000

FTE = full time equivalent

NFR = no monetary figure reported

Research Needs

It is critical that the ecological aspects of the condor recovery efforts be given high priority. It is not merely enough to “preserve” the species--we must examine and collect the appropriate data on distribution, abundance, and ecological relationships of the California condor. We must ensure that survival, reproduction, and recruitment are stable in order to reach a long-term goal of a viable, self-sustaining population of condors in the wild.

On the Colorado Plateau, there are many information needs pertaining to the biology of the condor. Major research endeavors require a detailed study plan and careful experimental design to obtain meaningful results. Research priorities and expenditure of limited financial resources and field biologist time must be determined in coordination with local information needs and overall condor recovery program issues. The next five years could focus on obtaining various types of scientific information, with an emphasis on that data necessary to make informed management decisions. The Arizona Working Group and California Condor Recovery Team should be included in prioritizing research needs and approaches. The current gap in data that could be addressed includes the following:

- Collect information on bird flight corridors, activity areas and flight elevation. This can be achieved through extensive use of satellite telemetry, GPS data recorders, and traditional telemetry devices.
- Collect information on prey base distribution, seasonality, cause of death, and abundance.
- Assess toxicity of copper-jacketed bullets; determine toxicity levels by analyzing tissue sample of non-target scavengers. Assess exposure potential and pathways of lead in the environment.
- Behavioral information that could be useful as the reintroduction expands includes: pair bond formation, flock social structure and dominance hierarchy, and dispersal and foraging patterns.
- Collect habitat use information: nesting, roosting, and perching preference.
- Collect information on interspecies relationships (turkey vultures, zone-tail hawks, peregrine falcons, golden eagles).
- Document potential nest-predator interactions (e.g., ravens, coyotes, ringtails).
- Collect all nest site information (e.g., cave/ledge length, width, aspect).

- In relation to aircraft overflights and condors, collect data on the following:
 - Determine the general flight corridors used by condors.
 - Aircraft/animal relationships.
 - Define bird responses to overflights.
 - Tolerance of condors to overflights.
 - Biotic factors.
 - Behavioral responses.
 - Effects of disturbance on habitat use.
 - Duration of animal responses to aircraft.
 - Long-term or large-scale effects.
 - Determine how aircraft are perceived.

- Data should also be collected regarding impacts from recreational activities:
 - Define responses to recreational use on animal physiology, sound and hearing.
 - Tolerance to recreation.
 - Biotic factors.
 - Behavioral responses.
 - Effects of disturbance on habitat use.
 - Duration of animal responses to recreational use.
 - Long-term or large-scale effects.

Accomplishment of Recovery Tasks

The recovery strategy for the California condor is to focus on: 1) increasing reproduction in captivity to provide condors for release; 2) releasing condors to the wild (to establish two geographically separate, self-sustaining, free-flying condor populations); 3) minimizing condor mortality factors; 4) maintaining habitat for condor recovery; and 5) implementing condor information and education programs (FWS 1996). With the reintroduction of California condors in northern Arizona, number 2 has been initiated. As discussed in several sections throughout this report, a variety of actions associated with the reintroduction of condors in northern Arizona have implemented numbers 3 and 5.

The recovery outline of the recovery plan includes several tasks to be completed or implemented. The following specific tasks from that outline have been accomplished with the reintroduction of condors in northern Arizona.

2. Reintroduce California Condors to the Wild
 24. Following the procedures outlined in tasks 21 through 23, implement releases of California condors outside California.
 241. Release California condors in northern Arizona.

4. Minimize Mortality Factors in the Natural Environment

45. Monitor contaminant levels in California condors.
5. Implement Information and Education Programs on Condor Habitat Use and protection Needs.
 54. Establish observation points and educational facilities at selected sites.

Attaining a successful reintroduced population of California condors in Arizona (including the southwestern United States) is essential to meet the species' recovery plan objectives.

CONCLUSIONS and RECOMMENDATIONS

The review team, and those agencies, organizations, and individuals who participated in the review of the first five years of the California condor reintroduction program in northern Arizona, have expressed a very high level of satisfaction with the reintroduction program. Several issues of coordination, communication, and management have been identified where there could be some improvement, but no agency, organization, local governmental group, local land owner, or other private individual has recommended termination of the condor reintroduction efforts.

Overall, the California condor reintroduction program in northern Arizona after the first five years is widely considered to be an unprecedented success. With the laying of an condor egg in the wild in 2001, expectations are high that a chick may be successfully raised in the wild in 2002. But there have been setbacks. With each new challenge (e.g., deaths, inappropriate behavior, poisonings), actions to address the problem were identified and incorporated into condor management decisions. Adaptive management, learning from each challenge, and then moving forward, is truly a critical aspect of this *experiment* in the reintroduction of condors to the wild. The nonessential experimental rule provided direction to seriously consider terminating the program if condor mortality rates are at 40 percent or greater, or released condors are not finding food on their own. Following the release of 47 condors over five years in northern Arizona, the mortality rate of this primarily immature population of released condors is very close to 40 percent. This report fully discloses the causes and circumstances of condor deaths and the resulting management actions, including modifying feeding strategies. These mortalities were not the result of relaxed regulations under the nonessential experimental rule. As the condor population matures and by applying adaptive management concepts, future losses may be minimized. The issues of mortality rate and wild foraging are considered to be adequately addressed.

The review team would like to acknowledge the tremendous efforts of The Peregrine Fund, and especially field personnel, in carrying out the reintroduction of condors in northern Arizona. The participation in the program by AGFD, BLM, NPS, and FWS has greatly contributed to its overall success. There has been an enthusiastic acceptance of the condor reintroduction program by the public, including in local communities, with support provided by local land owners and businesses. The consistent adherence by regulatory agencies to the obligations provided through

the nonessential experimental rule (that no changes in land use practices occur due to the presence of condors), has been an important part of gaining local support for the program. The ultimate success of California condor recovery in the southwest is dependant on the continued acceptance and support of the program by local communities, and will require a long-term commitment and active participation by many agencies and organizations in Arizona and Utah, and perhaps other states.

The review team unanimously recommends to the California Condor Recovery Team and FWS, the continuation of the California condor reintroduction program in northern Arizona. However, this review of the first five years of the reintroduction program brought to light several issues that need to be addressed in order to increase the effectiveness of the program. The following recommendations are provided for consideration by all cooperators. Additional detail is included in the main body of this report. The Arizona Condor Working Group and The Peregrine Fund, in coordination with the overall condor recovery program, can address the details, costs, and priority of these recommendations.

Administration and Coordination Recommendations

- Proceed with the process to broadly expand the nonessential experimental area designation.
- Secure all permits as required by management agencies.
- Develop a new MOU among all program cooperators, clearly defining roles and expectations. Conduct at least one annual meeting for all program cooperators.
- Improve coordination and develop stronger partnerships with:
 - Tribes located in northern Arizona
 - Kaibab National Forest
 - Utah Division of Natural Resources
 - Land management agencies in Utah (NPS units; national forests, BLM)
 - USDA APHIS-Wildlife Services
- Develop law enforcement coordination protocols.
- Identify opportunities for increased public education about condors and the reintroduction program.
- Encourage/support development and commercial availability of non-toxic ammunition.
- Initiate a hunter awareness program regarding the threat of lead poisoning to condors by ingestion of bullet fragments from animal carcasses.
- Initiate investigations into the pathways of lead in the environment (identify potential lead exposure sources, and its distribution and abundance).

- Continue coordination with utility companies and marking of transmission lines in critical locations.
- Coordinate with federal management agencies concerning their responsibilities under section 7 of the ESA, and the provisions of the nonessential experimental rule.

Field Management Recommendations

- Continue management flexibility to rapidly respond to new challenges through adaptive management.
- Continue intensive monitoring and individual bird assessments (e.g., location; roost sites; health and behavior assessments, including blood lead testing), especially for the first 60 to 90 days following release.
- Establish a medical treatment facility near the release site(s).
- Expand on the use of satellite telemetry and other remote location data recorders (e.g., GPS units).
- Intervene (e.g., hazing; capture) as soon as possible to prevent a bird from being compromised due to behavioral or health reasons; to remove a problem bird from the population; or to preclude a problem situation from developing (e.g., placement of perching deterrents).
- Continue to hold birds in the flight pen longer than the six month natural fledging age.
- Increase the use of adult condor mentors while holding juvenile birds in the flight pen.
- Continue providing contaminate free carcasses and feeding site management, including disposal of the remains of proffered carcasses.
- Develop data management procedures for consistency in recording observations, and prompt entry of data for computerized data storage, organized retrieval, and analysis. Field biologists should be allocated time for data transcription as part of their daily assignments.
- Prioritize research needs and make all data available to program cooperators for research, peer review, and management decisions.
- Identify condor movement patterns and flight corridors.
- Expose young birds to large carcasses as early as possible.
- Aggressively manage and document condor nesting activities.

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Appendix A. Time line of California condors reintroduction to northern Arizona (modified from The Peregrine Fund 2001 Annual Report to FWS).

- October 1996:** The section 10(j) rule of the Endangered Species Act was published in The Federal Register, and a lawsuit filed by San Juan County in southern Utah was dismissed, giving the green light for the release to take place.
- October 29, 1996:** Six parent-reared California Condors were flown from Burbank, California to Page, Arizona on a C26A smoke jumper plane supplied by the Bureau of Land Management. The six condors were then flown to the release site above the Vermilion Cliffs by The Salt River Project helicopter.
- December 12, 1996:** Hundreds of California Condor enthusiasts gathered below the Vermilion Cliffs to witness the release of six condors.
- January 10, 1997:** The body of Condor 142 was found dead below the Vermilion Cliffs, apparently killed by a Golden Eagle.
- May 18, 1997:** The body of Condor 151 was found below a span of high power lines southeast of Page, Arizona. The condor died shortly afterwards from injuries sustained from the collision with the line.
- April 29, 1997:** Nine California Condors, hatched between March 15, 1995 and May 20, 1995, were flown from the Los Angeles Zoo to Page, Arizona by the Bureau of Land Management and transported to the release site above the Vermilion Cliffs.
- May 14, 1997:** The first four of the nine condors were released.
- May 26, 1997:** The second group of five condors were released, bringing the total of free-flying California Condors in Arizona to 13.
- July 13, 1997:** Condor 126 had to be captured and sent back to the World Center for Birds of Prey in Boise, Idaho. It was determined that her tameness towards humans might jeopardize the behavior of the other condors.
- July 14, 1997:** Condor 128 left the area with Condors 122 and 127, and was never seen again. Numerous flights were taken in order to try to pick up a radio signal but were abandoned by the end of August. We are now counting the bird as a mortality.

- July 20, 1997:** Condor 124 was captured at the visitors' center on the South Rim of the Grand Canyon National Park. She had last been seen feeding 26 days before. She was given emergency medical assistance and sent to the San Diego Wild Animal Park where she recovered. She has since been re-released at the Vermilion Cliffs and is doing well.
- October 8, 1997:** Four additional puppet-reared condors were flown from the Los Angeles Zoo to Page, Arizona by the BLM smoke jumper plane from Boise, Idaho. They were picked up by The Salt River Helicopter and flown to the release site.
- November 20, 1997:** The four young Condors were released from the Vermilion Cliffs release site.
- November 25, 1997:** The Boise Air National Guard flew a C-130 transport plane to Miramar Air Force Base near San Diego and picked up seven condors from the San Diego Wild Animal Park. It then flew to Burbank where 13 additional condors were picked up from the Los Angeles Zoo. All 20 birds were flown to the Peregrine Fund's new condor facility in Boise, bringing the Boise captive population to 41 individuals. The 20 new birds ranged from three to seven years of age.
- July 31-**
- August 13, 1998:** Condor 119 disappeared and flew 310 miles north before being spotted at Flaming Gorge Reservoir on the Wyoming/Utah border before returning to the site on August 13.
- August 23-27, 1998:** Condors 116, 122, and 123 left the release area on August 23, and were spotted on August 25 near Grand Junction, Colorado over 250 miles to the north. They returned to the Vermilion Cliffs in just one day on August 27.
- September 25, 1998:** The final approval had been given to establish a second California Condor release site on the Hurricane Cliffs approximately 65 miles to the west of the Vermilion Cliffs release site and construction began on the enclosed 8 foot by 24 foot enclosed hack box and 24 foot by 30 foot attached fly pen.
- October 3, 1998:** The carcass of California Condor #169 was found.
- October 7, 1998:** The BLM smoke jumper plane in Boise flew six young California Condors from Boise, Idaho to St. George, Utah and then proceeded to Burbank, California. The six young condors were driven to the new Hurricane Cliffs site.

- October 8, 1998:** Three additional California Condors were flown from the Los Angeles Zoo to St. George, Utah and transported to the new Hurricane Cliffs site, bringing the total to nine new birds, giving Arizona a total of 23 condors.
- November 18, 1998:** The eight young condors were released from the Hurricane Cliffs site.
- November 23, 1998:** The single condor, #134, produced in 1996 was released from the Vermilion Cliffs release site.
- December 24, 1998:** Condor 177, released on November 18, was found dead near the release site, presumably killed by a coyote.
- March 11, 1999:** Condor 124 was found shot and killed in the Grand Canyon. A young man turned himself in and was subsequently fined \$3,200 by the FWS.
- May 6, 1999:** Condor 186 was captured and returned to Boise after repeatedly approaching people and showing signs of being too tame.
- November 8, 1999:** Nine condors were flown from Boise, Idaho to St. George, Utah. The birds were then driven to the Hurricane Cliffs release site.
- December 7-29, 1999:** Seven of the nine condors at the Hurricane Cliffs site were released. One was returned to Boise for future release and four year old condor 129 was released at the Vermilion Cliffs.
- January 5, 2000:** Condor 207 found dead near Hurricane release site from aspirating food.
- February 4, 2000:** Condor 197 found dead near Hurricane release site from eagle predation.
- March 3, 2000:** Condor 116 found dead above Colorado River from lead poisoning. All of the condors were trapped and tested for lead. Only 119 had high levels and was treated and released.
- April 11-14, 2000:** Condors 195, 196, 198 and 203 were captured for behavioral reasons and returned to Boise.
- May 1, 2000:** Condor 111 missing and presumed dead.
- June 12, 2000:** Condor 165 found dead below south rim of Grand Canyon from lead poisoning.
- June 16, 2000:** Condor 191 died at the Phoenix Zoo from lead poisoning.

- June 20, 2000:** Condor 182 found dead near the Vermilion Cliffs, cause unknown. Condor 150's telemetry signal found stationary over several weeks in an inaccessible area of canyon—cause of death unknown. All but one of the birds were captured and tested for lead. Nine had unacceptable levels over 50 ug/dl and were treated and released over a period of two months.
- September 7, 2000:** Condor 184 found dead below the Vermilion Cliffs, presumably from eagle predation.
- November 8, 2000:** Thirteen condors were flown from Boise, Idaho to Marble Canyon, Arizona by the USFS with funding from the BLM.
- December 7, 2000:** The first pair of adult nine year old condors, 82 and 74 were released in the experiment to accelerate having birds breeding in the wild at an earlier date.
- December 19, 2000:** The second pair of adult 10 year old condors, 70 and 60 were released.
- December 25, 2000:** Adult condor 82 found killed by coyotes.
- December 28, 2000:** Adult condor 74 was found killed by coyotes and the remaining adult pair 70 and 60 were immediately caught and brought back into captivity ending the experiment.
- December 29, 2000:** The remaining seven young and two older birds were released from the Vermilion Cliffs release site.
- January 31, 2001:** Condor 232 was temporarily brought back into captivity for behavioral reasons.
- February 9, 2001:** Young Condor 228 was found dead and emaciated on top of hack box.
- March 25, 2001:** First California Condor egg laid in the wild by captive released condors was found in Grand Canyon National Park. It was broken by the condors on the same day.
- May 14, 2001:** Young condors 232 and 224 were temporarily brought back into captivity for behavioral reasons.
- May 23, 2001:** Condor 186 was temporarily brought back into captivity for behavioral reasons.
- August 24, 2001:** The first satellite transmitter placed on a condor in Arizona was placed on condor 176.

Appendix B. California condor releases in northern Arizona (modified from The Peregrine Fund Annual Report, 2001). LAZ = Los Angeles Zoo; SDWAP = San Diego Wild Animal Park; WCBP = World Center for Birds of Prey, Boise, Idaho.

Release 1. Vermilion Cliffs, 12 December 1996. Birds transferred to site 28 October 1996.				
Condor	Sex	Breeding Facility Rearing Method	Hatch Date	Status as of 31 Jan 2002
133	F	LAZ Parent	22 May 1996	Free-flying
136	F	LAZ Parent	12 May 1996	Free-flying
142	M	LAZ Parent	29 May 1996	Dead - 10 Jan 1997 Golden eagle
149	F	LAZ Parent	7 May 1996	Free-flying
150	F	WCBP Parent	26 May 1996	Dead - June 2000 Unknown
151	F	LAZ Puppet	2 June 1996	Dead - 18 May 1997 Transmission line collision

Release 2. Vermilion Cliffs, 14 May 1997. Birds transferred to site 29 April 1997.				
Condor	Sex	Breeding Facility Rearing Method	Hatch Date	Status as of 31 Jan 2002
116	M	SDWAP Puppet	13 April 1995	Dead - 2 Mar 2000 Lead poisoning
119	F	SDWAP Puppet	15 Mar 1995	Free-flying
127	F	SDWAP Puppet	31 Mar 1995	Free-flying
128	F	LAZ Puppet	19 April 1995	Dead - 14 July 1997 Lost

Release 3. Vermilion Cliffs, 26 May 1997. Birds transferred to site 29 April 1997.				
Condor	Sex	Breeding Facility Rearing Method	Hatch Date	Status as of 31 Jan 2002
114	M	SDWAP Puppet	9 April 1995	Free-flying
122	M	LAZ Puppet	17 May 1995	Free-flying
123	M	LAZ Puppet	20 May 1995	Free-flying
124	F	LAZ Puppet	4 April 1995	Dead - 10 Mar 1999 Shot
126	F	SDWAP Puppet	2 May 1995	Free-flying

Release 4. Vermilion Cliffs, 20 November 1997. Birds transferred to site 8 October 1997.				
Condor	Sex	Breeding Facility Rearing Method	Hatch Date	Status as of 31 Jan 2002
158	M	SDWAP Puppet	7 April 1997	Free-flying
162	M	LAZ Puppet	14 April 1997	Free-flying
165	M	WCBP Puppet	20 April 1997	Dead - 12 June 2000 Lead poisoning: 17 shot pellets in crop
169	M	SDWAP Puppet	20 May 1997	Dead - 3 Oct 1998 Coyote

Release 5. Hurricane Cliffs, 18 November 1998. Birds transferred to site 7 and 8 October 1998.				
Condor	Sex	Breeding Facility Rearing Method	Hatch Date	Status as of 31 Jan 2002
134	M	SDWAP Puppet	2 April 1996	Free-flying
176	F	WCBP Puppet	19 Mar 1998	Free-flying
177	M	WCBP Puppet	28 Mar 1998	Dead - 24 Dec 1998 Coyote
182	F	WCBP Puppet	2 April 1998	Dead - 20 June 2000 Unknown
184	F	LAZ Puppet	11 April 1998	Dead - 7 Sept 2000 Golden eagle
186	M	LAZ Puppet	15 April 1998	Free-flying
187	M	WCBP Parent	22 April 1998	Free-flying
191	F	WCBP Parent	10 May 1998	Dead - 16 June 2000 Lead poisoning
193	M	WCBP Puppet	30 May 1998	Free-flying

Release 6. Hurricane Cliffs, 7 December 1999. Birds transferred to site 8 November 1999.				
Condor	Sex	Breeding Facility Rearing Method	Hatch Date	Status as of 31 Jan 2002
195	F	SDWAP Puppet	19 Feb 1999	Captivity - WCBP
196	F	SDWAP Puppet	20 Mar 1999	Free-flying
197	F	SDWAP Puppet	24 Mar 1999	Dead - 4 Feb 2000 Golden eagle
198	M	SDWAP Puppet	31 Mar 1999	Free-flying
203	M	WCBP Puppet	23 April 1999	Free-flying
207	M	WCBP Parent	4 May 1999	Dead - 15 Jan 2000 Aspiration
211	F	WCBP Parent	23 May 1999	Dead - May 2000 Missing

Release 7. Vermilion Cliffs, 7 December 2000. Birds transferred to site 8 November 2000.				
Condor	Sex	Breeding Facility Rearing Method	Hatch Date	Status as of 31 Jan 2002
74	M	LAZ Puppet	20 May 1992	Dead - 28 Dec 2000 Coyote
82	F	SDWAP Puppet	4 April 1992	Dead - 25 Dec 2000 Coyote

Release 8. Vermilion Cliffs, 19 December 2000. Birds transferred to site 8 November 2000.				
Condor	Sex	Breeding Facility Rearing Method	Hatch Date	Status as of 31 Jan 2002
60	M	LAZ Puppet	30 Mar 1991	Captivity - WCBP
70	F	LAZ Puppet	25 May 1991	Captivity - WCBP

Release 9. Vermilion Cliffs, 29 December 2000. Birds transferred to site 8 November 2000.				
Condor	Sex	Breeding Facility Rearing Method	Hatch Date	Status as of 31 Jan 2002
210	F	WCBP Puppet	23 May 1999	Free-flying
223	M	WCBP Puppet	18 April 2000	Free-flying
224	F	WCBP Puppet	18 April 2000	Free-flying
227	M	WCBP Puppet	28 April 2000	Free-flying
228	F	WCBP Parent	28 April 2000	Dead - 9 Feb 2001 Starvation
232	M	WCBP Puppet	30 April 2000	Captivity - WCBP
234	F	WCBP Puppet	11 May 2001	Free-flying
235	F	WCBP Parent	18 May 2001	Free-flying

Appendix C. California condor five-year review open houses public comments and summary of issues from comment letters.

Public Open House, 1 November 2001, Kanab, Utah

- a. Status of 10J expansion in Utah West of I-15.
- b. Impact to local economy
- c. How to cope with close encounters with Condors.
- d. "Natural" mortality should not count towards 40% threshold (over 5 year period).
- e. Natural mortality in juvenile raptors much higher than 40%.
- f. West Nile Virus and other disease threats.
- g. Need to give more public presentations locally, including schools.
- h. Cost of program.
- i. Contact local tourism industry to gauge level of interest.

Public Open House, 5 November 2001, Flagstaff, Arizona

1. Should expect mortality to begin higher; unanticipated events; learning curve.
2. Program extremely successful (at least in captivity) which should balance out with higher mortality in wild.
3. The whole idea is to have a population in the wild and not in captivity so need to keep trying.
4. Don't stop no matter what the numbers.
5. Break out "natural" vs. man-caused mortality.
6. Mortalities have taught us a lot.
7. We've saved a lot of birds (chelation, teaching aversion to dogs/perching on ground).
8. Once reproduce, expect parents to teach young about a lot of these hazards.
9. How will Condor be treated in BLM/NPS monuments (10J or Th)?
10. Public education re lead issue/hazard.
11. Lead exposure is manageable at this point although we don't know what the lasting effects may be.
12. We may want to invite people to future releases (like did 1st time) to foster interest and support.
13. Generally, Flagstaff is interested and approves of project.
14. Navajo activists would probably have positive input.
15. Hold one of these (in future?) meetings in Cameron or place closer to Navajo Nation and other tribal residents.

All comments received at the public open houses or otherwise received fall into 8 broad topics.

2. Status of 10(j) expansion.
2. Condor mortality rate.
3. Program costs.
4. Impact to local economy.
5. Education about program (how to behave around a condor, what to do/who to call; school programs) and about lead.
6. Public acceptance and interest.
7. Outreach to communities that haven't shown as much interest (e.g., tribes).
8. Disease threats.