

**A Review of the Second Five Years
of the
California Condor Reintroduction Program
in the Southwest**



April 2007

Review of the Second Five Years of the California Condor Reintroduction Program in the Southwest

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.

Prepared by the Southwest Condor Review Team:

William Austin	U.S. Fish and Wildlife Service, Flagstaff, Arizona
Keith Day	Utah Division of Wildlife Resources, Cedar City, Utah
Scot Franklin	Bureau of Land Management, St. George, Utah
Jeff Humphrey	U.S. Fish and Wildlife Service, Phoenix, Arizona
W. Grainger Hunt	The Peregrine Fund, Boise, Idaho
Chris Parish	The Peregrine Fund, Marble Canyon, Arizona
Ron Sieg	Arizona Game and Fish Department, Flagstaff, Arizona
Kathy Sullivan	Arizona Game and Fish Department, Flagstaff, Arizona

For a printed copy of this report, contact the Arizona Ecological Services Office in Phoenix at (602) 242-0210 or the Flagstaff Suboffice at (928) 226-0614.

The cover photograph in this report is by and courtesy of Chris Parish of The Peregrine Fund. For copies, contact Chris at cparish@peregrinefund.org.

Disclaimer

References to manufacturers, products, and brand and trade names do not imply endorsement by the preparers, the Southwest Condor Working Group, or the United States government.

Review of the Second Five Years of the California Condor Reintroduction Program in the Southwest

List of Acronyms and Terms Used in this Report

µg/dl	micrograms per deciliter
10(j) area	(Northern Arizona) Nonessential Experimental Population Area
AGFD	Arizona Game and Fish Department
AOU	American Ornithologists Union
APHIS	Animal and Plant Health Inspection Service
ASDO	Arizona Strip District Office
BLM	Bureau of Land Management
DVM	Doctor of Veterinary Medicine
EA	Environmental Assessment
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FR	Federal Register
FWS	U.S. Fish and Wildlife Service
GLCA	Glen Canyon National Recreation Area
GRCA	Grand Canyon National Park
MOU	Memorandum of Understanding
NEPA	National Environmental Policy Act
NPS	National Park Service
PTT	Platform Terminal Transmitter
SCWG	Southwest Condor Working Group
TPF	The Peregrine Fund
UDWR	Utah Division of Wildlife Resources
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
VHF	Very High Frequency
WMI	Wildlife Management Institute
WNV	West Nile Virus
WS	USDA APHIS Wildlife Services

Review of the Second Five Years of the California Condor Reintroduction Program in the Southwest

Table of Contents

List of Preparers i

List of Acronyms Used in this Report ii

Table of Contents iii

Tables v

Figures vi

INTRODUCTION 1

BACKGROUND 1

REVIEW PROCESS 3

PUBLIC PARTICIPATION 4

BIOLOGY AND MANAGEMENT

 Release Strategies 5

 Monitoring and Data Collection 7

 Behavior 9

 Courtship and Reproduction 12

 Movements 10

 Health 14

 Mortality 18

 Demography Overview 20

LEAD-REDUCTION EFFORTS

 Introduction 21

 Surveys and Focus Group 23

Review of the Second Five Years of the California Condor Reintroduction Program in the Southwest

Education and Communication.....24

Lead Research.....25

Non-lead Ammunition Program26

Cooperator Lead-Reduction Efforts.....30

Treatment Facility30

Comments and Recommendations.....30

ADMINISTRATION

Coordination Among Program Cooperators and Compliance with Commitments32

Coordination in Utah.....35

Compliance of Federal Agencies with Sections 7(a)(1), 7(a)(2), and 7(a)(4) of the Endangered Species Act.....36

Public Support and Initiatives.....39

Economic Opportunities44

Law Enforcement.....45

Aviation.....45

USDA APHIS-Wildlife Services Activities47

Expansion of the Nonessential Experimental 10(j) Population Area49

Project Costs50

Research Needs.....51

Review of the Second Five Years of the California Condor Reintroduction Program in the Southwest

FUTURE RESEARCH AND MANAGEMENT NEEDS.....53

 Accomplishment of Recovery Tasks53

CONCLUSIONS AND RECOMMENDATIONS54

 Future Administration and Field Operation Recommendations60

LITERATURE CITED62

Appendix A. Summary of public comments received during the second five-year review65

Appendix B. Abstracts cited in the Health, Demography Overview, and Lead-Reduction Efforts sections of this report76

Appendix C. Actions taken to reduce lead exposure to condors79

Tables

Table 1. Summary of condor releases in the Southwest (2002-06)6

Table 2. Lead exposure and response categories15

Table 3. Condor mortality factors of the first and second five-year periods of the reintroduction program19

Table 4. Condor fatalities of the second five-year period of the reintroduction program20

Table 5. Non-lead ammunition obtained by hunters through the free ammunition program in 2005 and 2006.....28

Table 6. Non-lead ammunition manufacturers31

Table 7. Summary of recommendations for research from the first five-year review and accomplishments in the second five-year period52

Table 8. Summary of administration and coordination recommendations from the first five-year review and accomplishments in the second five-year period56

Review of the Second Five Years of the California Condor Reintroduction Program in the Southwest

Table 9. Summary of field management recommendations from the first five-year review and accomplishments in the second five-year period58

Figures

Cover: Reintroduced California condor soaring over Grand Canyon.

Figure 1. California condor nonessential experimental population area of the Southwest3

Figure 2. Condor locations obtained with GPS telemetry in 2002-06.....9

Figure 3. Condor locations during September 2006 in Kolob Canyon of Zion National Park.....13

Figure 4. Condor use of the Kolob region of southern Utah obtained with GPS telemetry13

Figure 5. Condor night roost locations in areas outside the release site obtained with VHF telemetry14

Figure 6. Number of condors exposed to, tested, and treated for lead (1999-06)16

Figure 7. Arizona game management units within the condor range26

A Review of the Second Five Years of the California Condor Reintroduction Program in the Southwest

INTRODUCTION

At the end of 2006, the U.S. Fish and Wildlife Service (FWS) completed the tenth year of releases of California condors (*Gymnogyps californianus*) in northern Arizona. This reintroduction is conducted under a special provision of the Endangered Species Act (ESA) that allows for the 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, and every five years thereafter. 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 evaluates the progress of the condor reintroduction program in the Southwest and compliance with the established commitments for the second five-year period (2002-06) of the program.

BACKGROUND

The program of releasing California condors in the Southwest includes northern Arizona and southern Utah and 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 Utah Division of Wildlife Resources (UDWR)], and The Peregrine Fund (TPF), a private/nonprofit organization. TPF 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. TPF 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 Southwest

Condor Working Group (SCWG), facilitating coordination among the agencies and organizations. The MOU was updated in 2005 (see the Coordination Among Program Cooperators and Compliance with Commitments section).

The first condor release in northern Arizona occurred on December 12, 1996. A total of 93 condors were released to the wild and five were wild-hatched in northern Arizona by the end of 2006. Reintroduction efforts have been complicated by predation, lead poisonings, condor-human interactions, and shootings. Thirty-seven of the released birds and one of the wild-hatched birds have died. Three released individuals were returned to captivity. One of those individuals was returned in an effort to maintain the optimum genetic representation in the breeding flock. The other two (which were released as adults as part of an experiment) were returned to captivity due to lack of awareness of ground-based predators.

In March 2001, a reintroduced condor 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 (GRCA). Egg production continued with contributions from two pairs of condors in 2002, three pairs in 2003, two pairs in 2004, two pairs in 2005 and three pairs in 2006. Those reproductive efforts resulted in one wild-fledged individual in 2003, two in 2004, and two in 2005. After ten years of the release program, there are 57 free-flying condors in northern Arizona, including four produced in the wild.

The nonessential experimental population status applies to condors only when they are within the geographic bounds of the designated 10(j) area of the Southwest, 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 on the north, and Interstate Highway 15 to U.S. Highway 93 near Las Vegas, Nevada on the west (Figure 1). 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. Early in the program, condors left the nonessential experimental area on several occasions, flying as far as Flaming Gorge, Wyoming (310 miles from the release site), and Grand Junction, Colorado (approximately 250 miles from the release site). All of the far-wandering condors returned to the release area on their own.

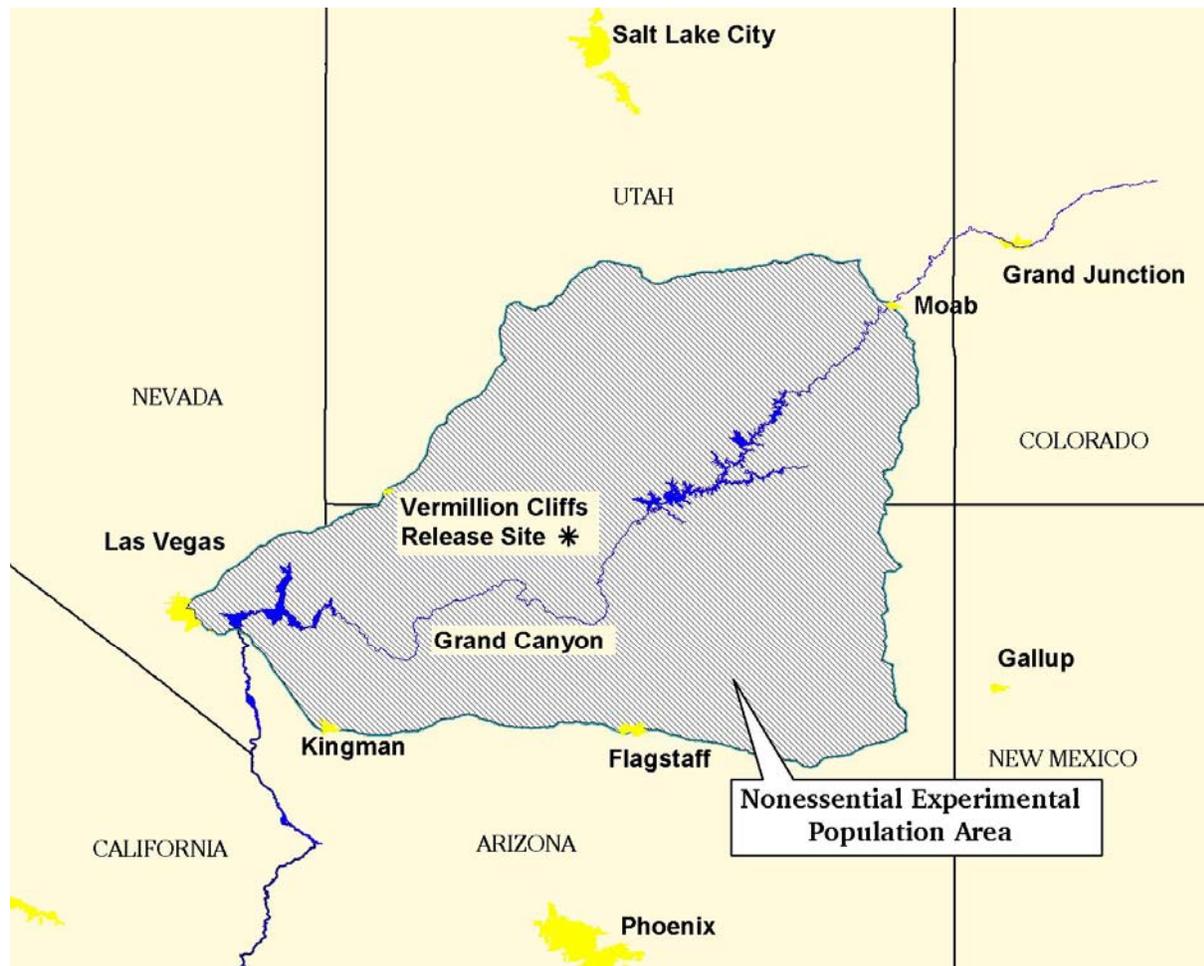


Figure 1. California condor nonessential experimental population area of the Southwest.

Condor activity in southwestern Utah has increased considerably over the past three years (2004-06). Groups of condors now regularly reside in Utah from April through November. Breeding in the area is anticipated in coming years.

REVIEW PROCESS

This review was conducted by the Southwest Condor Review Team (referred to within this report as the review team) that included condor biologists, representatives of local land and wildlife management agencies, the SCWG, and FWS, with input from local governments and the public. This report, prepared by the review team, is submitted to the California/Nevada Operations Office which is the lead for the California condor program. That FWS lead will coordinate any further action with the California Condor Recovery Team which is an advisory panel of scientists providing support to FWS. 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 for the second five-year period 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 come 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 examines 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 are re-assessed. Each topic is individually addressed, and grouped in one of two broad categories: biology and management, or administration. Recommendations to improve the effectiveness of the program are included.

PUBLIC PARTICIPATION

The review team sought to include broad participation in the review process. The team solicited comments and participation in the review from government agencies, Tribes, business owners, environmental and industry groups and local individuals, and condor and endangered species experts that have expressed interest or participated in the reintroduction program. Additionally, more general advertisement of the review was conducted in the northern Arizona and southern Utah news media markets.

Notification was provided through direct mailing (>100 addresses), email (>150 addresses), website posting (www.fws.gov/southwest/es/arizona/) and news releases sent to 62 news outlets (predominantly print and radio in northern Arizona, southern Utah and southeastern Nevada). A number of media outlets in southern Utah and northern Arizona published notices or broadcast information about the review.

Detailed information regarding topics upon which comments could be formulated was provided upon request and was made available through four relevant websites:

www.peregrinefund.org/released_condorsinfo.asp, www.fws.gov/arizonaes/, www.fws.gov/southwest/es/arizona/CA_Condor.htm, and www.azgfd.gov/condor.

Because the team received a number of comments that referenced information from these websites, we know that this method of distributing information was effective. Team members also distributed handouts at open houses summarizing aspects of the condor reintroduction program and the five-year review process.

The review team hosted two public open houses, one in Kanab, Utah, on October 3, 2006, 7-9 p.m. at the Grand Staircase Escalante National Monument - Kanab Visitor Center, 745 East Highway 89; and one in Flagstaff, Arizona, on October 4, 2006, 7-9 p.m. at the Arizona Game and Fish Department Office, 3500 South Lake Mary Road. Twelve attendees registered at the Kanab meeting and ten registered at the Flagstaff meeting. At each open house, the team members provided a review of the California condor reintroduction program since January 2002, and open house participants provided questions, concerns, and comments orally or in writing. We also recorded oral comments and responses to questions for consideration and inclusion in this five-year review. A summary of comments and discussion from the open houses and those received by mail and email is provided in Appendix A.

Requests for comments were solicited starting on September 1, 2006, and accepted through October 31, 2006. Public and agency input was received via direct mail, email, telephone, and in-person at open houses. Written comments and the list of public open house attendees are included in the administrative record and are available for inspection by appointment at the Arizona Ecological Service Field Office, 2321 W. Royal Palm Road, Suite 103, Phoenix, Arizona, 85021, (phone: (602) 242-0210).

BIOLOGY AND MANAGEMENT

Release Strategies

During the five years of this reporting period (2002-06), the status of condor restoration in Arizona has undergone considerable development. Most encouraging has been the establishment of successfully reproducing condor pairs, a substantial increase in the overall number of free-ranging condors, and a dramatic range extension into southern Utah. We have continued to release condors throughout the period, and there were 57 free-ranging individuals at the end of 2006.

California condors were first introduced in northern Arizona in December 1996, when six birds were released from BLM-administered lands at the western end of the Vermillion Cliffs. Eight additional releases followed through December 2000 (Arizona Condor Review Team 2002). Releases within the second five-year-reporting period began on February 16, 2002 when eight condors produced in 2001 were released at Vermillion Cliffs. An additional 38 condors were released there in 14 subsequent events (Table 1). Reintroductions generally involved road transportation of fledging-age captive-produced condors from the World Center for Birds of Prey Captive Breeding Facility to a 40x60x18-foot flight pen with adjacent 30x15x5-foot semi-enclosed box structure containing sheltered perches. All condors within the flight pen were exposed to a mock power pole fitted with a low voltage electrified cross arm for aversive conditioning to electrical structures.

Table 1. Summary of condor releases in the Southwest (2002-06).

Release Date	Location	Number Of New Condors Released	Died	Survive In Wild
February 16, 2002	Vermillion Cliffs	8	4	4
September 25, 2002	Vermillion Cliffs	3	1	2
March 3, 2003	Vermillion Cliffs	3	0	3
October 4, 2003	Vermillion Cliffs	2	0	2
November 29, 2003	Vermillion Cliffs	2	0	2
January 9, 2004	Vermillion Cliffs	1	0	1
March 20, 2004	Vermillion Cliffs	4	2	2
October 16, 2004	Vermillion Cliffs	3	1	2
February 4, 2005	Vermillion Cliffs	3	0	3
March 1, 2005	Vermillion Cliffs	5	1	4
May 25, 2005	Vermillion Cliffs	1	0	1
August 19, 2005	Vermillion Cliffs	2	0	2
October 12, 2006	Vermillion Cliffs	3	0	3
March 2, 2006	Vermillion Cliffs	3	0	3
September 12, 2006	Vermillion Cliffs	3	0	3
Totals		46	9	37

Condors were observed, sometimes for months, in the flight pens and evaluated for potential release. Condors chosen for release were moved to a release pen (40x20x6 feet with an adjoining 40x8x5 feet semi-enclosed box structure for protection from the elements and predators) situated at the edge of the Paria Plateau in clear view of free-flying condors feeding, perching, and loafing around the release site. Both of the Vermillion Cliffs structures have been enhanced structurally and spatially since the last reporting period. Pre-release condors generally spent a week or two in the release pen to acclimate to their new surroundings and to nearby free-flying condors. TPF provided food in the form of stillborn dairy calves to condors in captivity and every three days after release. Among the newly-released condors were three two-year-olds

from the California-based Pinnacles release site. Release of those individuals was part of an experiment to determine whether or not their previous behavior of perching on power-poles in California had become fixed. Thus far, none of the three birds have been observed on power poles since release in northern Arizona.

During the first five years of releases, we investigated the utility of a separate release site (Hurricane Cliffs south of St. George, Utah) to diminish the pressure of increased competition at feeding sites for newly-released condors, and to potentially reduce continual visitation of free-flying condors to Vermillion Cliffs. After several releases, however, the population had merged, so we reverted to single-site releases and increased the number of feeding stations at the Vermillion Cliffs site as a proactive measure to ensure socially low-ranking condors would get enough food. Later in the first five years, we also learned that the increased visitation of free-flying condors to the holding pens appeared to habituate the young held within to the older condors, thus making transition into a wild flock easier and faster. Once on the wing, the young seemed more ready to follow the wild population.

Continuing with changes made late during the first five years (Arizona Condor Review Team 2002), we reduced the number of birds per release and, on average, held birds longer which meant they were older at first release. After the normal behavioral evaluation to select individuals for release, we would release three or four individuals along with a few re-release candidates. Acknowledging that these first-time releases were still of the age that parents would continue to care for them in a natural setting, we nevertheless found that condors released under these two conditions (older and in the company of experienced birds) showed improved post-release behavior as compared with the early years of the program.

We have had the benefit of three different holding facilities, one in Boise, and two at the Vermillion Cliffs release site, so crowding has not yet been a problem. However, with expected increases in flock size, new release sites and/or additional feeding sites may be necessary. On the other hand, the more widely-ranging flock, and the dispersing of breeding pairs into territories as far as 70 miles from the release site, may be relieving the pressure of birds upon resources at the release site. Expanding the experimental area could increase the flexibility necessary for adaptive management (see Expansion of the Nonessential Experimental 10(j) Population Area section).

Monitoring and Data Collection

Prior to release, each condor was fitted with patagial (wing-mounted) number tags and a pair of patagially-mounted (rarely retrix-mounted) radio transmitters. The transmitters were either conventional Very High Frequency (VHF) or Global Positioning System (GPS/PTT) instruments (see below). Two (redundant) transmitters provided added security in case of failure of one of the units, and often supplied both GPS and conventional radio telemetry data. TPF recaptured the birds every six months, on average, to replace transmitters as needed. In addition, TPF took

blood samples to monitor lead levels and West Nile Virus (WNV) post-vaccination antibody titers.

During the second five years of the reintroduction program, TPF increased the size of the field crew from six to eleven biologists for intensive monitoring of the increasing condor population through visual, radio, and GPS methods. TPF biologists and field workers tracked the daily movements and activities of condors throughout the reporting period. Because ground tracking has become more difficult with the increase in the number of free-flying birds and their more frequent and widespread movement throughout the region's rugged terrain, TPF has come to rely more on satellite-based GPS/PTT transmitters (Microwave Technology), a state-of-the-art alternative to ground tracking made possible by the AGFD. They weigh less than conventional transmitters and do not require modification of the normal attachment configuration. The GPS transmitters are designed to record hourly position fixes with resolution of approximately 50 meters, and to report them to orbital satellite arrays several times a day, providing TPF with nearly real-time information on a locations of individuals.

Each morning, TPF acquires the accumulated GPS fixes from the previous day using a telnet connection and transfers them to topographical maps in a GIS mapping system. The data are immediately transmitted to the field crew who use them to plan that day's tracking strategy and any necessary direct management actions. TPF has mapped entire sequences of movement by GPS-equipped condors, including, for example, pair formation, prospecting for nest caves, and incubation exchanges. The transmitters have been especially valuable in revealing locations of condor concentration and prolonged activity in difficult-to-access canyon regions, including remote areas of southwestern Utah and the western portion of the Kaibab Plateau. TPF uses the transmitters to locate foraging areas. Knowledge of foraging areas has become particularly important since the summer of 2000 when the first known lead-related fatalities occurred. In all, TPF has maintained over 80% contact with the population, documenting behavior, roost locations, foraging activities, and identification of group activities within the population. TPF uses these data to identify potential threats and opportunities to intervene as necessary in response to behavior and/or health needs, particularly lead poisoning which is the leading cause of death of condors released in northern Arizona.

To date, TPF has obtained more than 50,000 relocation fixes from an average of 17 GPS-equipped condors (Figure 2). The polygon in Figure 2 represents the core area of condor use. Condor use is focused on the North and South rims and river corridor of the Grand Canyon, the Kaibab Plateau, and the Kolob region area of southern Utah. The distance from the release site on the Paria Plateau to the South Rim of the Grand Canyon is approximately 50 miles. The distance from the release site to the Kolob area is approximately 70 miles.

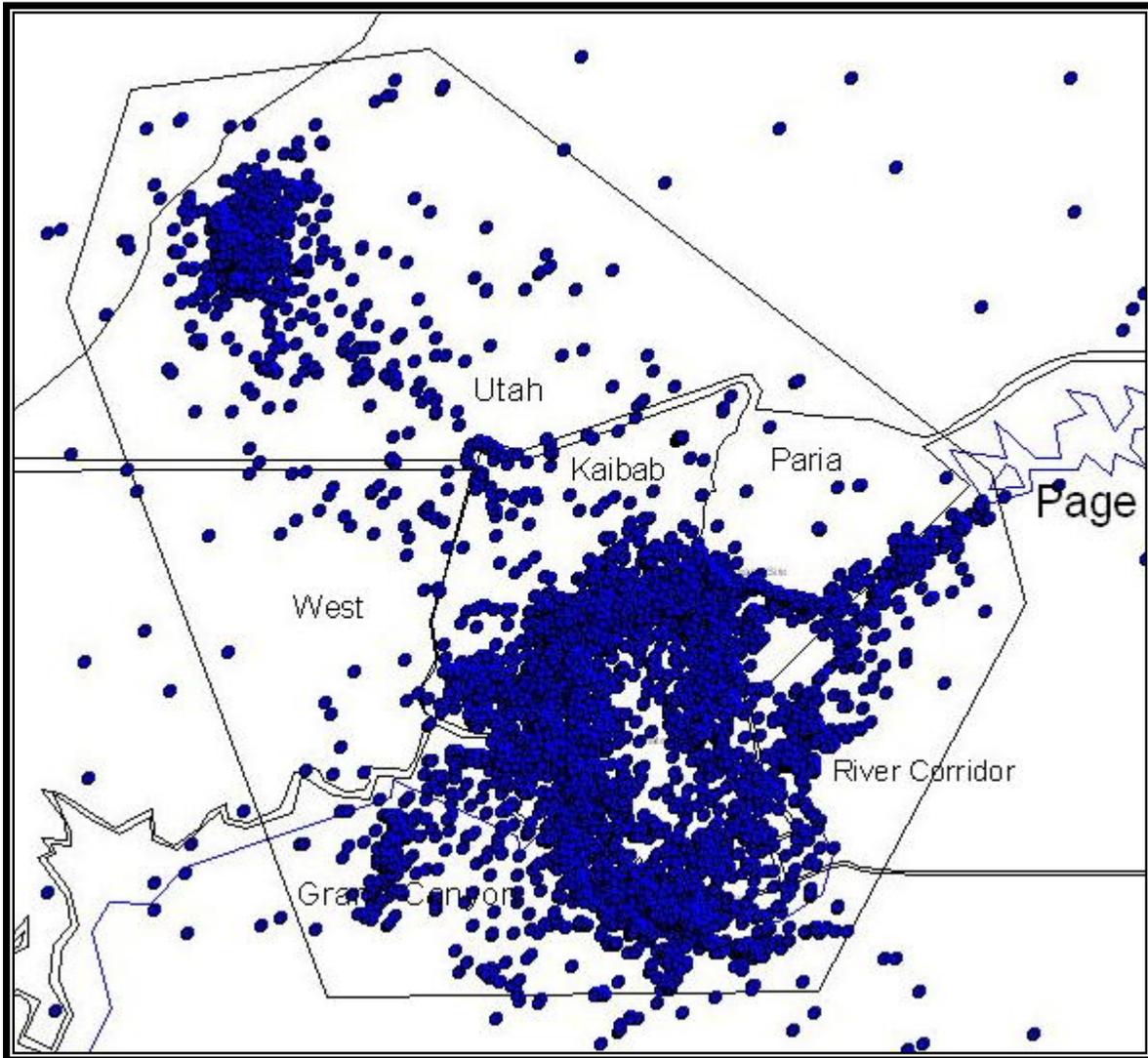


Figure 2. Condor locations obtained with GPS telemetry in 2002-06.

Behavior

TPF continues to condition condors by hazing and confinement for the purpose of breaking patterns of undesirable behavior as it relates to humans and artificial structures. TPF bases that effort on their experience over the course of the program that such conditioning results in improved behavior as the birds mature. During the 2006 season, for example, TPF placed four condors in detention for purposes of breaking behavior patterns, and retained two additional birds (that were later re-released) to prevent interference with a breeding pair which subsequently nested successfully. No bird has been deemed unreleasable under this protocol.

Courtship and Reproduction

2002

Courtship displays intensified in 2002, and as many as 14 condors were engaging in courtship activities between December 2001 and April 2002. The activity among those individuals resulted in formation of three pairs and a quad (two males and two females). Cave and cavity explorations were on the increase with one of the newest pairs, condors 134 and 149, focusing upon the Tapeats Canyon area on the northwest flank of the Kaibab Plateau. Two pairs, 119/122 (Battleship pair) and 123/127 (Dana Butte pair), selected caves at the South Rim of GRCA, laid eggs, and attempted incubation. For the second year in a row, condors 119/122 failed to produce a chick after a seemingly successful incubation period on the west wall of the formation known as the Battleship. When individuals from both pairs did not find food in the immediate area, they would make the 100-mile round trip to the release site to feed and then return. The normal interval between incubation exchanges was 4-7 days. No pairs were reproductively successful in 2002.

2003

The 2003 Battleship nesting attempt by pair 119/122 appeared to have failed in the last week of incubation. The precipitous abandonment of the nest by the adults seemed to indicate that something had gone wrong during the time TPF expected the egg to hatch. Further investigation of the nest by NPS climbers confirmed that only eggshell fragments remained in the cave.

The Dana Butte pair, condors 123/127, moved to a new location in the Salt Creek drainage, approximately one mile west of their previous 2002 attempt. Unable to see into the Salt Creek nest cave, TPF was initially reluctant to conclude the condors had produced a chick, but the chick was finally confirmed on August 16, 2003. Regular feedings were observed and documented, and chick 305 fledged on November 5 at 1339 hours, the first wild-produced fledgling in the history of the condor release program in the Southwest.

A quad formed in 2003 that included several of the condors involved the previous year. One of the females produced an egg in a cave on the southwest corner of the Paria Plateau. TPF attempted, unsuccessfully, to gain view of the cave that the quad (consisting of condors 114, 126, 133, and 162) had chosen as a first nest site. Several attempts by three climbers from cooperating agencies finally revealed egg shell fragments but little more. The quad continued to search out other potential nest caves after their failed nest attempt. Hoping that they would try again, TPF decided to encourage the quad to break into two pairs by recapturing condors 126 and 162. TPF was successful in recapturing them, but soon had to release them when a mountain lion fixated on the pen.

2004

Courtship displays intensified again in 2004, and by the end of February as many as 16 condors were engaged in courtship activities. Nest cave explorations increased, and one of the newest pairs, condors 133 and 158, intensively explored the west flank of the Kaibab Plateau for the first time but did not choose a nest. Two other pairs were successful in producing viable eggs. After trapping two problematic birds involved in a quad in 2003, condors 114 and 149 (a new pairing) were able to choose a nest cave only 600-700 meters from the Vermillion Cliffs release area. Based on observations, TPF suspected that the female laid an egg in the middle of March. The chick of that pair, later labeled Condor 342, fledged on November 23, 2004, and is doing well in the wild.

Condors 119 and 122, in their third year's attempt, followed suit with the laying of an egg in what has been referred to as the Battleship nest cave within the GRCA. The chick was visually confirmed in July just three days after the Vermillion Cliffs chick was observed. Condor 350 fledged two days after the Vermillion Cliffs chick on November 25, 2004. Condor 350 is still alive and well in the wild.

2005

There were two successful nesting attempts in 2005; one on the Vermillion Cliffs and one in the Grand Canyon. A third new pair nested on the Kaibab Plateau. Condor 114 and a new female Condor 126 nested in the same nest cave on Vermillion Cliffs that was used by 114 and 149 in 2004. The newest Vermillion Cliffs chick, Condor 389, was first observed on June 24, 2005, and successfully fledged on November 30, 2005. Condors 123 and 127 returned to production after a successful fledgling in 2003 with a new attempt yielding yet another chick from the Salt Creek cave. Condor chick 392 fledged on December 23, 2005. This young condor spent considerably more time on the ground than other wild-fledged juveniles, but later in the 2006 season took to flying with the rest of the flock.

A new pair initiated their first attempt on the east flank of the Kaibab Plateau where they utilized an ancient granary. All appeared well for condors 136 and 187 until late July when TPF concluded that hatching was overdue by nearly 30 days. On June 3, 2005, both condors returned to the release site and roosted there that evening which was a sure sign that they had failed. Within several days, TPF recovered the egg and submitted it for necropsy, which determined that the egg had died in the late stages of incubation.

2006

There are currently eight condor pairs in the wild in Arizona. Four pairs have fledged five young, beginning in 2003, and four of those five young survive today. Three pairs nested in 2006, but none were successful. After the Battleship Pair (119 female, 122 male) fledged Condor 350 within the Grand Canyon in 2004, the pair moved to a new location less than a mile

from the original nest and appeared to have laid an egg. One pair member (male Condor 122), however, exhibited the symptoms of late-stage lead poisoning just two weeks into incubation, and TPF was forced to capture it for treatment. Its mate (female Condor 119) subsequently abandoned the nest despite efforts to provide food in the area of the nest cave. A second pair (133 female, 158 male) established a nest and laid an egg in its first attempt on the west flank of the Kaibab Plateau. Although the incubation schedule appeared to be normal, the pair ultimately abandoned its unhatched egg well past term. TPF collected the egg and submitted it for analysis which revealed that the egg was fertile, but like another first attempt, the egg had died just before hatching. The third pair (136 female, 187 male) nested on the east flank of the Kaibab Plateau as they had in 2005. As in the 2005 attempt, their 2006 egg also failed to hatch, even though the eggs of both years were determined to be fertile. These events are not surprising, given that some of the other successful pairs have failed in their first two attempts.

Movements

The extent and pattern of condor ranging has changed somewhat from that of the first reporting period. In particular, the number of condors involved in courtship, pair formation, and breeding has increased with the number of mature, experienced birds. Condors have extended the length of time they frequent areas away from the release site, and they appear far more proficient in finding carrion. Toward the end of this reporting period, it appeared as though the observed dispersal of older breeding-age birds might result in more permanent changes in observed yearly movements. For example, a number of birds have come to reside for long periods in the hills outside Zion National Park (Figure 3), although during winter they have tended to return to the area of the release site where food is always available. The birds have frequented the area of two reservoirs (Kolob and Blue Springs) as well as several high-mountain meadows southeast of Cedar City (Figure 4).

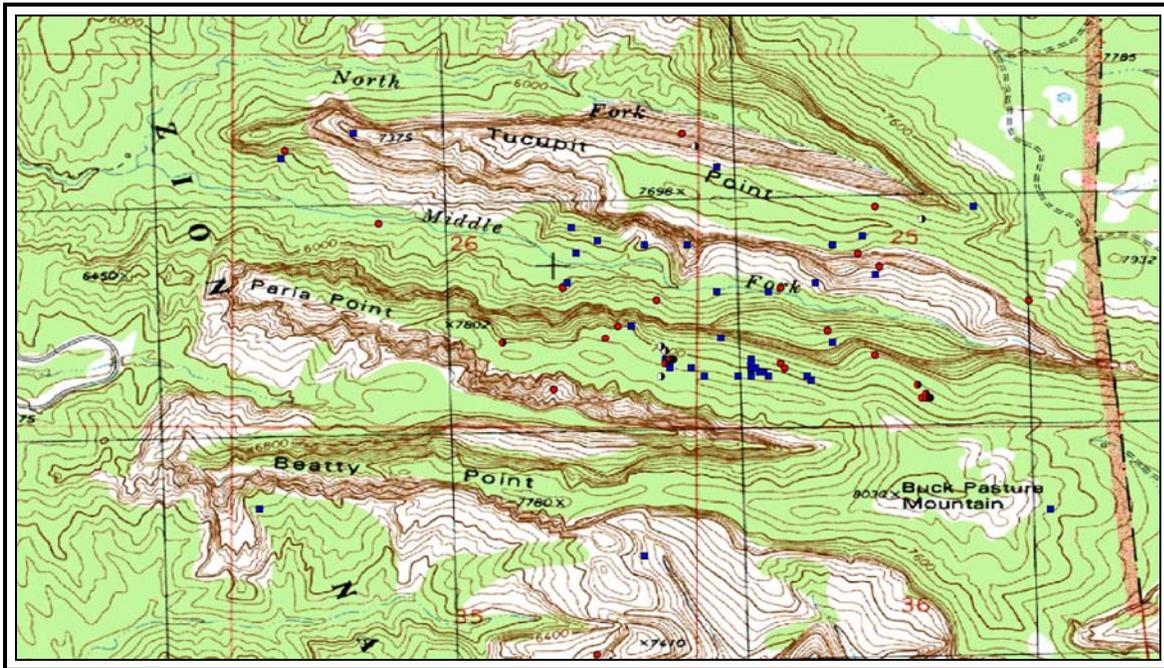


Figure 3. Condor locations during September 2006 in Kolob Canyon of Zion National Park (symbols of differing shapes and colors represent individual condors).

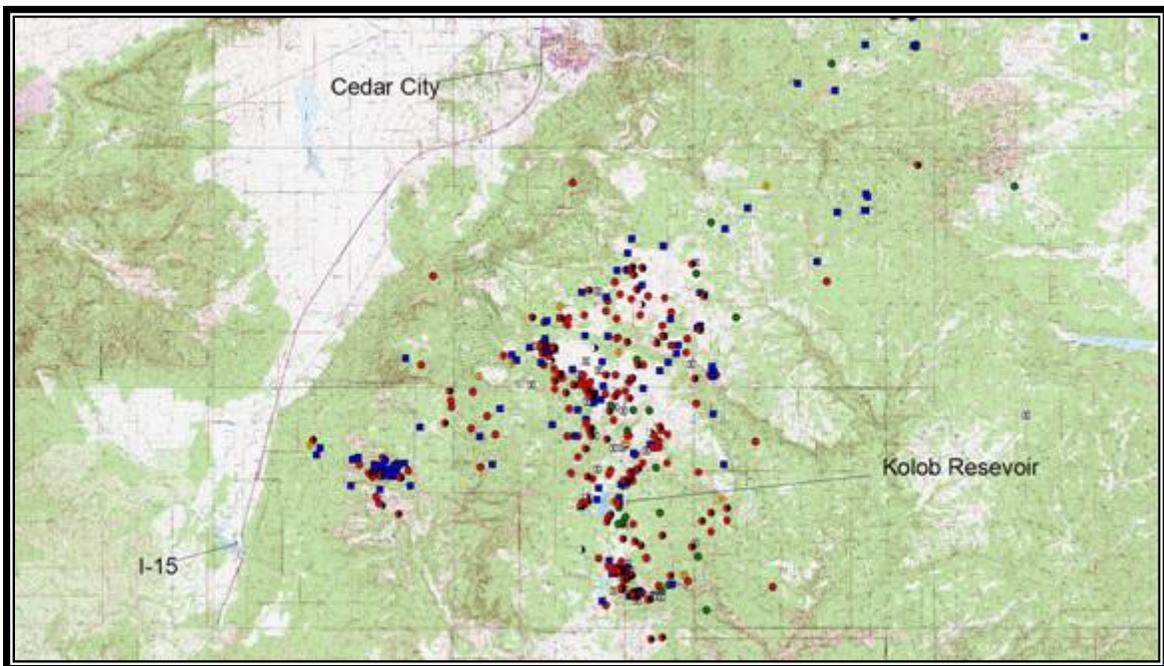


Figure 4. Condor use of the Kolob region of southern Utah obtained with GPS telemetry (symbols of differing shapes and colors represent individual condors).

Frequent condor movements to the Kaibab Plateau over the past five years have been the cause of both optimism and concern (Figure 5). The good news is that condors are ever more proficient in finding food on their own which strengthens the prognosis of an eventual self-sustaining and entirely wild population. However, there is increasing evidence that condors are encountering lead bullet fragments and pellets in the remains of rifle-killed deer (*Odocoileus* spp.), shot coyotes (*Canis latrans*), and hares (e.g., *Lepus* spp.) (Hunt *et al.* 2006). The GPS transmitters have been valuable for determining the exact locations of condor activity both in real time and in retrospect when individual condors later recaptured and tested at the release site show high lead levels. The transmitters have allowed TPF to locate and examine scavenged carcasses in a number of instances.

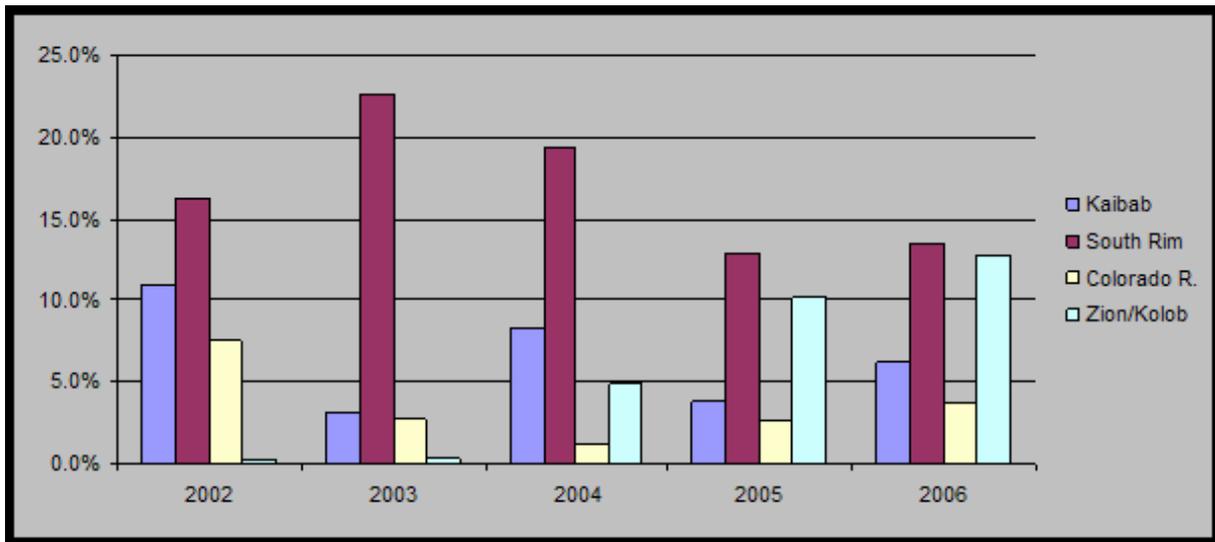


Figure 5. Condor night roost locations in areas outside the release site obtained with VHF telemetry (note the dramatic increase in the use of the Zion region of southern Utah in 2004 through 2006).

Health

For the purposes of analyzing and responding to lead exposure, the levels listed in Table 2 are used. For more information on lead exposure, the decision tree for treatment, and the treatment process (e.g. chelation) see Parish *et al.* (in press; abstract 3 in Appendix B).

Table 2. Lead exposure and response categories.

Field Blood Lead Level (µg/dl)	Indication	Management Response
0-14	Background	None
15-29	Exposure	Monitor
30-59	Exposure	Hold and monitor
>60	Toxicity	Hold and treat

During the first five years of the condor release program in Arizona, lead poisoning appeared to constitute an episodic rather than a chronic threat to condor survival. Throughout most of the first reporting period, there was little indication of lead exposure. In the early summer of 2000, however, a series of lead exposures and deaths (and additional suspected deaths) from ingesting lead shotgun pellets occurred. Two years later, in the fall of 2002, increased condor use of the Kaibab Plateau corresponded to elevated levels of lead in blood samples, followed by a similar pattern in subsequent years. The high yearly incidence of lead exposure during this reporting period has necessitated continued blood sampling and treatment (Figure 6). Meanwhile, research has identified condor use of rifle-killed deer and coyotes as the principal pathway of lead to condors in Arizona (Fry *et al.* 2003, Church 2006, Hunt *et al.* 2006, Hunt *et al.* in press). TPF radiographs have illustrated lead pellets and fragments in the digestive tracks of lead-poisoned condors and bullet fragments in rifle-killed deer and coyotes known to have been fed upon by condors. Moreover, TPF radiographs of the remains of deer killed with standard lead-based rifle bullets revealed a profusion of metal fragments as the normal condition. With the aid of GPS-satellite telemetry, TPF found an abrupt increase of blood lead levels corresponding with increased condor use of deer-hunting areas on the Kaibab Plateau in 2002 and thereafter. For additional information regarding lead exposure in relation to movements see Hunt *et al.* (in press; abstract 2 in Appendix B). Spikes in blood lead levels were associated with condor visitation to the Kaibab Plateau during and just after the 2002-2006 deer seasons, and there were significantly higher lead levels among condors visiting the plateau in the weeks prior to testing. The AGFD has responded by offering non-lead bullets to deer hunters in the primary area of exposure and a majority of the hunters have enthusiastically endorsed the program.

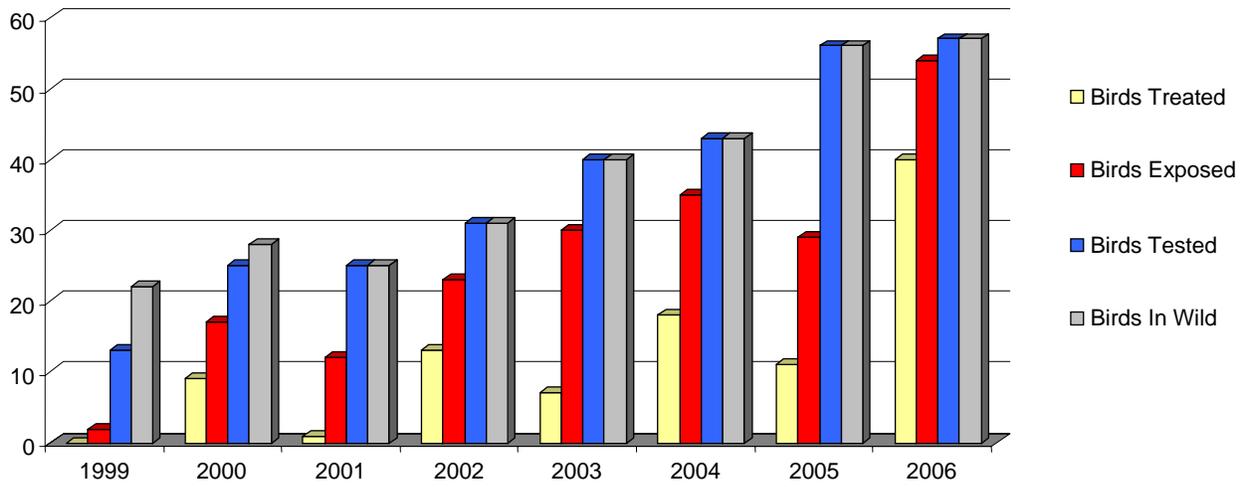


Figure 6. Number of condors exposed to, tested, and treated for lead (1999-2006).

The possibility of WNV in the wild population has been a concern as well. Since 2003, TNF has vaccinated condors and obtained blood samples to determine titers for WNV. So far, there has been no evidence of WNV in this population.

Below is a year-by-year summary of events associated with condor health in Arizona as reported by TPF:

2002

We were able to trap and test all birds in the population when they came to the release site, and we treated those birds that revealed high levels of lead in blood. In all, we found 23 condors with elevated levels, with 13 requiring treatment to purge the lead from their systems.

2003

We trapped all of the birds every six months to replace transmitters and take blood samples. We administered WNV vaccinations in July and August to all 40 condors in the Arizona population as per protocol from the Centers for Disease Control. Incidental to this abnormally-timed capture, we found evidence of 13 cases of lead exposure requiring five chelations. Two of the individuals (condors 203 and 235) requiring treatment had been observed feeding on a coyote carcass that we suspected to have been shot. We tested the coyote carcass and found metal fragments within the heavily scavenged carcass. Within two days the two condors associated with the contaminated carcass were trapped, tested, and radiographed. Both condors had radio-dense objects within their digestive tract and high blood lead levels, and both were immediately transferred to the Phoenix Zoo for treatment. Condor 235 had a blood lead level of 554µg/dl.

Both condors survived the lead exposure, subsequent treatment, and removal of the lead fragments. They were later released near the Vermillion Cliffs.

2004

Beginning June 17, 2004, we trapped every wild condor with the exception of the two new chicks and missing Condor 176. We vaccinated each bird (44 wild and 6 captive) for WNV per the protocol from the Centers for Disease Control and obtained blood samples for evaluating WNV titers. Incidental to the captures, we found evidence of 24 cases of lead exposure ($>15\mu\text{g/dl}$); two of those cases required chelation. The two individuals (condors 210 and 235) requiring treatment were observed feeding on carcasses that we suspected had been shot. But we found no fragments or pellets in what remained of the carcasses, nor did we find fragments in x-rays of these condors despite the high levels of lead in their system. After treatment, both condors were later released near the Vermillion Cliffs. Other trapping events revealed another 11 condors with indications of lead exposure and 16 more were chelated primarily in the winter months.

2005

We collected 171 blood samples during the reporting period; all free-ranging condors were tested as in past years. Over 50% showed lead levels indicative of lead exposure ($>15\mu\text{g/dl}$), and 23% (18 birds) required chelation treatment. Radiographs of four condors showed visible lead fragments ($n=2$) or shotgun pellets ($n=2$) in their stomachs. The condors with the pellets died, whereas the lead fragments of the other two were removed by a purging procedure administered by Dr. Kathy Orr, DVM, at the Phoenix Zoo.

To further advance the understanding of the lead issue, we supplied blood samples to the University of Arizona for a study sponsored by the AGFD to investigate lead isotopes in blood and lead fragments recovered in wild carrion and the digestive tracts of condors. We published a paper on the extent and pattern of rifle bullet fragmentation in deer (Hunt *et al.* 2006). We also presented three papers at the August 2005 meeting of the American Ornithologists Union (AOU) at the University of California at Santa Barbara and have submitted all three for publication in a special AOU symposium volume on the California condor. Although some of the papers will not appear until 2007, all are available through the internet at www.perergrinefund.org and www.azgfd.gov/condor. Also see abstracts 1 through 4 in Appendix B.

2006

TPF continued to focus on lead exposure detection and treatment as an essential element in maintaining the population. We collected 167 independent blood samples during the reporting period. As in past years, all free-ranging condors ($n=57$) were tested at least once during the reporting period. Fifty-four (95%) of the individuals showed lead levels indicative of lead exposure ($>15\mu\text{g/dl}$) occurring at some point in the reporting period. Thirty-four of the latter

(60%) revealed lead levels exceeding 65 µg/dl, and 40 birds (70%) were chelated. Radiographs of four of these condors showed radio-dense fragments consistent with those recovered in past years. The fragments were removed by a purging procedure administered by Dr. Kathy Orr and other staff at the Phoenix Zoo. As in the past, the Phoenix Zoo played an important role in the treatment of six lead-poisoned condors during 2006; four of the condors had late-stage lead poisoning. The condors were ataxic with crop stasis and some with lower extremity paralysis. Surgical procedures, including pharyngostomy and ingluviotomy, were utilized in treating the four condors, two of which were too sick to benefit from the procedure and later died. Two additional condors were treated at the Phoenix Zoo in January 2007 and died soon thereafter from exposure in 2006 and are therefore included in this document. An additional condor died of lead poisoning sometime in December 2006, and was collected from the field in January 2007.

In summary, shotgun pellets and rifle bullet fragments in animal carcasses have been the primary source of lead contamination to condors in Arizona. Radiographs allowed observations of lead pellets and fragments in the digestive tracks of lead-poisoned condors and bullet fragments in rifle-killed deer and coyotes known to have been fed upon by condors. Moreover, radiographs of the remains of deer killed with standard lead-based rifle bullets revealed a profusion of metal fragments as the normal condition (Hunt *et al.* in press). With the aid of GPS-satellite telemetry, TPF found that an abrupt increase of blood lead levels corresponded with increased use of deer-hunting areas on the Kaibab Plateau in 2002 and thereafter. Spikes in blood lead levels were associated with condor visitation there during and just after the 2002-06 deer seasons, and there were significantly higher lead levels among condors visiting the Kaibab Plateau in the weeks prior to testing.

Mortality

We recorded 18 fatalities in the first five-year period and 20 in the second five-year reporting period (Tables 3 and 4). Two of the lead-caused fatalities occurred in January 2007 but were the result of exposure in 2006 and are therefore reported here. One additional lead fatality with an undetermined date of death was recovered from the field in January 2007. GPS telemetry data indicate last activity in 2006, and therefore this fatality is also reported in this reporting period. Predation of newly-released condors, together accounting for one-third of fatalities during the first period, has been since mitigated by adaptive management, i.e., hazing of recently released condors to safer roosts, holding young condors longer before release, and the benefit of integrating into a larger, more experienced flock. We have recorded no collisions or electrocutions since installing mock power poles, although there are comparatively few powerlines in the region. The “suspected lead poisoning” category in the first period stemmed from the coincidental deaths of undiagnosed condors with an episode of known poisoning fatalities. The higher number of deaths from lead ingestion in the second period principally resulted from an increased reliance on wild carrion (Hunt *et al.* in press). We cannot rule out the possibility that a proportion of fatalities in the “missing” and “unknown” categories were lead related. Moreover, we believe that significantly more deaths would have occurred had we not performed some 89 chelations during the second period.

The single fatality of a wild-hatched individual (Condor 305) occurred at 501 days post-fledging during the transition to independence from parental feeding. Due to the condition of the body at the time of recovery, an exact cause of death was not determined. The other four wild-hatched chicks are integrated into the flock and are surviving today.

Table 3. Condor mortality factors of the first and second five-year periods of the reintroduction program (includes birds that died or were recovered from the field in 2007 as a result of lead exposure in 2006).*

Mortality Factor	1996-2001	2002-2006
Coyote predation	4	1
Eagle predation	3	0
Lead poisoning	3	9*
Suspected lead poisoning	2	0
Power line Collision	1	0
Shooting	1	2
Starvation	1	2
Septicemia (blood poisoning)	1	0
Missing	2	4
Unknown	0	2

Table 4. Condor fatalities of the second five-year period of the reintroduction program (*indicates a bird that died or was recovered from the field in 2007 as a result of lead exposure in 2006)

Condor	Source of Mortality	Sex	Age at Release (years)	Age at Death (years)	Days Free-flying
252	Coyote	Male	0.8	0.8	0
347	Starved	Male	0.8	0.9	34
240	Lead	Male	0.8	1.4	202
258	Shot	Male	0.7	1.4	251
305	Starvation	Male	Wild hatched	1.9	501
353	Missing	Female	1.7	2.0	100
300	Missing	Female	0.9	2.1	426
291	Unknown	Male	1.6	2.5	360
304	Lead	Male	0.9	2.9	727
249	Lead	Male	1.4	4.1	1001
186	Shot	Male	0.6	4.4	1382
198	Unknown	Male	1.0	4.5	1256
235	Lead	Female	0.6	5.1	1640
248*	Lead	Female	0.8	5.6	1763
176	Missing	Female	0.7	5.9	1911
227*	Lead	Male	0.7	6.7	2205
232*	Lead	Male	0.7	6.7	2191
196	Missing	Male	0.7	7.3	2414
149	Lead	Female	0.5	9.8	3385
119	Lead	Female	2.2	11.8	3517

Demography Overview

We addressed the overall impact of the various mortality agents on the demography of the condor population in Arizona and Utah in a paper presented by Woods *et al.* (in press; see abstract 4 in Appendix B) at the AOU conference in August 2005. The authors concluded that, in the absence of releases, the condor population can be expected to increase under a projected rate of natural reproduction, but that increase would require the continuation of the current regime of lead testing and treatment. This suggests that, whereas the population can apparently

tolerate the impact of the aggregate of other mortality factors, the added impact of lead-related deaths resulting from lack of treatment would likely prevent the establishment of a self-sustaining population. The difficulty of making such assessments with condors is that adult survival must necessarily be very high because very small proportional changes in mortality can have large effects on demographic trend. Given the relatively small size of the population, a small increase in the number of annual deaths can negatively impact the trend of the population. Lead poisonings can be episodic, like those observed in summer 2000, so the question of sustainability will remain unanswered for some time to come. Meanwhile, we will continue to closely monitor the population and to apply adaptive management whenever and wherever indicated.

Analysis of demographic data is an involved process, often including evaluation of the number of days each bird was free-flying in relation to its death, as described for example in Woods *et al.* (in press). A full evaluation using this process is underway for the past five years of the project. Below is a very simple listing of birds in the population and their survival which is provided to partly address the “mortality rate” requirement of the rule designating the experimental population.

For the first five-year review period (1996-2001):

- 47 individuals were released; 18 (38.3%) individuals died
- 3 individuals were returned to captivity

For the second five-year review period (2002-2006):

- 26 individuals survived from the first period; 9 (34.6%) individuals died
- 46 individuals were released into the population; 10 (21.7%) individuals died
- 5 wild-hatched chicks were added to population; 1 (20%) individual died
- Overall, there were 77 individuals in the population; a total of 20 (26%) died

For the first ten years of the reintroduction program (1996-2006):

- 93 individuals were released
- 3 individuals were returned to captivity
- 5 wild-hatched chicks were produced
- 38 (40%) of the 95 individuals (that were not returned to captivity) died

LEAD-REDUCTION EFFORTS

Introduction

Although lead toxicity in wild condors in California had previously been identified as a concern among wild condors in California (Janssen *et al.* 1986, Wiemeyer *et al.* 1988, Snyder and Snyder 1989 and 2000, Pattee *et al.* 1990, and Meretsky *et al.* 2000), it was unknown if lead toxicity would be a significant problem among the reintroduced condor population in northern Arizona and southern Utah. Lead toxicity was identified as a management issue during the first five

years (1996-2001) of the Arizona reintroduction program (Arizona Condor Review Team 2002), but it has only been during the last five years (2002-06) that condor lead exposure has emerged as a critical management issue. Lead toxicity has been identified as the leading cause of condor mortality, with twelve confirmed and two suspected cases (see Mortality section; Woods *et al.* in press, see Appendix B). Since the first known lead exposure incident in 2000, condor dispersal from the release site has intensified, resulting in increased foraging on non-proffered carrion such as mule deer (*Odocoileus hemionus*), elk (*Cervus elaphus*), and coyotes (Cade *et al.* 2004; Parish *et al.* in press, see Appendix B). During this time, the highest frequency of lead exposure in condors has been associated with increased movements away from the release site, and the consumption of non-proffered carcasses potentially containing lead from spent ammunition (Hunt *et al.* 2006, see Appendix B; Hunt *et al.* in press, see Appendix B). Moreover, since 2002, the highest numbers of lead exposure events have repeatedly occurred during the fall hunting season in the Kaibab Plateau region (Hunt *et al.* in press). Furthermore, ingested lead pellets and bullet fragments have been recovered from the digestive tracts of several condors that tested positive for lead exposure (Parish *et al.* in press).

Since 2002, condor trapping, lead testing, and treatment efforts have been amplified in response to the increased threat of lead exposure (Cade *et al.* 2004, Parish *et al.* in press). Although field biologists have managed to reduce the number of condor deaths due to lead toxicity by pursuing this rigorous monitoring and treatment protocol (Parish *et al.* in press), these efforts are highly invasive, labor intensive, and costly. In addition, the long-term sub-lethal effects of lead exposure in condors are unknown. Thus, it is unlikely that the northern Arizona and southern Utah condor program will succeed at achieving a self-sustaining condor population with the above-mentioned lead exposure situation (see Demography Overview section).

After the fall 2002 hunting season (see Health section), it became evident to project cooperators that steps must be taken to reduce the amount of lead available to condors in Arizona. A voluntary lead-reduction program was initiated in 2003. While research into the prevalence and effects of lead on condors (Fry and Maurer 2003, Fry 2004, Church *et al.* 2006) and lead-reduction efforts (see www.projectgutpile.org) have also occurred in California, efforts in Arizona have focused on voluntary measures to reduce the amount of lead available to condors in the wild. This is due to a consensus among project cooperators that voluntary measures are the best course of action to take in Arizona. Further, unlike releases in California, condors in Arizona are managed under the 10(j) rule of the ESA (see the Compliance of Federal Agencies with Sections 7(a)(1), 7(a)(2), and 7(a)(4) of the Endangered Species Act section and U.S. Fish and Wildlife Service 1996a).

For a timeline of significant lead-reduction efforts undertaken by condor project cooperators, see Appendix C. Information on lead-reduction efforts in Arizona through 2005 was also reported in Sullivan *et al.* (in press; see abstract 5 in Appendix B). Surveys and research cited in this section are available on-line at www.azgfd.gov/condor and www.peregrinefund.org.

Surveys and Focus Group

In May 2003, the lead reduction subcommittee of the California Condor Recovery Team compiled a report on condor-lead issues (Redig *et al.* 2003). As part of the effort to reduce lead exposure in condors, the AGFD contracted the Wildlife Management Institute (WMI) to determine hunter knowledge of and attitudes towards lead poisoning in condors. Responsive Management and D. J. Case and Associates (D. J. Case) were contracted by WMI to determine the knowledge and attitudes.

During the fall of 2003, Responsive Management conducted phone surveys of 205 Arizona and 200 Utah hunters (Responsive Management 2003 and 2003a). Among other questions, hunters were asked if they were aware that lead poisoning was a problem faced by condors; if they were aware of any educational efforts to try to reduce lead poisoning in condors; and what actions they would be willing to take to help reduce lead exposure in condors. Key findings from the surveys included that only 23% of Arizona hunters and 12% of Utah hunters were aware that lead poisoning was a problem faced by California condors. In addition, only 9% of hunters in Arizona and 2% in Utah were aware of any educational efforts to reduce condor deaths from lead poisoning. However, most Arizona and Utah hunters stated they would be “somewhat or very willing” to take actions during their hunt to help condors. These actions included: removing all carcasses from the field (97% AZ, 98% UT); burying or hiding all gut piles (89% AZ, 86% UT); removing bullets and surrounding affected flesh (84% AZ, 78% UT); and using non-lead ammunition (83% AZ, 78% UT). These data established a baseline to measure subsequent changes in hunter knowledge and opinions.

D. J. Case incorporated the data from these phone surveys with information from interviews of condor professionals and literature searches to develop condor conservation and lead-reduction test messages. Test messages were discussed and rated during three focus group meetings of Arizona and Utah hunters and ranchers held in December 2003 (D. J. Case and Associates 2005). The best-scoring communication message from the focus groups was: “Hunters and ranchers have a long history of caring for the land and conserving all kinds of wildlife. They can continue this tradition and help prevent lead poisoning in California condors by taking one or more of the following actions in condor range: use non-lead ammunition; retrieve all animal carcasses; hide carcasses or gut piles to make them inaccessible to condors; and/or remove bullets and affected flesh from animal carcasses left in the field.” Focus groups also revealed that hunters and ranchers were not convinced that spent lead ammunition was a major cause of condor lead poisoning. They requested credible data linking lead ammunition to condor lead poisoning. They also expressed a greater willingness to help condors if asked by a credible source. In Arizona, hunters and ranchers considered sportsmen’s groups and the state wildlife agency to be the most credible sources.

Focus group results were then utilized to develop a communication strategy. The strategy included actions such as increased education, communication and cooperation between condor project cooperators and the hunting community, continued condor lead exposure research, and

the implementation of a non-lead ammunition program (D. J. Case and Associates 2005 and 2005a).

Education and Communication

Data obtained from the phone surveys and focus groups were utilized to create an education and communication strategy to gain support for voluntary lead reduction efforts in Arizona's condor range (D. J. Case and Associates 2005). In 2003, the AGFD began hunter education and communication efforts and have expanded these efforts each subsequent year. Each year from 2003-06, condor lead exposure data, accompanied by a request for voluntary lead reduction actions, were mailed to 3,700-7,800 hunters drawn for hunts within the condor range in northern Arizona. In addition, a full page in the Arizona hunting regulations has been devoted to the condor-conservation and lead-reduction message since 2003. Notices about condors and lead have also been posted in the Kaibab Plateau region for deer and varmint hunters. Condor-lead educational booths at shooting events and sportsman's expos have also been utilized.

The AGFD encouraged local sportsmen's groups to join a Condor Coalition consisting of sportsmen's groups and government agencies supporting voluntary efforts to reduce the amount of lead available to condors. As of January 2007, local and national Condor Coalition members included the Arizona Antelope Foundation, Arizona Deer Association, Arizona Desert Bighorn Sheep Society, Arizona Elk Society, AGFD, Arizona Chapter of the National Wild Turkey Federation, Boone & Crockett Club, BLM-ASDO, GRCA, International Hunter Education Association, Kaibab National Forest, National Shooting Sports Foundation, North American Grouse Partnership, Sporting Arms and Ammunition Manufacturers' Institute, TPF, FWS, and WMI. Coalition members support voluntary lead-reduction efforts within the condor range and fund condor conservation and lead-reduction educational efforts.

Personnel from cooperating agencies of the Arizona condor project, including AGFD, TPF, NPS, FWS, USFS, and BLM attended "one-voice" condor training on August 5, 2005. Project cooperators were trained to communicate a consistent and effective message regarding voluntary lead-reduction efforts in the condor range. Personnel also continued to disseminate the condor lead-exposure-reduction message within their agencies and to the public. Representatives from Arizona sportsmen's groups also attended "one-voice" condor training on August 6, 2005, in order to disseminate accurate and consistent information to their members.

The general public has received the condor-conservation and lead-reduction message through educational presentations, wildlife-fair displays, the internet, and media outlets. AGFD and TPF have presented forty to seventy condor educational programs each year between 2003 and 2006. AGFD's condor web page (www.azgfd.gov/condor) first carried the condor lead-reduction message in 2003, and has been expanded and updated each year to incorporate ongoing research and new information on condors and lead. Media coverage has included magazine and newspaper articles in local publications, as well as a condor segment on AGFD's "Wildlife

Views” television program and a piece in AGFD’s “Wildlife Views” magazine. Since 2003, AGFD’s lead-reduction outreach efforts have reached an estimated 10,000 people annually.

Lead Research

Arizona and Utah hunters and ranchers indicated that they needed more data linking lead ammunition to condor lead poisonings to increase their support for voluntary lead reduction efforts (D. J. Case and Associates 2005). The AGFD and TPF responded by conducting and funding five research projects related to condor lead exposure and lead ammunition. First, TPF condor project biologists recorded lead exposure and lead ammunition ingestion by condors starting in 1999 and have summarized the data through June 2005 (Parish *et al.* in press; see abstract 3 in Appendix B).

Second, lead toxicity mortality rates were recorded by TPF and summarized through January 2005 (Woods *et al.* in press; see abstract 4 in Appendix B). Data from these two studies verify that lead exposure is a critical management issue in Arizona. Starting in 2004, condor lead exposure, lead-ingestion, and lead-toxicity data have been reported to hunters in the annual AGFD hunting regulations and reported to the public through educational programs.

Third, since 2003, AGFD has purchased 21 GPS satellite transmitters to track condor movements. Transmitters were mounted on the patagia of individual condors and TPF used data from these transmitters along with data from conventional VHF transmitters to compare condor movements between July 2001 and June 2005 in relation to lead-exposure rates (Hunt *et al.* in press, see abstract 2 Appendix B). An association between high lead-exposure rates and increased use of the Kaibab Plateau in northern Arizona during deer hunting season was confirmed (Hunt *et al.* in press). Starting in 2005, data from this study have been shared with hunters and the public.

Fourth, TPF conducted research from 2002 to 2004 to determine the extent of lead bullet fragmentation in rifle-killed deer (Hunt *et al.* 2006, see abstract 1 in Appendix B). This study demonstrated that standard lead bullets typically fragment into hundreds of pieces before exiting a target such as a deer, and that these fragments remain in the deer carcasses as well as the gut piles. The study also confirmed that the fragmentation rate of pure copper bullets is minimal compared to that of lead bullets (Hunt *et al.* 2006).

The fifth study is an ongoing lead isotope study funded by the AGFD and conducted by the University of Arizona, Tucson, using biological samples provided by TPF condor biologists. This study aims to conclusively determine the pathway for lead exposure in condors. Lead isotope ratios of condor blood and lead removed from condor digestive tracts are being compared to lead isotope ratios of lead retrieved from carcasses on which condors feed, lead ammunition, and other possible lead sources. Preliminary results have established a direct match between lead ammunition and lead found in condor blood and digestive tracts (Chesley *et al.* 2006). As

they become available, data from this study are incorporated into the communication strategy and shared with the public.

Non-lead Ammunition Program

The AGFD, using money from the Heritage and Wildlife Conservation funds (i.e., Arizona state lottery and Indian gaming revenue), administered a free non-lead ammunition program for the fall 2005 and 2006 hunting seasons in game management units within the condor range in Arizona. AGFD partnered with Cabela's, Sportsman's Warehouse, Federal Ammunition, and Barnes Bullets and offered free non-lead ammunition to deer, pronghorn (*Antilocapra americana*), bighorn sheep (*Ovis canadensis*), and buffalo (*Bison bison*) hunters drawn for hunts within the core condor foraging range (game management units 12AE, 12AW, 12B, and 13A, see Figure 7). Coupons to obtain the free ammunition accompanied a letter outlining condor lead poisoning issues and asking for hunters' help in reducing the amount of lead available to condors. Coupons were mailed at the beginning of August. The fall hunting season began in late October and continued through December. Coupons were redeemable through mid-November each year.

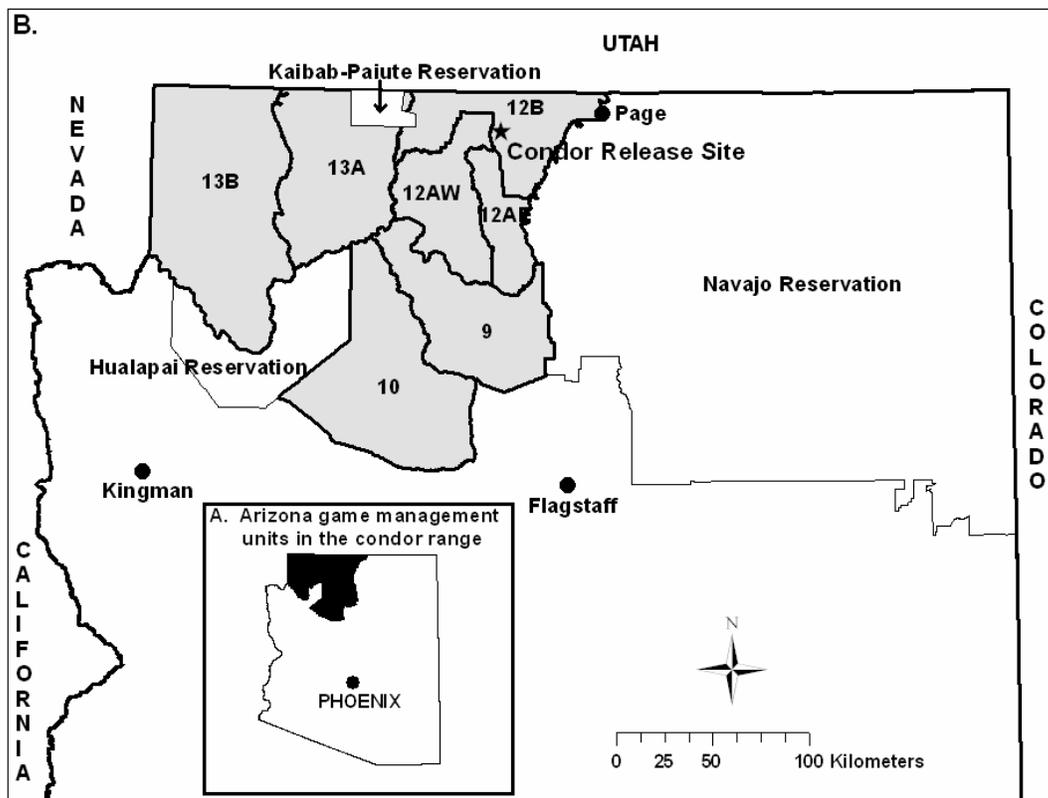


Figure 7. Arizona game management units within the condor range.

In 2005, hunters holding permits for deer, bighorn sheep, and buffalo rifle hunts in Units 12AE, 12AW, and 12B qualified for the free non-lead ammunition program, and hunters holding permits to hunt big game in Units 9, 10, 13A, and 13B were mailed letters asking them to take voluntarily lead-reduction actions. In 2006, hunters holding permits for deer, pronghorn, bighorn sheep, and buffalo rifle and muzzleloader deer hunts in Units 12AE, 12AW, 12B, and 13A qualified for the free non-lead ammunition program. Hunters holding permits to hunt big game in Units 9, 10, and 13B were also asked to take voluntary lead-reduction actions. Turkey (*Meleagris gallopavo*) hunters from all Units were mailed letters asking them to take voluntary lead-reduction actions for the spring and fall hunts each year. Hunters who participated in the free non-lead ammunition program received either 40 rounds of loaded rifle ammunition, 50 bullets for hand-loading, or 48 muzzleloader rounds and were encouraged to properly sight in their gun before their hunt.

In 2005, 1,551 (65%) of the 2,390 eligible hunters from Units 12A and 12B redeemed their coupons for free non-lead ammunition. Because 107 (7%) of the hunters actually redeemed two coupons (due to a logistical error), 1,658 coupons were redeemed in 2005 (Table 5). In 2006, hunters from an additional Unit (13A) and muzzleloader hunters were added to the program. The total number of big game tags in Units 12A, 12B, and 13A was reduced by 1,000 in 2006, however. Hence, a total of 1,390 deer, pronghorn, bighorn sheep, and buffalo hunters were eligible for free non-lead ammunition in 2006. In addition, loaded non-lead rifle ammunition was offered in more calibers and grain weights and all-copper bullets were offered for hand-loaders in 2006. Program results were similar in 2006, with 832 (60%) of eligible hunters participating in the free non-lead ammunition program. Available ammunition included Federal Premium Vital-Shok cartridges loaded with Barnes Bullets, Barnes 100% copper Triple-Shok X-bullets for hand-loading, and Barnes 100% copper muzzleloader ammunition.

Table 5. Non-lead ammunition obtained by hunters through the free ammunition program in 2005 and 2006 (* n/a = not available).

Caliber	Bullet weight (grains)	Number Of Coupons Redeemed in 2005	Number Of Coupons Redeemed in 2006
<i>Loaded rifle ammunition – 40 cartridges offered</i>			
.243 Winchester	85	n/a*	41 (5%)
.25-06 Remington	100	44 (3%)	13 (2%)
.270 Winchester	130	343 (21%)	129 (16%)
.270 Win. Short Magnum	130	21 (1%)	9 (1%)
7mm Win. Short Magnum	160	14 (1%)	7 (1%)
7mm Remington Magnum	160	291 (17%)	128 (16%)
.308 Winchester	150	130 (8%)	31 (4%)
.308 Winchester	165	n/a	5 (1%)
.30-06 Springfield	165	n/a	101 (13%)
.30-06 Springfield	180	534 (32%)	99 (12%)
.300 Win. Short Magnum	165	n/a	8 (1%)
.300 Win. Short Magnum	180	47 (3%)	22 (3%)
.300 Winchester Magnum	165	n/a	14 (2%)
.300 Winchester Magnum	180	182 (11%)	67 (8%)
.300 H&H	180	n/a	1 (<1%)
.300 Weatherby	180	n/a	41 (5%)
.300 Remington Ultra Mag	180	n/a	26 (3%)
.338 Winchester Magnum	225	52 (3%)	21 (3%)
Hand-loading rifle bullets – 50 bullets offered			
6mm	85	n/a	2 (<1%)
.25	100	n/a	0 (0%)
.25	115	n/a	2 (<1%)
6.5mm	120	n/a	0 (0%)
.270	130	n/a	8 (1%)
.270	140	n/a	7 (1%)
7mm	140	n/a	7 (1%)
7mm	160	n/a	3 (<1%)
.30	130	n/a	2 (<1%)
.30	150	n/a	5 (1%)
.30	165	n/a	4 (<1%)
.30	180	n/a	4 (<1%)
8mm	180	n/a	0 (0%)
.338	185	n/a	1 (<1%)
Totals (for rifle cartridges and bullets)		1658 (100%)	808 (100%)

Muzzleloader ammunition – 48 bullets and 1 loading jag offered			
.45	195	n/a	0 (0%)
.50	245	n/a	2 (8%)
.50	250	n/a	0 (0%)
.50	250	n/a	12 (50%)
.50	285	n/a	0 (0%)
.50	290	n/a	9 (38%)
.50	300	n/a	0 (0%)
.54	275	n/a	0 (0%)
.54	325	n/a	1 (4%)
Totals (for muzzleloader ammunition)		n/a	24 (100%)

To help evaluate the success of the 2005 free ammunition program, AGFD worked with D. J. Case and Associates to develop two post-hunt surveys, one for non-lead ammunition program participants and one for non-participants. Surveys were mailed in November 2005 to all 2,390 eligible hunters. A total of 1,105 surveys (46%), including 943 participant (61%) and 162 non-participant (19%) surveys, were completed and returned by December 15, 2005 (D.J. Case and Associates 2006). Findings suggested that the main reasons why hunters participated in the non-lead ammunition program were: they were asked to participate by AGFD (95%); they wanted to help condors (92%); and the ammunition was free (87%). Survey results indicated that 81% of all participants used the free non-lead ammunition during their hunts. Ninety-three percent of the respondents who harvested a deer said the non-lead ammunition performed the same as, or better than, lead ammunition. In addition, 97% of the respondents who tested the non-lead ammunition stated its accuracy was average to excellent. Eighty-nine percent of the respondents said they would use non-lead ammunition again if it was provided for free, and 56% indicated that they would purchase it on their own in the future. Lastly, 72% of the respondents said they would recommend non-lead ammunition to other hunters.

Non-participant survey results indicated several reasons why hunters did not participate in the free non-lead ammunition program. Thirty percent of respondents listed their main reason as the program failing to offer their desired caliber, grain weight, or type of non-lead ammunition, and 15% indicated that the program was too complicated or a hassle (D.J. Case and Associates 2006). Forty-three percent stated their reason for non-participation as “other.” “Other” reasons included: coupon was lost (15%); forgot to participate (8%); already using non-lead ammunition (5%); did not hunt (3%); and do not support this program (3%). Non-participants suggested that offering more calibers of non-lead ammunition (64%) and providing more information on condor lead poisoning (38%) would have encouraged more hunters to participate in the free non-lead ammunition program.

2005 survey results and 2006 hunter-check-station interviews, combined with the free non-lead ammunition program results, indicated that approximately 50-60% of the deer from game management units 12A and 12B were harvested with non-lead ammunition during 2005 and

2006 fall hunts as a result of the free non-lead ammunition program. Hence, voluntary lead-reduction efforts have reduced the amount of lead available to condors in Arizona. This program has also received overwhelmingly positive feedback from the hunting and environmental communities, demonstrating the merit of this ground-breaking cooperative effort. Although great strides have been made in the last five years, condor lead-exposure data suggests that the current 60% participation rate by big game hunters in Arizona may not be sufficient to sustain a healthy condor population in Arizona and Utah (see Health and Mortality sections). In response, the AGFD, TPF, and our partners plan to significantly increase hunter outreach efforts in an attempt to reach a 90-100% participation rate by big game hunters within the core condor range.

Cooperator Lead-Reduction Efforts

Since 2003, the AGFD has provided free non-lead ammunition to law enforcement officials and other professionals who may dispatch injured animals within the condor range. Project cooperators also coordinated an injured animal dispatching protocol with NPS and local law enforcement agencies in 2004 to ensure that animals dispatched with lead could be identified and removed from the field. Wildlife Services (WS) of the U.S. Department of Agriculture (USDA) Animal and Plant Health Inspection Service (APHIS) also initiated a lead-reduction protocol for their activities within the condor range (see the USDA APHIS-Wildlife Service's Activities section).

Treatment Facility

In an effort to more effectively diagnose and treat condors with high blood lead levels, the AGFD and TPF have partnered to equip and run an on-site condor treatment facility in Marble Canyon, Arizona. Condors that test positive for lead exposure in the field can now be transported to the treatment facility. Birds can receive chelation treatment and x-rays on-site. A rehabilitation pen and isolation chambers are utilized to monitor and collect fecal samples from birds being treated for lead exposure. Prior to establishment of this facility, birds had to be transported to an animal hospital in Page or Flagstaff for x-rays and treatment. Condors exhibiting clinical symptoms of lead toxicity are still transported to the Phoenix Zoo for treatment.

Comments and Recommendations

It is important to note that while the current free non-lead ammunition program is focusing on reducing the use of lead bullets in condor range, reducing the use of lead shot in condor range is also important. In Arizona, lead shot has been removed from the digestive tracts of seven condors (Parish *et al.* in press). Condor ingestion of lead bullet fragments has been associated with the fall hunting season (Hunt *et al.* in press), while condor ingestion of lead shot has been less predictable, and is not associated with a well-defined hunting season. Therefore, a free non-lead shot program would be logistically complex and probably much less effective than a free non-lead bullet program. Future lead-reduction efforts will include increased attempts to reduce

the use of lead shot within the condor range. AGFD acknowledges, however, that these efforts may be less productive than lead bullet reduction efforts. AGFD remains hopeful that the voluntary use of non-lead shot will increase due to our communication efforts. There are also concerns about year-round rifle varmint hunting and the availability of non-lead ammunition for that purpose. In 2007, some non-lead .22 caliber ammunition will be available.

A significant factor in the success of voluntary lead-reduction efforts is the availability and affordability of non-lead ammunition. Although non-lead slugs and waterfowl shotgun pellets are commonly available, only a few bullet manufacturers offer non-lead rifle ammunition alternatives (Table 6), with a selection that is far less complete than that of lead ammunition. And although the recent increase in availability of non-lead ammunition gives cause for optimism, we encourage ammunition manufacturers to further expand the production of non-lead alternatives. AGFD also requests that ammunition retailers offer more non-lead ammunition for their customers. The AGFD free non-lead ammunition program will not continue indefinitely, so it is crucial that sportsmen in condor range are able to procure a wide variety of non-lead ammunition at reasonable prices. Available non-lead rifle ammunition is loaded with 100% copper Barnes X, Barnes XLC, Barnes Triple Shock X, and Barnes Solid bullets. Non-lead shot is composed of steel, tungsten, bismuth, and tin. A more complete list can be found at the California condor web page at www.azgfd.gov/condor. The impact of bonded lead/copper bullets and their fragmentation characteristics needs additional evaluation.

Table 6. Non-lead ammunition manufacturers.

Non-lead Rifle Ammunition Manufacturers	Non-lead Shotgun Ammunition Manufacturers
Black Hills Gold	Bismuth Cartridge
Conley Precision Cartridge	Estate Cartridge
Cor-bon Ammunition	Federal Premium Ultra Shok
Federal Premium Vital Shok	Hevi-shot
PMC Gold Line	Kent Cartridge
PMP Super Rifle Ammunition	Remington Premier
Safari Arms Ammunition	Sellier and Bellot
Superior Ammunition	Winchester
Weatherby Premium	Wolf Ammunition

Future work to reduce condor lead exposure will include expanding education and communication efforts by increasing the quantity and effectiveness of oral and written lead-reduction messages, while specifically targeting hunters and sportsmen. Future education and communication efforts will attempt to include all Arizona sportsman’s groups, Arizona hunting guides, the State of Utah, Utah hunters and sportspersons, the Navajo Nation, the Kaibab Band of Paiute Indians, the Havasupai Tribe, the Hopi Tribe, ammunition manufacturers, and ammunition retailers.

Condor program cooperators also plan to incorporate strategic use of the media. AGFD will request that, beginning in 2007, the condor conservation and voluntary lead-reduction message be published in Condor Coalition member's newsletters. An attempt will be made to include the condor-lead message in other sportsmen and hunter publications as well. Messages will focus on the conservation history of hunters and commend those hunters and sportsmen's groups who support voluntary lead-reduction efforts within the condor range. The success of these efforts will therefore be dependent upon the cooperation of media organizations.

Future efforts to expand the Condor Coalition will focus on recruiting influential local and national sportsmen's groups. Because hunters consider sportsmen's groups the most credible source for information, the use of Coalition member names in hunter correspondence will be a valuable communication tool. Coalition members will also be asked to contribute to educational efforts and possibly assist in funding voluntary lead-reduction efforts.

Relevant lead research will also continue. Results from the University of Arizona lead isotope study will be published and shared with the public, as will results from the free non-lead ammunition program. Future lead research will be considered and will include fragmentation rates of newer bonded bullets (Hunt *et al.* 2000) and lead isotope studies of feathers to determine lead exposure levels and sources (Fry 2004, Church *et al.* 2005).

It is important to assess whether voluntary lead-reduction efforts in Arizona are effective in reducing the amount of lead available to condors. To accomplish this, AGFD will combine sustained condor lead-exposure monitoring with hunter surveys. TPF will continue condor lead-exposure testing to determine if lead-exposure rates decrease. A follow-up hunter awareness survey is also proposed (D. J. Case and Associates 2005) to determine if education and communication efforts have resulted in an increased awareness of condor issues and a decreased use of lead ammunition in the condor range.

ADMINISTRATION

Coordination Among Program Cooperators and Compliance with Commitments

The 1996 MOU established a framework for cooperation among the various state and federal agencies, Tribal governments, and TPF involved in the reintroduction of California condors in northern Arizona and southern Utah. Not all signature agencies/organizations had the same level of involvement in the program. This original MOU was for a period of five years.

In 2005, a new MOU was signed by the "primary" cooperators that are active in the program. The new MOU does not include original cooperators who had not been active, but it does allow for those and others to be added to the list of cooperators as needed. This current MOU was signed by AGFD, UDWR, FWS Regions 1, 2, and 6, TPF, BLM-ASDO, NPS, and USFS (Kaibab National Forest). It is also for a period of 5 years, but can be renewed based on mutual

agreement. One benefit of this new MOU is that it promotes cooperation among participants for the betterment of the program by clearly defining the roles of each cooperator.

In late 2004, the chair of the SCWG was changed and representatives of the AGFD and UDWR now co-chair the committee. A liaison was also established for the California Condor Recovery Team. This change in chairs has improved administration of the SCWG with more timely minutes of meetings and follow-up on action items from the previous and current meetings to gauge progress. Since this change, regular spring and fall meetings of cooperators have taken place.

Coordination with the California program on a field level has improved due to regular meetings of field staff to share information. However, due to the lack of a dedicated national California Condor Recovery Coordinator through much of the reporting period, administrative coordination was sporadic. FWS recently assigned a new lead for this program.

AGFD provided a full time California Condor Coordinator to work with the TPF biologists on day-to-day management, and to improve outreach opportunities and program coordination.

The GRCA condor biologist left the program in 2005, and GRCA has been unable to fill this position although it is likely to be filled in 2007. This has resulted in their more limited involvement with the SCWG except on items of immediate interest. NPS interpretive staff offer daily condor education programs during the summer.

SCWG representatives have informed and briefed the Hopi Tribe, Navajo Nation, and Kaibab Band of Paiute Indians on the program and ongoing projects.

The SCWG had representatives on a subcommittee of the California Condor Recovery Team dedicated to mitigating lead availability to condors. This committee arranged for a survey of hunters within the condor range in California, Arizona, and Utah to determine awareness of the program and knowledge of lead issues. The SCWG further provided a central source for information and produced a final report to the Recovery Team.

As part of this review, SCWG participants were asked to comment on their perspectives regarding coordination and cooperation. Responses are presented below.

The UDWR has observed substantial improvement in communication and coordination between cooperators during this review period. This improvement and this has allowed for much more efficient dissemination of information to interested Utah-based agencies. Current involvement of UDWR is primarily associated with information transfer and program support. Specific initiatives and programs will be developed as needed to address condor presence in Utah.

The BLM believes that the coordination among cooperators and commitment fulfillment has been very good. Their representative is present at SCWG meetings and there is a good spirit of cooperation and information sharing among members. As a government agency with a high and ever-increasing workload, they see a great benefit in having TPF and a full-time AGFD condor biologist running day-to-day operations of the program.

Glen Canyon National Recreation Area (GLCA) believes that coordination with FWS has been great. They see opportunities for some improvement in coordination of some field operations and interactions.

The USFS (Kaibab National Forest) reported that cooperation, coordination and sharing of information among the SCWG has proceeded in an easy, effective, and informative fashion. The Kaibab National Forest appreciates and has enjoyed participating in the recovery effort.

The AGFD believes coordination among project cooperators has improved over the last five years. The twice-a-year SCWG coordination meetings have resulted in improved communication and efficiency. Since the group has been co-chaired by the state agencies of Arizona and Utah, the meeting agendas, notes, and action items have been more organized. As an example, in 2004, at the first meeting with the new chairs, all unresolved action items were reviewed, resolved, or assigned to specific working group members. In 2005, the working group finalized a new MOU among all primary cooperators. The AGFD has also provided monthly condor updates to project cooperators to improve communication. Even though coordination between primary cooperators has improved over the last five years, increased participation from other parties (e.g., the Navajo Nation and Kaibab Band of Paiute Indians) would benefit the program.

TPF reported that they are pleased with the excellent coordination among the partners now that the SCWG is co-chaired by the AGFD and UDWR. TPF acknowledges the involvement of AGFD in response to lead issues. In addition to having a full-time condor biologist on staff, the AGFD has provided financial support for a non-lead ammunition distribution program for hunters in the range of condors. TPF is also appreciative of AGFD support of research efforts. TPF believes AGFD has made tremendous strides in advancing public awareness of condors through their education programs. TPF would like to see UDWR follow suit in the near future because their participation would play a major role in the success or failure of establishing a self-sustaining population. TPF would also like the land management partners (e.g., BLM, NPS, and USFS) make significant financial commitments to help continue the work. Lead poisoning from spent ammunition proves to be the most significant obstacle to establishing a self-sustaining population of condors in the region. TPF believes the partners must work closely to find ways to eliminate the sources of lead in order for the program to succeed. TPF believes that, without the lead problem, the success of the program is assured with wild production occurring and the near elimination of some mortality factors as a result of adaptive management.

Coordination in Utah

Condors have roamed widely from their release sites in northern Arizona since the beginning of the reintroduction program. These travels have included portions of Nevada, Colorado and Wyoming, but have centered on Utah. Small groups of condors (up to 24) now regularly summer in the Deep Creek drainage near Lava Point of Zion National Park and some birds have remained in this area as late as November. The condors that summer in Utah have primarily been immature animals. In 2006, however, two condors near breeding age displayed potential territorial searching behavior in the Kolob Canyon section of Zion National Park. UDWR personnel have supported TPF biologists who are monitoring these condors by forwarding reported sighting information, assisting with retrieval of dead birds, and providing landowner contact information. UDWR personnel have also assisted with crowd-control issues when condors have come near populated areas (e.g. Cedar City). Law enforcement officers have assisted in at least one investigation involving a dead condor in Utah.

The prospect that condors would ultimately establish populations in Utah had been foreseen and the 10(j) reintroduction area, which includes nearly all of south-central Utah, was designed to take this into account. As condor use of Utah habitats increased in frequency, numbers, and duration, the SCWG sought ways to increase involvement of Utah's management agencies in condor recovery. This has been a two-step process. The first step in this process was reintegration of the UDWR into the SCWG framework. UDWR responded by assigning a primary contact who reestablished regular representation for Utah on the SCWG. In December 2004, the UDWR was assigned, along with AGFD, co-chair responsibilities within the SCWG. Utah now hosts one SCWG meeting annually and coordinates SCWG assignments with AGFD. Second, a UDWR representative was assigned to the SCWG subcommittee that develops and coordinates public relations announcements and press releases. This individual now provides Utah-specific input for press releases and media contact.

A Utah Condor Working Group was established by UDWR to coordinate with Utah's management agencies and the SCWG. This group includes representation from BLM, FWS, NPS, and USFS. The Utah sub-group acts as a liaison group for information transfer between and among Utah agencies and the SCWG. Its members have also committed to plan coordinated management strategies for condor recovery in Utah. One planning meeting has been held by the Utah Condor Working Group to discuss condor-management issues. Each of the agencies represented has expressed support for condor recovery efforts and acknowledged the need for a coordinated response to condor issues. Future planning meetings will be held to further define Utah's role in condor recovery and assure effective integration and implementation of condor recovery actions across agencies. Members of the Utah Condor Working Group now regularly attend SCWG meetings to facilitate these actions.

Additionally, UDWR has taken several other steps to increase dissemination of information on condor-related topics. A protocol for responding to reports of injured or dead condors was distributed to resource management agencies throughout the southern half of the state in

February 2004. An entire afternoon session of the 2005 meeting of the Utah Chapter of The Wildlife Society was dedicated to presentations concerning the California condor recovery program in northern Arizona and southern Utah. This provided the opportunity to educate Utah resource professionals and receive input regarding future management issues in Utah. Wildlife Services (WS) personnel in southern Utah have been informed of the presence of condors and advised of those areas in Utah that are frequented by these birds. They have committed to using extra caution when operating in those areas. Efforts to inform Utah residents have included local radio programs, wildlife shows and festivals, and a formal presentation to the Southern Regional Advisory Council, one of five bodies established by State law to allow for public involvement in wildlife management issues in Utah.

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

In the report for the first five-year review, this section included an extensive outline of the responsibilities for compliance with the ESA in relation to the nonessential experimental population of California condors. That report listed the responses from involved agencies regarding their knowledge of their responsibilities. That report also listed most of the section 7 consultations conducted with those agencies during the first five years of the reintroduction program. For the most part, the responses of the agencies indicated that the responsibilities were clear and understood.

However, the first five-year review also stated that 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. While the recommended memorandum was not prepared, section 7 consultation has subsequently proceeded, essentially according to the outline of the first five-year review, with most of the involved agencies. However, there appears to be some misunderstanding of how the rule designating the nonessential population, the agreements that were made at the time of designation, and the section 7 responsibilities interact.

For this second five-year review, agencies were asked to report effects on land-use practices due to the presence of the condor, and to list and describe projects for which section 7 consultations were conducted during 2002-06. Responses were received from four of the involved agencies.

The UDWR responded that California condors do not frequent UDWR properties or directly impact land management actions. The UDWR indicated that condors will be considered in review of projects planned in known condor use areas.

GLCA reported that they have consulted with the FWS on approximately 15 occasions to discuss proposed projects and use of measures meant to reduce effects to condors. They indicated consultation has been streamlined and has been positive.

The AGFD reported that they receive periodic inquiries from other agencies regarding mandatory use of non-lead ammunition on public lands. The AGFD has resolved these inquiries by citing the 10(j) final rule and agreement with the counties, as well as identifying the success of the voluntary lead reduction efforts.

The BLM responded that they seem to be receiving conflicting direction from the FWS on authorizing land use practices in California condor habitat. They stated that BLM has been implementing the agreement between the counties and the FWS to not restrict land use practices in the 10(j) area based solely on the needs of condors. They have developed and are implementing conservation measures (stipulations) for land use practices that include a two-tier system. One set of conservation measures applies to users of public lands (applicants) and are optional. The other set is mandatory and applies only to BLM. They stated that the FWS has asked that BLM make conservation measures for California condors mandatory and applicable to all. BLM believes this is contrary to the agreement made by the FWS with the counties.

The USFS (Kaibab National Forest) reported that incorporation of conservation measures brought forward by the FWS has been easy to implement and they hope to be able to expand their cooperation.

FWS believes that continued implementation of section 7(a)(1) responsibilities by Federal agencies is very important in meeting recovery objectives for California condors. Through section 7(a)(2), FWS provides recommended conservation measures to action agencies that may reduce effects of project activities on condors and further recovery of the species. However, to provide better consistency in management across the 10(j) designated area, further discussions among the cooperators are needed to agree on whether to implement these measures and, if so, how and when they should be included in projects and activities.

Nonessential experimental populations located outside National Wildlife Refuge System or National Park System lands are treated, for the purposes of section 7 of the ESA, 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. Nonessential experimental populations located within National Wildlife Refuge System or National Park System lands are treated, for the purposes of section 7 of the ESA, 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.

The final rule designating the nonessential experimental population outlines the section 7 responsibilities listed above. The special rules of the final rule do not modify those regulations.

The agreement with counties states that one of the objectives of the agreement is “to ensure to the maximum extent practicable that all current and future land, water, or air uses within the experimental population area will not be restricted due to the designation or presence of the nonessential experimental population of California condors.” The agreement also contains a component that states that current land uses should not be restricted due to the designation of the nonessential experimental population, or the presence or potential presence of California condors. However, the agreement also outlines the section 7 responsibilities listed above. The agreement also states that a nonessential experimental population located within the National Park System or National Wildlife Refuge System is subject to the protection and consultation requirements of section 7(a)(2).

Integration of the final rule, section 7 responsibilities, and the agreement with counties should be as follows.

Federal agencies with lands outside of the National Park System within the nonessential experimental area are required to evaluate their discretionary actions to determine if the actions will jeopardize the continued existence of California condors. If jeopardy is not determined likely, no additional consultation is necessary. However, FWS continues to recommend that the agency request a conference, and the policies of some agencies require that they request a conference, at the may affect level. A conference at the may affect level will result in a conference report with advisory recommendations that, if adopted, would minimize effects to condors. Conferences allow the FWS to provide consistent advisory recommendations across the range of the condor population. In addition, by monitoring actions that may affect condors, FWS can better measure the effectiveness of the recommendations to the reintroduction program. Although the FWS Section 7 Handbook allows for conferences to be conducted in a manner such that conference reports can be converted to biological opinions upon listing of the species, the proposed status for this nonessential experimental population will not be changed, so that option is not appropriate for this situation.

For Federal agencies with lands within the National Park System (i.e., National Parks and Monuments, and National Recreation Areas) within the nonessential experimental area, section 7 consultation is required if an action may affect the California condor. If the agency determines that an action will not affect the condor, no further consultation is necessary. If the agency determines that the action may affect, but is not likely to adversely affect the condor, written concurrence from the Service is required. Project modification or other measures may be necessary in order to achieve concurrence. If the agency determines that an action is likely to adversely affect the condor, formal consultation is required. Reasonable and prudent measures with terms and conditions and conservation recommendations may be the result of formal consultation.

Within the nonessential experimental population area, there are no prohibitions against unavoidable and unintentional take of a California condor, provided that such take is non-negligent and incidental to a lawful activity (such as hunting, driving, or recreational activities)

and the take is reported as soon as possible. However, formal biological opinions that anticipate incidental take will continue to include incidental take statements.

In order to achieve the objectives of sections 7(a)(1), 7(a)(2), and 7(a)(4), the FWS will continue to recommend conservation measures for California condors to all entities for use in development and implementation of projects. In general, the purpose of these conservation measures is to reduce the likelihood of potential take of individual condors and protect habitat in order to further recovery objectives for the species.

Condors outside of the nonessential experimental population area receive the full protection of section 7 regardless of what lands they occur on, and section 9 prohibitions against take remain in effect.

Public Support and Initiatives

Numerous individuals and organizations outside of the list of official reintroduction program cooperators continue to provide invaluable support to the program. The SCWG acknowledges and thanks the following individuals and organizations: Maggie Sacher, owner of Vermillion Cliffs Lodge, continues to provide a location for the TPF field base of operations. Her generous support of the program is punctuated by her consistent enthusiasm of the important role condor reintroduction can play in highlighting the human and natural resources of the cliff country she loves. Dr. Kathy Backus, DVM, of Kanab Veterinary Hospital, provided invaluable veterinary services in the field, and her generous provision of radiographic services and information have not only saved the lives of condors but have also contributed to an increased understanding of the dispersal and effects of lead in the environment. Dr. Kathy Orr, DVM, and her associates from the Phoenix Zoo provided invaluable service to the program through treatment of several lead-poisoned or otherwise injured condors throughout the duration of the program. Norm Freeman, director of Elemental Technologies, Inc., continues to work closely with TPF staff to arrange for the transport of captive-reared condors from the World Center for Birds of Prey in Boise, Idaho to the Vermillion Cliffs release site. Salt River Project has regularly responded to requests for helicopter flight support for the transport of condors and personnel. Arizona Public Service has designed, donated, and installed solar panels on the remote Vermillion Cliffs release site to accommodate live-feed video at the release facility. Through the Arizona Heritage Fund, the people of Arizona have provided the resources needed to create and implement a successful hunter education program and equip condors with satellite transmitters. Numerous hunter organizations and ranchers have committed through the Condor Coalition to inform their members of ways to minimize the effects of lead ammunition on condors; their efforts are demonstrating that self-motivated sportsmen groups and ranchers continue their tradition of wildlife conservation. Finally, with great pride, members of the SCWG express admiration for the enduring accomplishments of William A. Burnham (1947-2006). We are indebted to Bill for his leadership of TPF and in the conservation community. The Southwest condor reintroduction program is but one aspect of Bill's legacy to the conservation of birds of prey and their habitats.

His vision, dedication, and perseverance made the return of California condors to the Southwest possible.

Levels of public acceptance of the condor reintroduction appear to be more uniformly supportive in this reporting period (2002-06) than in the previous reporting period. During initial years of the reintroduction program, while most commenters expressed enthusiastic support for the program, some individuals and entities in northern Arizona and south-central Utah vocally criticized and even litigated against the reintroduction program, expressly criticizing FWS intentions and lack of specific commitment to accommodating their concerns in the special 10(j) rule (Arizona Condor Review Team 2002). During the current review period such objections to the program have been rare and of the comments received for this report, no such sentiments were provided by the public. We can attribute this to continued and increased SCWG cooperation with broader groups of interested parties, continued interactions by TPF field staff and other working group members with local community members, and observations of opinion leaders in resource-based economies that the program and FWS are meeting commitments under the 10(j) rule. Some community leaders that represent constituents outside of the currently designated 10(j) area and in which condors have chosen to disperse continue to emphasize that the 10(j) area be expanded. However, these individuals have not expressed objection to the reintroduction program; preliminary and visible progress on a possible 10(j) expansion may be contributing to their acceptance of the program.

Broad national, international, and local news and entertainment media coverage of the Southwest condor reintroduction has waned since the initial releases of condors. This has presumably resulted from reduced novelty, diminished controversy, fewer unlawful condor casualties, and steady success associated with the condor reintroduction program. However, unique and benchmark events in the program – such as first egg laying and fledging – have generated flurries of broad interest. As a result, the SCWG and its members have focused news releases and news media opportunities on such events. The logistics of providing news-crew access to remote wilderness sites, and concern over disturbing condors as a result of media access and the public dissemination of exact breeding location information, have been deterrents to media coverage of recent newsworthy program accomplishments. Initial photographic images of fledging and egg laying sites have been of low quality due to limited accessibility of these locations even for reintroduction-program personnel, yet newsworthiness of these events still resulted in news coverage and publication of these photographs. TPF and AGFD have readily made photographic images available. Television news producers have requested that a more concerted effort be made to gather video images of such program events. Assessments of viewership/readership of condor reintroduction news products and public attitudes (nationally or locally) have not been conducted.

Longer-term and more in-depth information products have been produced and well received. In September 2005, AGFD's Chuck Emmert and TPF's Chris Parish won an Emmy award from the National Academy of Television Arts and Sciences for an Arizona Wildlife Views segment entitled "As Curious as a Raven." The segment aired on PBS stations KAET-TV and KUAT-TV

in the Phoenix and Tucson media markets in September and October 2005, and DVDs of the production are used by working group members during presentations.

News media coverage of annual condor releases at the Vermillion Cliffs in 2002-06 has been sporadic and limited to coverage in the Salt Lake City, Phoenix, and Flagstaff media markets. Annual condor releases (now conducted January to March) continue to draw 100-200 attendees. While the number of attendees is significantly less than that of the initial condor release, the opportunity to be a part of this aspect of the program is greatly appreciated and popular among local residents and regularly attracts destination visitors from Flagstaff, Kanab, and St. George and occasionally bird watchers from as far as California and Wisconsin.

Throughout the year, travelers and bird watchers use the condor-release viewing facility in House Rock Valley. TPF uses the area for staging information meetings with interested groups. Improvements to the area have been made. However, as noted by an area grazing allottee, people are coming to view condors and are frustrated and need to be accommodated; repairs and facility updates are needed. The BLM has finalized plans to construct a new viewing area below the release site which will include parking, a new shelter, restroom, and fence around the site.

Staff at public land visitor centers within the reintroduced area report continued or increasing visitor interest in condor viewing. At BLM offices in St. George and Kanab, and at GLCA visitor centers, public interest is fairly high and employees in the visitor center respond to questions routinely. BLM brown-bag lunch programs and other speaking engagements on the condor are well attended. At GLCA, condor pamphlets have proven to be one of the most popular handouts and visitor-service personnel report that visitors often wish to view condors in the wild. Many explain that the chance to view a condor was one reason they chose to vacation in the area. The review team received requests for additional and more current condor information for visitors at the North Rim of GRCA, Kaibab Lodge, Jacob Lake, and Vermillion Cliffs Lodge. The SCWG will consider providing monthly condor reports and distribute information to these facilities to assist with the information demands of staff, interpreters, and visitors. As a result of GRCA staff requests, TPF and AGFD will again provide interpretive training at the North Rim in spring 2007.

Most SCWG members and personnel from working group agencies/organizations deliver presentations regarding the condor to service organizations, school groups, and visitor centers at varying frequency. TPF continues to provide presentations in communities throughout the range of the released condors and contributes greatly to the support and training of interpretive programs at public facilities throughout the range (and increasingly in the State of Utah as released condors expand into the state). GRCA and AGFD have substantially increased and improved their outreach efforts in the 2002-06 period.

Although visitors come to GRCA because it is one of the natural wonders of the world, once they have arrived, more often than not, it is the story of the California condor and its successful reintroduction that holds their interest and compels them to find out more about the canyon.

During the last five years, GRCA at the South Rim has attempted to implement a focused approach to communicate the condor reintroduction story to the widest audience possible. From April to October, GRCA offers one to two formal interpretive programs daily that focus on the current condor program and its successes and challenges. These programs contact approximately 15,000 visitors per year. Approximately 25 times a year, evening programs are offered that take visitors on a visual representation of the condor reintroduction. This typically reaches a total of 2,000 visitors per year. The GRCA environmental education department has created a specialized program for children that delves into the challenges of raising condors in captivity and reintroducing them to a more wild setting. A program for kindergarten to second grade reaches approximately 500 children a year and a daily summer program focuses on older children and reaches approximately 1,500 a year. During periods of peak condor activity at the South Rim, GRCA often has a ranger work at an observation station and provide short, 5- to 10-minute programs throughout the day on the condor. GRCA has provided this service for the previous two years, contacting over 2,500 visitors a year during this process. In addition to formal interpretation, staff answer questions about the condors numerous times each day and provide additional short programs on the species (averaging about 5,000 contacts per year). In 2006, GRCA added a mounted condor specimen to the visitor center. It was placed directly over where most interpretive programs (including geology, history, etc. programs) are presented. As a result, most programs involve a short question and answer period involving the condor. In the six months after it was installed, South Rim staff reached over 15,000 people with some portion of the condor story.

The GRCA interpretive division takes great pride in providing accurate information on the species. Over 25% of the formal interpreter training in 2006 was spent on condor-related issues. In the winter of 2007 GRCA will send six interpreters to the San Diego Zoo for training on condors. In short, at the South Rim of the Grand Canyon, GRCA treats the condor story as one of the main interpretive themes and makes a consistent effort to communicate that story to the public. In total, GRCA staff reached just shy of 200,000 people during the last five years with interpretive personal services relating to the condors at the South Rim of Grand Canyon.

Additionally, condor program volunteers stationed at GRCA informally provide interpretive services. One volunteer reported spending over 1,400 hours in voluntary field work for this program during the last three years. Many of these hours have been spent interpreting condor biology, behavior, and the recovery program, to several thousand GRCA visitors. TPF field staff also provide impromptu interpretation to visitors when working at GRCA.

AGFD has significantly increased outreach efforts in the last five years. Outreach efforts have included condor presentations to general audiences as well as sportsmen's groups, condor booths at wildlife and sportsmen's fairs, and letters to big game hunters. During 2002-06, AGFD averaged approximately 40 condor presentations, five condor education booths, and 6,000 letters to sportsmen reaching well over 10,000 people annually. The AGFD-led effort to develop a hunter-education and non-lead-ammunition program to reduce lead exposure to condors is a substantial outreach effort and is described in full in the Lead-Reduction Efforts section of this

report. This program in itself has been reported broadly in the news media (particularly California news markets) and has gained a tremendous amount of interest and support within sportsmen, environmental, and land-management groups.

During the second five-year review process, repeated requests for increased participation in environmental education programs were received (although not from professional educators). Suggestions included use of condor satellite telemetry data in the AGFD Focus Wild curriculum to increase exposure of the program in schools, teach natural sciences and math lessons, and allow students to be the conduit for information to parents. AGFD will explore the need for and feasibility of such a program.

In the past five years, the SCWG and individuals interested in the condor reintroduction program have increasingly relied upon the internet to disseminate and receive condor program information. Web sites and pages that fill this need include TPF's www.peregrinefund.org/released_condorsinfo.asp, FWS's www.fws.gov/southwest/es/arizona/CA_Condor.htm and www.fws.gov/endangered/i/B0G.html, BLM's www.blm.gov/az/asfo/wildlife/condor.htm, AGFD's www.azgfd.gov/condor, and GRCA's www.nps.gov/archive/grca/pphtml/2highlights94.html.

As the range of the reintroduced California condor population has expanded in the past five years, so too have outreach efforts. In Utah, several outreach efforts have been undertaken opportunistically during the past five years, but no condor-specific publicity/outreach programs have yet been developed (but see the Coordination in Utah section for efforts that have been made). National Parks in southern Utah can greatly benefit by modeling their interpretive programs on those developed at GRCA as condors increasingly frequent Utah sites and visitor demand for information increases. Pursuing an effort to increase the 10(j) area (see the Administration – Expansion of Nonessential Experimental 10(j) Population Area section) would demand an increased commitment of outreach efforts by the working group and an expanding list of future partners. The SCWG recognizes that continued support for the management of condors, particularly in areas where the condor range is expanding, requires substantial early outreach efforts.

As part of this review, SCWG participants were asked to provide information regarding their perspectives on public acceptance and interest. Responses received are below.

UDWR stated that southern Utah publics seem to be supportive of the California condor recovery program. Utah citizens are curious about condors and enjoy seeing them. They are interested in the birds, if a bit hesitant to give full, unconditional support to the recovery program. The non-essential experimental designation has done much to ameliorate concerns about the possible impact of a listed species on normal land use and recreational activities.

BLM reported that public acceptance, especially among the local citizens and project proponents, is favorable due to the 10(j) status and lack of use restrictions based solely on the condor. Public

interest is fairly high. Tour groups and individuals regularly stop at the Vermillion Cliffs viewing area. Employees in the visitor centers routinely field condor questions. Brown-bag lunch programs and other speaking engagements on the condor are well attended.

GLCA received a large number of condor pamphlets from the AGFD. These have proven to be one of their most popular handouts. They often hear from visitors that wish to view condors in the wild. Many visitors explain that the chance to view a condor was one reason they chose to vacation in the area.

The USFS (Kaibab National Forest) reported that public interest in condors has consistently been expressed by their guests at the Jacob Lake Visitor Center and the House Rock Valley overview along Highway 89A, and occasionally by visitors met on the Kaibab National Forest. Outreach efforts have been limited to displays and information-sharing at the Jacob Lake Visitor Center.

TPF believes public acceptance of the overall program has been very positive, but raising the necessary funds to support the release and monitoring effort remains a significant challenge.

Economic Opportunities

Most businesses in the immediate proximity of the condor release area are heavily reliant on outdoor recreation and tourism (Grand Canyon viewing, hiking, river running and trout angling, and supporting lodging, dining, and guide services). Local business owners and public lands managers continue to note that condor presence in the area provides “value added” to the selection of this area as a visitor destination. An appreciable number of visitors do not schedule trips for the sole purpose of seeing condors, although some businesses have reported that clients have extended their stay in the area to include a condor viewing experience. GRCA reports that only a small number of visitors come to the park to view condors, yet upon arrival the majority of surveyed visitors stated that condor viewing was the most memorable feature of their visit. Extended visits and side trips to areas for condor viewing undoubtedly result in increased spending in the area. Some condor-viewing destination travel is known to occur (particularly resulting from condor releases and for bird watchers in pursuit of untagged condors – such as recently fledged birds at GRCA) creating economic stimulus that is solely attributable to the condor program. However, the extent of resulting increased visitors is unknown and their length of stay and trip spending has not been ascertained. Similarly, as the range of the introduced condors expands to additional tourist destinations, visitor spending is likely to increase.

Marketing condors as a visitor destination feature is not within the current scope of the SCWG. However, the group recognizes the potential for such commercial and regional interest in such efforts and is prepared to consider the effects to the program and how the program could prudently accommodate such interest.

Condor field crews and SCWG members also contribute to local economies through fuel, grocery, meal, and occasional lodging purchases. If 10(j) area expansion efforts and condor

range expansion continue to occur, spending by project participants will increase in volume and area.

Due to the nonessential experimental 10(j) population designation, land-use restrictions and resulting economic costs to local economies have not been realized and are not anticipated.

Law Enforcement

Clarification regarding jurisdictions and responsibilities of the major land-management agencies involved in the reintroduction process was included in this section in the first five year review (Arizona Condor Review Team 2002). Please see that report for the information.

The first five-year review recommended that the partners in the program review the law-enforcement protocols and include coordination as a priority in order to ensure complete and timely cooperation pertaining to incidents involving condors. The suggested review was expected to result in: 1) revised protocols; 2) field forensic training for personnel; 3) improved coordination among law enforcement personnel, field biologists, 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/or 5) better communications and response from the FWS Forensic Laboratory.

The SCWG conducted the recommended review during the reporting period. The review resulted in a *California Condor Injury/Mortality Protocol*, a *Dispatch (Arizona and Utah Radio Rooms) Procedure for an Injured or Dead California Condor*, and a *Procedure for Submitting Free-Ranging California Condors for Postmortem Examinations*. These protocols and procedures are intended to increase the effectiveness and efficiency of law enforcement and forensics responses to injured or dead California condors that are discovered in the field, and they have been distributed to the appropriate personnel. With the development of these procedures and other discussions, the SCWG believes the law enforcement issues have been sufficiently addressed. No other outstanding issues with law enforcement procedures or implementation occurred during 2002-06.

During the reporting period, two California condor deaths were investigated by the FWS Office of Law Enforcement. Both of the condors were found dead in northern Arizona in September 2002. Examination results from the FWS National Fish and Wildlife Forensics Laboratory confirmed that Condor 258 died as a result of being shot with a shotgun and that Condor 186 died after being shot with an arrow. The investigations of these two condor deaths are still open.

Aviation

Air safety is of critical importance to both human safety and to the condor recovery program. As the Grand Canyon Ecoregion serves as a high-density tourism 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 ground level, but this is not an enforceable requirement. Over GRCA, 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 GRCA but extends somewhat over adjacent land ownerships. Aircraft flight corridors and flight-free zones have been established. There are FAA regulations governing how flights operate, and operators also have been provided information regarding the presence of condors in the area. In the ten years of the condor reintroduction program there have been no reported condor strikes or near misses by air-tour operators. In some cases, condors have become one more interesting resource that air-tour pilots can mention to their customers.

Agency aircraft, when conducting agency missions such as fighting fires, 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. GRCA developed an observation record for their Fire and Aviation Program that records near misses and flight path diversions. A few diversions of GRCA administrative helicopter flights occurred during the early years of the reintroduction program. During that time, condors would occasionally gather around the dip tank at the North Rim helibase. The tank has since been covered and there have been no reported diversions in the past three years. In the past five years, condor-aviation conflicts in GRCA have not been a problem. A Resource Advisor should be present on wildland fires involving aircraft. One of the functions of the Resource Advisor is to be aware of possible condors in the area and alert aircraft personnel.

A number of military aviation training routes exist in northern Arizona and southern Utah. However, these routes have not imperiled any condors to date. The first five-year review (Arizona Condor Review Team 2002) 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 the Department of Defense flight planning publication AP/1B which is published twice annually). Nellis Air Force Base did not respond to inquiries as to their awareness of condors.

Prohibitions in the Airborne Hunting Statute 16 USC 742j-1 that pertain to condors include:

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.”

In the past five years there have been a few incidents of aircraft flying near the release site, but none that could be considered illegal. One incident in the first five years of the program regarding the harassment of condors by aircraft 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. The SCWG recommends that all condor field personnel report all potential condor/aviation incidents and be trained to record aircraft identification numbers, and 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.

There is an existing airport adjacent to Navajo Bridge which is a location frequented nearly year round by condors. Due to wind conditions, planes sometimes take off toward the bridge but no adverse condor/aircraft interactions have been observed to date.

USDA APHIS-Wildlife Services Activities

WS has conducted predation management efforts in southern Utah and on the Arizona Strip annually, including lands administered by the BLM. All WS activities are conducted pursuant to National Environmental Policy Act (NEPA) documents prepared by the program under APHIS implementing guidelines. For the most part, WS activities have consisted of coyote predation management for the protection of cattle and calves or to improve mule deer and pronghorn fawn survival. Some efforts in both states have addressed human safety concerns associated with mountain lions (*Felis concolor*) or, in Utah, black bears (*Ursus americanus*).

When discussing condor reintroduction efforts, predation management activities by WS on the Arizona Strip have often been perceived as an issue (and were raised as part of the original 10(j) rule). Due to these concerns, WS activities were carefully evaluated as part of the first five-year review of the condor reintroduction program in northern Arizona. During the period of actual experience beginning December 1996 to present, no conflicts between condors and WS activities have been noted.

WS activities on BLM or National Forest system lands within the 10(j) area are conducted pursuant to national level MOUs between APHIS and the respective land managing agencies. All field activities are further conducted under a work plan developed by WS that considers resources under the jurisdiction of the land managing agency. All predation management activities on BLM lands on the Arizona Strip in the last five years have been in accordance with the national MOU between BLM and WS and the local work plan. For lands within the Escalante/Grand Staircase National Monument, a work plan has been developed between the

State of Utah and the Monument that parallels the process contained in the APHIS-BLM MOU. WS is not a party to the existing condor reintroduction MOU.

Since the first California condors were released in 1996, WS 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. WS personnel have also contacted TPF each time to ensure the condors were adequately protected.

WS aircraft used in aerial gunning are typically fixed-wing and fly close to the ground. 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, identified annually or as needed by TPF, are not flown by WS in order to avoid any possible aerial conflict with the condors. Additionally, WS has committed to reporting birds if they are observed, and TPF has provided information about missing birds and transmitters on occasion.

WS has committed in its environmental assessments (EA) to mitigation to prevent possible conflicts with all uses, including accommodating endangered species needs. The WS aerial gunning program on the Arizona Strip and in the Escalante/Grand Staircase National Monument employs only non-lead pellet shot fired from shotguns aboard the aerial platforms. Coyotes removed by ground shooting are taken from the field or otherwise made unavailable to condor scavenging so there is no risk of lead poisoning from the WS program.

WS was sued in Federal court over the use of the M-44 device outside of the 10(j) area in 2000. In 1983 a condor was reportedly killed by an M-44 device set by FWS employees in California. 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. As a result, the FWS has provided terms and conditions on the M-44 device to both the Environmental Protection Agency and WS as part of section 7 consultations. WS has incorporated these restrictions outside of the 10(j) area in specific corridors as part of the settlement to the 2000 lawsuit. Additionally, the M-44 device is not available for use in Arizona, in National Parks or Monuments (such as the Parashant, Vermillion Cliffs or Escalante/Grand Staircase) or in National Recreation Areas (e.g., GLCA and Lake Mead National Recreation Area). Restrictions on the areas where the device can be used, along with the terms and conditions identified by the FWS in section 7 consultations, should preclude any risks to condors from this method.

WS also calls and shoots by rifle some predators, chiefly coyotes, from the ground. While the rifle bullets used vary, they are generally small, fast, highly-frangible copper-jacketed hollow-point bullets that contain lead. As noted above, coyotes removed by ground shooting are removed from the field or otherwise made unavailable to condor scavenging so there is no risk of lead poisoning from the WS program.

Because coyotes are scavengers as are condors, and at BLM's urging, in 1999 WS 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 52 µg/dl. WS has agreed to participate in future monitoring, as appropriate, to assist the project in determining lead risks.

There have also been additional efforts by WS in the 10(j) area outside the Arizona Strip. For example, WS 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. WS has been involved in the capture and removal of problem mountain lions in the Mt. Elden area north of Flagstaff as well as the capture of mountain lions for research near Flagstaff and in Zion National Park. WS conducts seasonal coyote predation management in cattle areas in southern Utah, generally at times when condors are not present. WS also conducts sheep protection activities in southern Utah throughout the year. WS activities are addressed in their EAs and section 7 consultations and the FWS has concurred that these activities are not likely to jeopardize condors.

WS has the statutory authority to manage and prevent wildlife damage, including predation management to protect livestock. Recognizing that WS will continue to conduct predation management in the condor reintroduction area, and that good communications between the WS and the condor reintroduction program is essential, we recommend that WS be invited to become a condor program cooperator 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), most specialists believed that the designated area would be large enough to adequately contain the condor population. However, the discussion of issues within the *Federal Register* rule (Issue and Response 14; 61 FR 54055) acknowledged that should the designated area prove inadequate, FWS has the option to revise the rule to increase the size or change the configuration of the area.

By July 1998, condors were confirmed outside the current 10(j) area and since that time there have been other instances to the north, east, west and south of the 10(j) area. Initially, these flights appeared to be experimentation by new birds, and the longest travels still fit into that category with birds either returning or being lost. However, over the past three years a significant increase in condor use has occurred in the Kolob and Cedar City areas of Utah, and in spring 2006 individuals appeared to be exploring nest caves in this area.

The first five-year review of the program "strongly" recommended that the existing California condor nonessential experimental population area be broadly expanded "as soon as possible." The report continued that 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."

The SCWG approached the Western Association of Fish and Wildlife Agencies regarding this expansion option, and the states of Utah, Arizona, New Mexico, Colorado, Wyoming and Nevada assigned liaisons to the group to continue discussions. The Navajo Nation joined the discussions. Throughout early- to mid-2006, discussions occurred with these states and the Nation to gauge their interest in an expansion proposal to include all or portions of their states and the Navajo Nation. The SCWG formally submitted a concept expansion proposal to both the California Condor Recovery Team and the Arizona Field Supervisor for FWS at the end of September 2006. This proposal requested designation of one representative for the three FWS regions involved in the potential expansion area and offered assistance from workgroup members in the expansion rule process. This expansion proposal would only be for natural expansion of the birds outside the original 10(j) area and would not propose release sites outside the original area. Currently, this proposal is being considered by FWS for further action and funding.

Project Costs

Partners of the condor reintroduction program were asked to provide information regarding funds or other in-kind goods or services that were expended on the program during the review period (2002-06). Responses received are summarized below.

TPF reported spending \$6,163,827 during the reporting period on propagation and release efforts for the Southwest reintroduction effort. That sum is an increase of \$1,677,585 million over the \$4,486,242 expended during the previous reporting period. During the reporting period, TPF received \$1,984,939 from Congressional appropriations through the FWS, \$140,000 from AGFD, and the remainder from private donations solicited by TPF.

The AGFD has employed a full time condor biologist since 2002 and has also expended extra funds in the last five years to supplement lead-reduction efforts. The AGFD budget for the last five fiscal years (July-June) totaled (total costs):

2002	Condor biologist operating costs	\$51,800
2003	Condor biologist operating costs	\$62,200
2004	Condor biologist operating costs	\$70,300
	6 satellite transmitters and data download	\$25,000
2005	Condor biologist operating costs	\$86,700
	15 satellite transmitters and data download	\$54,500
	X-ray machine and developer; veterinary lab equipment, trailer to haul calf carcasses, two chest freezers to hold carcasses, three telemetry receivers, 11 Personal Data Assistants and field data entry system	\$40,500
2006	Condor biologist operating costs	\$68,200
	Satellite transmitter data download	\$8,500
	10 spotting scopes and tripods, field lead test equipment, video equipment, lab equipment, and telemetry receiver	\$11,500
	Free non-lead ammunition program	\$104,900

For the UDWR, California condor recovery obligations have been met through reallocation of existing budgets and personnel. Annually, this has required the commitment of approximately 0.1 FTE (\$6,500) and current expense expenditure of approximately \$750.00. Personnel and budget commitments will increase as condors become established in Utah.

The BLM-ASDO budgets approximately \$6,000 per year for transportation of condors. This is typically used to bring condors from the breeding facility in Boise to the release site. ASDO has also organized vehicles and personnel to get the condors from the viewing area to the release pens. This effort was not undertaken in 2006 due to two small releases of six birds rather than one large release of around twenty birds as had been done in previous years. The ASDO condor lead biologist's time budget in fiscal year 2006 was equivalent to \$5,881. The ASDO has committed \$40,000, including approximately \$27,000 in Challenge Cost Share dollars, to construct a new viewing area below the release site that will include parking, a new shelter, restroom, and fence around the site.

The USFS (Kaibab National Forest) reported an expenditure of approximately five days (\$1,700) of staff time per year on meetings, consultations, and outreach with the public and USFS personnel.

GLCA reported that approximately 40 hours at \$40 per hour (\$1,600) were expended as labor costs for section 7 consultations over the last five years.

The Arizona Ecological Services Office of the FWS provided approximately a 0.15 FTE each year from 2002 through 2006 at an annual cost of approximately \$11,000. That total represents condor-related activity including participation in the SCWG, recovery actions, section 7 consultations, and outreach.

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 following table is a summary of how the research needs identified in the first five-year review have been addressed during the second five-year period.

Table 7. Summary of recommendations for research from the first five-year review and accomplishments in the second five-year period.

Recommendation	Action	Reference In This Document
Collect data on condor flight corridors, activity areas, and flight elevations.	Data have been collected and analyzed through 2006, and results through 2004 have been reported (Hunt <i>et al.</i> in press). Some data collection and analysis is ongoing.	See the Movements section.
Collect data on food base distribution, seasonality, cause of death, abundance.	Data are collected continuously and analyzed annually. Research is ongoing.	See the Lead Reduction Efforts section.
Assess toxicity of copper-jacketed bullets using non-target species. Assess potential lead exposure pathways.	Some research has been initiated and accomplished. Research is ongoing.	See the Lead Reduction Efforts section.
Collect pair bond, flock social structure, dispersal, and foraging pattern data.	Data are collected continuously and analyzed annually. Research is ongoing.	See the Reproduction and Lead Reduction Efforts sections.
Collect habitat use data: nesting, roosting, perching preferences.	Data are collected continuously and analyzed annually. Research is ongoing.	See the Movements and Reproduction sections.
Collect data on interspecies relationships.	Interactions are recorded as they are observed. There is no directed research effort for this item.	See the Mortality section
Document nest-predator interactions.	These incidents are recorded as they are observed. There is no directed research for this item.	See the Mortality section.
Collect nest site data: cave/ledge size, etc.	Data are collected continuously and analyzed annually. Research is ongoing.	See the Reproduction section.
Collect data on aircraft overflights and condors.	Aircraft flight routes are generally known and can be compared to condor flight routes.	See the Movements section.
Collect data on condor impacts from human recreational activities.	Specific interactions are recorded as they are observed. There is no directed research effort for this item.	See the Law Enforcement section.

FUTURE RESEARCH AND MANAGEMENT NEEDS

It is increasingly apparent that the ultimate success of the reintroduction program will benefit from a substantial reduction in the incidence of lead exposure. Lead and the associated need for monitoring condor movements therefore remain the principal topics of the TPF condor research program. TPF plans to:

- Develop methods for assessing the lead-exposure history of individual condors.
- Evaluate lead loads in carcasses available to condors.
- Analyze the relationships between movements and lead levels with particular emphasis on the increasing use by condors of the Zion region of southern Utah.
- Monitor condor locations relative to carcass distribution.
- Investigate factors influencing condor nest success.
- Monitor and evaluate condor behavior and management methods aimed at improving errant behavior.
- Monitor and evaluate relationships between lead fragments and blood lead levels found in condors.
- Determine the long-term implication of repeated lead exposure to, and the impacts of multiple chelation treatments on, condors.
- Continue to investigate the occurrence and effects of other contaminants that condors may be exposed to.
- Model the demography of the population with recent data.

In addition to the above, the SCWG recommends the following research:

- Analyze feather lead isotopes to see if time of lead exposure can be determined.
- Evaluate fragmentation characteristics of additional bullet types (e.g. bonded bullets).
- Conduct follow-up surveys of hunters to determine the efficacy of outreach efforts.
- Determine how to engage varmint hunters in lead-reduction efforts.
- Evaluate the toxicity of bismuth and copper varmint-caliber bullets.

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 (U.S. Fish and Wildlife Service 1996b). With the reintroduction of California condors in northern Arizona, number 2 has been initiated. As discussed in several sections throughout this report, numbers 3 and 5 have been initiated through implementation of a variety of actions.

The recovery outline of the recovery plan includes several tasks to be completed or implemented. The following specific tasks from that outline have been initiated and are ongoing efforts in the reintroduction program 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.
 43. Implement management recommendations and strategies to minimize contaminant-related mortality factors.
 44. Eliminate or reduce the effects of environmental contaminants on California condor.
 45. Monitor contaminant levels in California condors.
5. Implement Information and Education Programs on Condor Habitat Use and protection Needs.
 51. Distribute educational material about condor habitat, species identification, and legal protection.
 54. Establish observation points and educational facilities at selected sites.

Attaining a successful reintroduced population of California condors is essential to meet recovery plan objectives for the species. The minimum criteria for reclassification of the California condor to threatened is maintenance of at least two non-captive populations and one captive population. These populations: (1) must each number at least 150 individuals, (2) must each contain at least 15 breeding pairs, and (3) be reproductively self-sustaining and have a positive rate of population growth. In addition, the non-captive populations (4) must be spatially distinct and non-interacting, (5) must contain individuals descended from each of the 14 founders. The condor reintroduction program in the Southwest is part of the effort to attain these goals.

CONCLUSIONS AND RECOMMENDATIONS

The first five-year review indicated that cooperators in the California condor reintroduction program in the Southwest expressed a very high level of satisfaction with the reintroduction

program (Arizona Condor Review Team 2002). The program was also widely considered to be an unprecedented success. No entity recommended termination of the program. The review team unanimously recommended continuation of the California condor reintroduction program in the Southwest to the California Condor Recovery Team and FWS.

The first five-year review also included several recommendations for administration, coordination, and field management. Tables 8 and 9 summarize the implementation of those recommendations and include a reference to where the relevant information can be found in this document.

Table 8. Summary of administration and coordination recommendations from the first five-year review and accomplishments in the second five-year period.

Recommendation	Action	Reference In This Document
Proceed with 10(j) expansion.	A proposal has been drafted and is under consideration.	See the Expansion of the Nonessential Experimental 10(j) Population Area section.
Secure all permits required by management agencies.	All cooperating entities have agreed to obtain all necessary permits per the MOU.	
Develop a new MOU and conduct annual cooperator meetings.	A new MOU was signed in 2005. The SCWG meets twice a year.	See the Coordination Among Program Cooperators and Compliance with Commitments sections.
Develop stronger partnerships with tribes in northern Arizona, Kaibab National Forest, UDWR, management agencies in Utah, and WS.	The condor program is discussed during annual AGFD coordination meetings with the Kaibab Band of Paiute Indians, the Navajo Nation, and the Hopi Tribe. Other mentioned entities are members of the SCWG. BLM coordinates with WS, and WS has expressed interest in more active participation	See the Coordination Among Program Cooperators and Compliance with Commitments sections.
Develop new law enforcement protocols.	Accomplished.	See the Law Enforcement section.
Identify opportunities for increased public education and outreach.	All agencies are currently coordinating outreach efforts, and looking for new education and outreach opportunities.	See the Lead Reduction Efforts (Education and Communication) and Public Acceptance and Interest sections.
Encourage development and availability of non-lead ammunition.	AGFD has provided free non-lead ammunition to selected hunters for two years. UDWR has stopped using lead ammunition in the 10j area for wildlife hazing activities.	See the Lead Reduction Efforts section.
Initiate condor-lead ammunition hunter awareness program.	Efforts were initiated in Arizona in 2003 and are ongoing.	See the Lead Reduction Efforts section.

Recommendation	Action	Reference In This Document
Initiate research into lead pathways; identify lead exposure sources.	This research has been initiated and is ongoing.	See the Lead Reduction Efforts section.
Coordinate with utility companies; mark critical transmission lines.	Identified areas of concern on the South Rim of GRCA have been marked.	
Coordinate with Federal agencies regarding section 7 and 10(j) rule of theESA.	Section 7 consultations have been conducted as needed and process is ongoing.	See the Compliance of Federal Agencies with Sections 7(a)(1), 7(a)(2), and 7(a)(4) of the Endangered Species Act section.

Table 9. Summary of field management recommendations from the first five-year review and accomplishments in the second five-year period.

Recommendation	Action	Reference In This Document
Continue management flexibility to respond to new challenges.	As new information and knowledge are obtained, they are incorporated into the program by the SCWG as appropriate.	
Continue intensive monitoring and individual bird assessment.	Ongoing.	See the Biology and Management section.
Establish a medical treatment facility near the release site.	Accomplished. The facility was fully functional as of 2005.	See the Treatment Facility section.
Expand use of satellite telemetry and GPS units.	On average, up to one-third of the population is fitted with these units.	See the Monitoring and Data Collection section.
Intervene to prevent birds from being compromised due to behavioral or health reasons.	Ongoing.	See the Biology and Management section.
Continue to hold birds in flight pen for more than six months prior to release.	Ongoing.	See the Biology and Management section.
Increase the use of adult mentor birds for juveniles in flight pen.	Initiated and ongoing.	See the Biology and Management section.
Continue providing contaminant-free carcasses at release site and dispose of remains.	Ongoing.	See the Biology and Management section.
Develop data management procedures for consistency, prompt entry into computer, organized retrieval and analysis. Allow biologists time for data entry.	Initiated and ongoing.	See the Biology and Management section.
Prioritize research needs and make data available to cooperators.	Initiated and ongoing.	See the Research Needs and Future Research and Management sections.

Recommendation	Action	Reference In This Document
Identify condor movement patterns and flight corridors.	Initiated and ongoing.	See the Biology and Management, Research Needs, and Future Research and Management sections.
Expose young birds to large carcasses as soon as possible.	Initiated and ongoing.	See Biology and Management section.
Manage and document condor nesting activities.	Ongoing.	See the Courtship and Reproduction section.

The California condor reintroduction program in the Southwest can highlight several significant accomplishments (which are described in detail throughout this report) of the second five-year period including:

- Addition of 5 wild-hatched chicks to the population, four of which are still alive.
- Implementation of a non-lead ammunition program in Arizona which has reduced available lead bullet fragments by an estimated 50% on the Kaibab and Paria plateaus.
- Reduction of overall mortality from almost 40% for the last reporting period to approximately 26% for this reporting period.
- Identification of lead ammunition residues as the primary obstacle to achieving the goal of a self-sustaining population.
- Improvement of adaptive management in the field to address behavior issues and increased coordination with California field teams.
- Virtual elimination of predation of newly released condors through improved field techniques.

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. Please see the description of condor death and survival figures in the Demography Overview section. Although those rough figures do provide information regarding condor survival, the percentages should not be regarded as mortality rates. The figures do not allow for good inferences regarding population trend. For example, more useful estimates need to be life-stage-specific and should consider the number of days each condor was exposed to mortality as reported by Woods *et al.* (in press) for the period 1996-2004. TPF is currently assembling the recent data for a population trend model covering the second five-years, during which the condor population was more fully invested in wild foraging than in the earlier period and thus more reflective of the mortality regime experienced by a wild population. This five-year review discloses the causes and circumstances of condor deaths and the resulting management actions. This report clearly indicates that lead contamination is a major factor that may hinder the success of the program. If the program is to succeed in the establishment of a

self-sufficient population of condors, the effects of lead contamination must be reduced or eliminated.

The SCWG believes the report indicates that the partners, participants, and agencies involved in the reintroduction effort continued to meet their obligations during the reporting period. The SCWG recommends to the California Condor Recovery Team and FWS continuation of the California condor reintroduction program in the Southwest.

The review team would again like to acknowledge the tremendous efforts of TPF, and especially their and other field personnel, in carrying out the reintroduction of condors in the Southwest. The participation of AGFD, UDWR, BLM, NPS, USFS, and FWS in the program 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.

Future Administrative and Field Operation Recommendations

Below is a summary list of recommendations made in several sections of this report. See Tables 8 and 9 for other ongoing efforts. Other topics and issues can be expected to arise in the next five-year period of the reintroduction program. As issues arise, appropriate discussion within the SCWG and implementation of necessary adjustments or modifications can be expected.

- Broaden outreach efforts to more effectively address ongoing issues with lead shot, bullets from varmint hunters, and non-participation in the free non-lead ammunition program. The effort will include additional outreach to Utah, hunting guides, Native American Nations, and others. The effort will include strategic use of media in outreach efforts.
- Expand the Condor Coalition by recruiting influential national and local sportsmen's groups.
- Continue publishing and sharing results from the free non-lead ammunition program with the public including results from the University of Arizona lead isotope study.
- Assess whether the voluntary lead-reduction efforts are effective in reducing the amount of lead available to condors.
- Consider monthly condor reports for distributing information to the North Rim, Kaibab Lodge, Jacob Lake visitor center, and other venues to assist with information demands of staff, interpreters, and visitors.
- Expand interpretative training for NPS to include staff on the North Rim.

- Consider a module on condors in the Focus Wild Arizona curriculum, perhaps with satellite telemetry data.
- Assist the southern Utah NPS units with development of outreach materials for visitors.
- Add WS in Arizona and Utah to the SCWG mailing list so they are invited to future meetings and receive updates.
- Clarify conservation measures for land-management practices.
- Continue the effort to expand the 10(j) area.

LITERATURE CITED

- Arizona Condor Review Team. 2002. A review of the first five years of the California condor reintroduction program in northern Arizona.
- Cade, T. J., S. A. H. Osborn, W. G. Hunt, and C. P. Woods. 2004. Commentary on released California condors in Arizona. Pages 11-25 *in* Raptors worldwide (R. D. Chancellor and B.U. Meyburg, Eds.), World Working Group on Birds of Prey and Owls, Berlin and MME/Birdlife Hungary, Budapest, Hungary.
- D. J. Case and Associates. 2005. Communicating with hunters and ranchers to reduce lead available to California condors. Unpublished report, Wildlife Management Institute, Washington D.C. and U.S. Fish and Wildlife Service, Sacramento, California.
- D.J. Case and Associates. 2005a. Communicating with hunters and ranchers to reduce lead available to California condors: implementation phase. Unpublished report, Wildlife Management Institute, Washington D.C. and U.S. Fish and Wildlife Service, Sacramento, California.
- D. J. Case and Associates. 2006. Non-lead ammunition program hunter survey. Unpublished report, Arizona Game and Fish Department, Flagstaff, Arizona.
- Chesley, J., P.N. Reinthal, T. Corley, C. Parish, and J. Ruiz. 2006. Radioisotopic analyzes of potential sources of lead contamination in California condors. Joint Annual Meeting of the Arizona/New Mexico Chapters of the Wildlife Society and the Arizona/New Mexico Chapters of the American Fisheries Society, February 2-4, 2006. Invited Symposium on Applications of Stable and Radiogenic Isotopes in Wildlife and Fisheries.
- Church, M. 2006. Sources of lead exposure in California condors. M.S. thesis, University of California, Santa Cruz, California.
- Fry, D. M., J. R. and Maurer. 2003. Assessment of lead contamination sources exposing California condors. Unpublished report, California Department of Fish and Game.
- Fry, D. M. 2004. Analysis of lead in California condor feathers: determination of exposure and depuration during feather growth. Unpublished report, California Department of Fish and Game.
- Hunt, G., W. Burnham, C. Parish, K. Burnham, B. Mutch, and J. Lindsay-Oaks. 2006. Bullet fragments in deer remains: implications for lead exposure in avian species. *Wildlife Society Bulletin* 34:168-171.

- Hunt, W. G., C. N. Parish, S. G. Farry, T. G. Lord, and R. Sieg. In Press. Movements of introduced California condors in Arizona in relation to lead exposure. Pages xx-xx *in* California Condors in the 21st Century (A. Mee, L. S. Hall, and J. Grantham, Eds.). Special Publication of the American Ornithologists Union and Nuttall Ornithological Club.
- Janssen, D. L., J. E. Oosterhuis, J. L. Allen, M. P. Anderson, D. G. Kelts, and S. N. Wiemeyer. 1986. Lead poisoning in free ranging California condors. *Journal of the American Veterinary Medicine Association* 189:1115-1117.
- Meretsky, V.J., N.F.R. Snyder, S.R. Beissinger, D.A. Clendenen, and J.W. Wiley. 2000. Demography of the California condor: implications for reestablishment. *Conservation Biology* 14:957-967.
- Parish, C. N., W. R. Heinrich, and W. G. Hunt. In Press. Five years of lead exposure among California condors released in Arizona. Pages xx-xx *in* California Condors in the 21st Century (A. Mee, L. S. Hall, and J. Grantham, Eds.), Special Publication of the American Ornithologists' Union and Nuttall Ornithological Club.
- Pattee, O. H., P. H. Bloom, J. M. Scott, and M. R. Smith. 1990. Lead hazards within the range of the California condor. *Condor* 92:931-937.
- Redig, P., N. Artz, R. Byrne, B. Heinrich, F. Gill, J. Grantham, R. Jurek, S. Lamson, B. Palmer, R. Patterson, W. Sanborn, S. Seymour, R. Sieg, and M. Wallace. 2003. A report from the California condor lead exposure reduction steering committee. Unpublished report to the U.S. Fish and Wildlife Service, California Condor Recovery Team.
- Responsive Management. 2003. Hunters' knowledge of and attitudes towards threats to California condors. Unpublished report, D.J. Case and Associates, Mishawaka, Indiana.
- Responsive Management. 2003a. Utah hunters' knowledge of and attitudes towards threats to California condors. Unpublished report, D.J. Case and Associates, Mishawaka, Indiana.
- Snyder, N. F. R., and H. F. Snyder. 1989. Biology and conservation of the California condor. *Current Ornithology* 6:175-267.
- Snyder, N. and H. Snyder. 2000. The California condor: a saga of natural history and conservation. Academic Press. San Diego, California. 410 pp.
- Sullivan, K., R. Sieg, and C. Parish. In Press. Arizona's Efforts to Reduce Lead Exposure in California Condors. Pages xx-xx *in* California Condors *in* the 21st Century (A. Mee, L. S. Hall, and J. Grantham, Eds.), Special Publication of the American Ornithologists' Union and Nuttall Ornithological Club.

U.S. Fish and Wildlife Service. 1996a. Endangered and threatened wildlife and plants: establishment of a nonessential experimental population of California condors in northern Arizona. Federal Register 61:54044-54060.

U.S. Fish and Wildlife Service. 1996b. California condor recovery plan. Third Edition. Portland, Oregon. 62 pp.

Wiemeyer, S. N., J. M. Scott, M. P. Anderson, P. H. Bloom, and C. J. Stafford. 1988. Environmental contaminants in California condors. *Journal of Wildlife Management* 52:238-247.

Woods, C. P., W. R. Heinrich, C. N. Parish, S. C. Farry, and T. J. Cade. In Press. Survival and reproduction of California condors released in Arizona. Pages xx-xx *in* California Condors in the 21st Century (A. Mee, L. S. Hall, and J. Grantham, Eds.). Special Publication of the American Ornithologists' Union and Nuttall Ornithological Club.

Appendix A. Summary of public comments received during the second five-year review.

October 3, 2006, Public Open House in Kanab, Utah

1. Lead issues.
2. Contribution of this reintroduction effort to recovery of condor.
3. Other non-lead contaminant issues.
4. Other non-lead mortality factors.
5. West Nile virus.
6. Condors and recent fires.
7. Roosting and breeding locations.
8. Research on reintroduced population.
9. Resources expended on monitoring.
10. Improve the observation area.
11. Supply condor information to facilities /lodges in the area.

October 4, 2006, Public Open House in Flagstaff, Arizona

1. 10j rule and proposed expansion.
2. Lead issues.
3. Micro-trash issues.
4. Power pole aversion training.
5. Adaptive management; program an experiment or for success.
6. Current mortality rate and sustainable population.
7. Report breeding pair status for the five-year period.
8. Project 2007 breeding potential.
9. Status of Hurricane Cliffs release site.
10. Status of Baja California releases.
11. Why have some eggs failed.
12. Increase public education.

Comments received by mail or email.

1. Support expansion of 10j area; proceed quickly.
2. Support use of non-lead ammunition; continue program; educate hunters.
3. Support program; current collaboration allows for any necessary adjustments.
4. More education about condors needed for teachers and children.
5. All GRCA staff should use non-lead ammunition.
6. Condor location data are needed on north rim for daily ranger programs.
7. Request TPF representatives for next spring's interpretive training.
8. Endorsement of recommendations on page 49 of first five-year review.
9. In exchange for 10(j) area expansion, ask for funding of education and outreach programs and ask new states to implement a non-lead ammunition program.
10. Provide more information to locals such as Kaibab Lodge and Jacob Lake.
11. Evolving (increasing) participants is good; bring new partners up to speed.
12. Should be no restriction of land use, even voluntary.

13. Increase public education for awareness and to decrease impacts.
14. Continue to enlarge collaboration with other hunting/shooting stakeholders.
15. Continue and increase monitoring; continue lead testing and treatment program.
16. Site new powerlines and other development away from recovery areas.
17. Enforce meaningful consequences for human harassment and offer rewards.
18. Protect and maintain primitive nature of condor habitat.
19. Increase study of condor behavior, needs, and mortality factors; improve recovery and analysis of carcasses.

Issue	Response	Reference In This Document
Describe the source of lead contamination.		See the Health and Lead Reduction Efforts sections.
Describe the lead data collected on condors from the California population. Do condors in California face the same level/threat of lead exposure as Arizona birds? Can we learn any management lessons from comparing differences?	The California program and lead issues are largely outside the scope of this report. However, we continue to make efforts to address the lead contamination issue in our Southwest population. Meetings of the California and Arizona field staff are regularly conducted to share information regarding this and other items.	
Describe testing and treating (and the effects of treating) condors for lead contamination.		See the Biology and Management and Research Needs sections.

Issue	Response	Reference In This Document
Describe the response in dealing with lead-contaminated carcasses and exposure.	Telemetry data are evaluated daily and responded to immediately. Target birds are trapped, evaluated, and treated if necessary as soon as practical. Holding birds during the hunting season has been done in the past, and it continues to be evaluated, but is not considered a long-term solution. We do not have a supplemental feeding program. Food is provided at the release site to both facilitate recapture of birds for testing and treatment if needed and to aid in socialization of new birds. Data suggest that varying amounts of food at the release site during hunting season yields no observable changes in utilization.	See the Release Strategies section.
Where are lead-contaminated carcasses found?		See the Lead Reduction Efforts section.
Describe tests or investigation of other lead sources.		See the Lead Reduction Efforts section.
Describe the effects of lead on condors.	We do not know how quickly lead can result in condor mortality. Surrogate tests cannot be directly related to condors. Field data suggest that effects of lead are variable and probably influenced by a number of factors.	See the Health, Lead Reduction Efforts, and Research Needs sections.

Issue	Response	Reference In This Document
Provide free non-lead ammunition at Jacob Lake.	This idea has been evaluated but due to the wide variety of needed ammunition calibers it was determined to be impractical. Both mail order and store locations for securing ammunition are available.	
Can the lead-reduction program be extended to the State of Utah?	Lead poisoning was not identified as an issue specific to Utah during the review period. However, UDWR continues to evaluate the AGFD program and internal discussions concerning the lead-condor issue do occur. Funding is not currently available to implement a program of the scope of the AGFD program in Utah.	
Describe petitions to ban lead in condor areas in California (rationale and efforts to avoid similar complaints/processes in Arizona).	Petitions to ban lead in California are outside the scope of this report. This Southwest program has attempted to take a pro-active approach to reduce or eliminate lead on a voluntary basis.	See the Lead Reduction Effort section.
Use the effects of lead on human health to motivate hunters to use non-lead ammunition.	The SCWG believes we should continue to collect, analyze, and report data on the biology of condors. We do not have the expertise to address human health issues, and this information is available elsewhere.	
Highlight the lead-exposure issue in doves and other species.	Efforts are underway in this area in other forums such as the Association of Fish and Wildlife Agencies.	

Issue	Response	Reference In This Document
Can Barnes assist with funding the lead-reduction efforts in Arizona and Utah?	Additional funding sources are continuously being sought.	
Update USFS and BLM regulations to accommodate the burying of gut piles in the field.	Due to significant archeological issues in some areas, methods other than burying are encouraged so as to not disturb these important resources. Burying is generally not a viable option due to soil conditions and other factors (e.g. other predators regularly dig buried carcasses up and re-expose them to condors).	
Link the lead issue to a broader list of bird species such as the raven study in Wyoming and eagles.		See the Health and Lead Reduction Efforts sections.
AGFD should set up a disposal site for gut piles at check points (and/or Jacob Lake). Is there a tallow company that can assist with gut-pile collection sites?	These ideas will be considered for future years.	
Post a lead program educator at Jacob Lake (in addition to check stations).	Staffing will not allow this level of outreach. However, many other efforts are underway. The program attempts to respond to specific education needs and requests.	See the Lead Reduction Efforts section.
How does this reintroduction program contribute to the recovery goals for the California condor?		See the Recovery Goals section.
Are there any non-lead contaminant issues?	These are still being evaluated.	See the Research Needs section.

Issue	Response	Reference In This Document
Are there significant mortality factors other than lead? Except for lead, will the current rate of mortality allow for a sustainable population of condors?	Aside from lead, other mortality factors should allow for the possibility of a sustainable population.	See the Mortality and Demography Overview sections.
Is West Nile Virus in the wild or captive populations? What measures are taken to guard against West Nile Virus infection/mortality?		See the Health section.
Were any condors lost in recent fires?	No condors were lost due to the fires, and no significant changes in condor behavior were observed.	
Describe condor roosting, breeding, and locations.		See the Courtship and Reproduction section.
What (non-lead) research is being conducted on the reintroduced population?		See the Research Needs and Future Research and Management Needs sections.
How many hours and resources are expended monitoring the condors?	Eleven full-time biologists monitor the birds 365 days per year.	See the Program Costs section.
Improve the observation area at the release site. Visitors are sometimes frustrated when they don't see condors.	BLM is improving the facilities at the observation site. The various outreach efforts can help visitors plan their trips, but bird movements vary throughout the year and there is no guarantee that all visitors will observe condors.	
Supply condor information to the facilities/lodges in the area (Jacob Lake, Vermillion Cliffs Lodge, North Rim country). Reach out to give more information to local people.	Condor information is available at the Forest Service visitor center at Jacob Lake, at Navajo Bridge, at Lees Ferry Lodge, and at other locations. Material can be provided to other locations upon request.	

Issue	Response	Reference In This Document
<p>What protections do condors receive in the 10(j) area? What condor management does the 10(j) area allow for? How does land and condor management differ on National Park Service land vs. BLM and Forest Service areas?</p>		<p>See the Compliance of Federal Agencies with Sections 7(a)(1), 7(a)(2), and 7(a)(4) of the Endangered Species Act section.</p>
<p>Do condors within the 10(j) area need to be considered under the National Environmental Policy Act?</p>	<p>Designation of the 10(j) area does not alter the responsibilities of land managers per other laws or regulations.</p>	<p>See the Compliance of Federal Agencies with Sections 7(a)(1), 7(a)(2), and 7(a)(4) of the Endangered Species Act section.</p>
<p>Who has requested expansion of the 10(j) area and why? 10(j) protection for all of Washington County and Utah doesn't seem to be moving very fast.</p>		<p>See the Expansion of the Nonessential Experimental 10(j) Population Area section.</p>
<p>What is the geographic "vision" for an expanded 10(j) area? Will additional or modified special rules be considered as part of a 10(j) expansion?</p>	<p>These questions will be evaluated and determined through the 10(j) expansion process.</p>	<p>See the Expansion of the Nonessential Experimental 10(j) Population Area section.</p>
<p>What are the effects to condor chicks and eggs of parental lead exposure and parental-delivered food contaminated with lead? What is the susceptibility of chicks to lead?</p>	<p>The susceptibility and effects are unknown. Attempting to determine them would require significant involvement with nesting and would be very difficult due to a number of factors. Necropsy results indicated condor chick 305 was in poor body condition and could have died from starvation; high lead levels were not detected during necropsy.</p>	<p>See the Health, Lead Reduction Efforts, and Research Needs sections.</p>

Issue	Response	Reference In This Document
What studies have been conducted on lead-exposed birds' bone, muscle and features?	Research is underway as part of the California Condor Recovery Team efforts.	
Aside from expense, what deters hunters from using non-lead ammunition?		See the Lead Reduction Efforts section.
What are the differences between copper and lead fragmentation?		See the Lead Reduction Efforts section.
Can the California and Arizona programs learn anything from each other's experience in dealing with micro-trash?	To date, micro-trash has been observed but has not been a significant issue in the Southwest program. However, it is a significant problem in California, and the field crews from both programs continue to meet and share issues and concerns.	
Is mock power pole aversion training continuing, and does it continue to be effective?	The conditioning is conducted and it appears to be effective.	See the Release Strategies section.
Describe adaptive management as practiced in the condor reintroduction program. Is the program being conducted for science (an experiment) or for success?	This second-five year review illustrates the many ways that adaptive management occurs in the program. This condor population is designated a nonessential experimental population. However, the ultimate program goal is to establish a self-sufficient population of condors in the Southwest.	See the Recovery Goals section.
What is the projected 2007 (and subsequent years) breeding potential?	The known possibilities for 2007 include three pairs at the South Rim, one pair at Vermillion Cliffs, two pairs on Kaibab Plateau, and one pair in Utah.	

Issue	Response	Reference In This Document
Why did the team utilize the Hurricane Cliffs release site? What happened to it? Will it be used in the future?		See the Release Strategies section.
What is the status of the Baja Mexico releases?	The Baja effort is outside of the scope of this report. It currently consists of approximately 14-19 condors.	Please see the San Diego Zoo website for more information.
Why have some eggs failed?		See the Courtship and Reproduction section.
Can full-time interpretation be provided at El Tovar? Provide interpretation on the Grand Canyon Railway. Increase exposure in the schools. Is there an opportunity to incorporate condors in the Project Wild curriculum? More needs to be done in providing for education of teachers and children regarding condors.	GRCA conducts daily interpretation during the summer. Discussions are underway regarding interpretation on the Railway. We will continue to evaluate and respond to educational opportunities and requests. Specific requests should be submitted to the program.	See the Public Acceptance and Interest section.
Is the use of non-lead ammunition emphasized at Becoming an Outdoor Woman camps? Continue hunter education to use non-lead ammunition. Continue to enlarge collaboration with other hunting/shooting stakeholders. Continue to offer free non-toxic ammunition.	The program will follow up on the Becoming an Outdoor Woman question.	See Lead Reduction Efforts section.
All GRCA staff (rangers and interpretive staff) need to be aware of condors and use non-lead ammunition.	This report should provide a broad background for GRCA staff. Non-lead ammunition is available for all staff.	

Issue	Response	Reference In This Document
Condor location data are needed on the north rim of GRCA for daily ranger programs.	General information can be and is provided. Specific information will not be provided in order to protect the birds.	
TPF representatives should be available for next spring's interpretive training.	TPF staff are available and respond to as many training requests as possible.	
In exchange for 10(j) expansion, the program should ask for full funding of education and outreach programs. For example, new states in the expansion should be asked to implement a non-lead ammunition program.	These suggestions may be considered during the 10(j) expansion process.	
Increasing the number of participants is good. Program needs to work better to bring in new partners up to speed. Should be no restriction of land use, even voluntary. Proceed quickly with 10(j) expansion.		See the Coordination Among Program Cooperators, Compliance with Commitments, Expansion of the Nonessential Experimental 10(j) Population Area, and Compliance of Federal Agencies with Sections 7(a)(1), 7(a)(2), and 7(a)(4) of the Endangered Species Act sections.
Continue and increase monitoring. Improve recovery and analysis of carcasses. Continue lead testing and treatment program. Increase study of condor behavior, needs, and mortality factors.		See the Biology and Management and Lead Reduction Efforts sections.

Issue	Response	Reference In This Document
<p>Site new powerlines and other development away from recovery areas. Protect and maintain primitive nature of condor habitat. Continue protection of habitat and management that maintains its primitive nature.</p>	<p>Although much of the condor range is primitive, condors do occur in less-than-primitive areas. A variety of human activity will continue to occur throughout the range of the condor. A variety of means are in place to protect condors and habitat.</p>	<p>See the Compliance of Federal Agencies with Sections 7(a)(1), 7(a)(2), and 7(a)(4) of the Endangered Species Act section.</p>
<p>Enforce meaningful consequences for human harassment and offer rewards.</p>		<p>See the Compliance of Federal Agencies with Sections 7(a)(1), 7(a)(2), and 7(a)(4) of the Endangered Species Act and Law Enforcement sections.</p>

Appendix B. Abstracts cited in the Health, Demography Overview, and Lead Reduction-Efforts sections of this report.

1. Hunt, W. G., W. Burnham, C. N. Parish, K. Burnham, B. Mutch, and J. L. Oaks. 2006. Bullet fragments in deer remains: implications for lead exposure in scavengers. *Wildlife Society Bulletin* 34: 168-171.

Abstract: Bullet fragments in rifle-killed deer carrion have been implicated as agents of lead intoxication and death in bald eagles (*Haliaeetus leucocephalus*), golden eagles (*Aquila chrysaetos*), California condors (*Gymnogyps californianus*), and other avian scavengers. Deer offal piles are present and available to scavengers in the fall, and the degree of exposure depends upon the incidence, abundance, and distribution of fragments per offal pile and carcass lost to wounding. In radiographs of selected portions of the remains of 38 deer (*Odocoileus* spp.) supplied by cooperating, licensed hunters in 2002–2004, we found metal fragments broadly distributed along wound channels. Ninety-four percent of samples of deer killed with lead-based bullets contained fragments, and 90% of 20 offal piles showed fragments: 5 with 0–9 fragments, 5 with 10–100, 5 with 100–199, and 5 showing > 200 fragments. In contrast, we counted a total of only 6 fragments in 4 whole deer killed with copper expanding bullets. These findings suggest a high potential for scavenger exposure to lead.

2. Hunt, W. G., C. N. Parish, S. C. Farry, R. Sieg, and T. G. Lord. In Press. Movements of introduced California Condors in Arizona in relation to lead exposure. Pages xx-xx in *California Condors in the 21st Century* (A. Mee, L. S. Hall, and J. Grantham, Eds.). Special Publication of the American Ornithologists Union and Nuttall Ornithological Club.

Abstract: The California Condor restoration program in Arizona has benefited by the close monitoring of movements of condors with respect to food acquisition, mortality factors, and encounters with humans and artifacts. All 69 individuals released during 1996-2004 were equipped with VHF transmitters, and 18 carried PTT/GPS satellite-based transmitters for varying periods since fall 2003. Tracking data revealed an evolving cycle of annual movement. Condors generally remained near the release site during winter and then traveled in spring and summer to the Colorado River corridor and the Grand Canyon. Summer and fall use of the Kaibab Plateau increased each year, as did the contingent of birds summering in the Zion region of southern Utah. Movement was more expansive in winter 2004/2005 than in previous winters, in part reflective of an increasing number of pairs establishing breeding territories. We obtained circumstantial evidence of lead sources by examining itineraries of condors on a case-by-case basis during the weeks prior to lead testing. Information supporting the hypothesis of bullet fragments in hunter-killed deer carrion as the primary cause of elevated blood-lead levels in condors includes (1) a recent study showing that the remains of most rifle-killed deer contain numerous lead fragments, (2) observations of condors in association with deer remains (N = 78 cases); (3) an increase of lead blood-levels with increased use of deer-hunting areas of the Kaibab Plateau in 2002, (4) spikes in lead blood-levels and condor visitation to the Kaibab Plateau during and just after the 2002, 2003 and 2004 deer seasons, and (5) significantly higher lead levels among condors visiting the Kaibab Plateau in the weeks prior to testing.

3. Parish, C. N., W. R. Heinrich, and W. G. Hunt. In Press. Five years of lead exposure among California Condors released in Arizona. Pages xx-xx *in* California Condors in the 21st Century (A. Mee, L. S. Hall, and J. Grantham, Eds.). Special Publication of the American Ornithologists' Union and Nuttall Ornithological Club.

Abstract: Lead poisoning was the most frequently diagnosed cause of death among free-ranging California Condors released by The Peregrine Fund in Arizona during 1996–2005 and may have caused additional undiagnosed fatalities. Among 437 blood samples analyzed March 2000 through December 2004 (excluding retests of exposed individuals), at least 176 showed evidence of lead exposure (≥ 15 $\mu\text{g}/\text{dl}$); 82 of those were between 15.0 $\mu\text{g}/\text{dl}$ and 29 $\mu\text{g}/\text{dl}$ (exposed), 55 between 31.0 $\mu\text{g}/\text{dl}$ and 59 $\mu\text{g}/\text{dl}$, and 39 exceeded 60 $\mu\text{g}/\text{dl}$ (clinically affected). Laboratory tests showed that at least 25 of the latter group were above 100 $\mu\text{g}/\text{dl}$; 10 of those exceeded 200 $\mu\text{g}/\text{dl}$, and 5 showed greater than 400 $\mu\text{g}/\text{dl}$; Chelation therapy was administered in 66 cases. Radiographs of 7 condors (3 alive, 4 dead) revealed shotgun pellets in their stomachs, and 7 more (6 alive, 1 dead) showed ingested lead fragments consistent with those of spent rifle bullets. Psyllium fiber or surgery was used to purge lead from the stomachs of surviving individuals. These data indicate that condors in northern Arizona frequently ingest lead and that rifle- and shotgun-killed animals are an important source of toxic exposure.

4. Woods, C. P., W. R. Heinrich, S. C. Farry, C. N. Parish, S. A. H. Osborn, and T. J. Cade. In Press. Survival and reproduction of California Condors released in Arizona. Pages xx-xx *in* California Condors in the 21st Century (A. Mee, L. S. Hall, and J. Grantham, Eds.). Special Publication of the American Ornithologists' Union and Nuttall Ornithological Club.

Abstract: A drastic decline in California Condors resulted in their complete removal from the wild in the 1980s and subsequent establishment of captive populations to propagate offspring for reintroductions. In 1996 The Peregrine Fund began releasing captive-produced condors in the Grand Canyon region of northern Arizona. By July 2005, 50 juvenile and 27 subadult condors had been released, and the free-flying population presently includes 14 adults, which have laid 11 eggs, fledged 3 young, and currently have 2 nestlings. Of the 77 released birds, 26 (34%) have died. Eight condors perished in their first 90 days following release and 14 in their first year (annual survival of 80%). Survival increased to 90% in the second through fourth years, and 98% from the fifth year onward. Lead poisoning from ingested shotgun pellets and bullet fragments was the greatest cause of fatalities for birds after their first 90 days free-flying, with six birds known and two suspected to have died of lead toxicity. Many surviving condors were also treated with chelation therapy at least once to reduce high blood lead levels. Under a program of intensive management, survival rates have been in the range expected for wild condors and pairs are breeding successfully. Self-sustainability, however, will require that lead in the condors' food be greatly reduced or eliminated.

5. Sullivan, K., R. Sieg, C. Parish. In Press. Arizona's efforts to reduce lead exposure in California condors. Pages xx-xx *in* California Condors in the 21st Century (A. Mee, L. S. Hall, and J. Grantham, Eds.). Special Publication of the American Ornithologists' Union and Nuttall Ornithological Club.

Abstract: Exposure to lead is one factor affecting the success of the California condor (*Gymnogyps californianus*) reintroduction program in Arizona. There have been 176 documented cases of lead exposure and 66 chelation treatments administered since 1999. Six condor deaths have been attributed by necropsy to lead poisoning. To address this, the Arizona Game and Fish Department (AGFD) and its partners are working to reduce lead exposure due to spent lead ammunition found in animal carcasses and gut piles. We have focused on public education, scientific research, and voluntary use of non-lead ammunition. In 2003, 205 Arizona hunters were interviewed by phone. Only 23% of the hunters were aware that lead poisoning was a problem faced by condors, but 83-97% were willing to take some action to help condors if credible lead exposure data were made available. Focus groups then rated condor conservation and lead reduction messages. As a result, condor lead data and conservation messages have been provided to the public since 2003. The AGFD and The Peregrine Fund are also funding research to investigate the link between lead ammunition and condor lead exposure. Preliminary results confirm lead from ammunition is a major source of lead exposure in condors. Other efforts include the formation of a voluntary lead reduction coalition consisting of sportsmen's groups and government agencies. The AGFD also funded a pilot program for the fall 2005 hunting season, providing free non-lead ammunition to deer hunters within the condor range. We hope the combination of these efforts will decrease the number of condor lead exposures in the future.

Appendix C. Actions taken to reduce lead exposure in condors.

2002

- The AGFD met with TPF to discuss condor lead exposure problems in Arizona.

2003

- 3,700 fall big game tag holders mailed letters asking them to take lead reduction actions on their hunt within condor range.
- A full-page condor article with information on lead reduction published in AGFD hunting regulations.
- Hunters were interviewed regarding their knowledge of condors and lead issues at Jacob Lake check station.
- Lead reduction notices were posted for varmint hunters on the Kaibab Plateau.
- AGFD provided non-lead ammunition to law enforcement personnel within the condor range to dispatch injured animals.
- Lead mitigation Subcommittee of the Condor Recovery Team conducted surveys of hunters and ranchers in Utah, Arizona, and California.

2004

- 7,800 fall big game tag holders were mailed letters asking them to take lead reduction actions on their hunt within condor range.
- A full-page condor article with information on lead reduction was published in the AGFD hunting regulations.
- Information on non-lead ammunition was posted on the AGFD Web page.
- AGFD and TPF coordinated with NPS and local law enforcement agencies on an injured animal dispatching protocol.
- AGFD coordinated with the USFS Jacob Lake Visitor Center on a condor display that included a lead reduction message.
- Funds were transferred to TPF to purchase satellite transmitters for a condor movement lead exposure study.

2005

- First year of free non-lead ammo program was implemented. 2,400 fall big game tag holders were mailed coupons for free non-lead ammunition to use on their hunt within the core condor range.
- 4,800 fall and spring big game tag holders were mailed letters asking them to take lead reduction actions on their hunt within condor range.
- A full-page article with condor-lead data and lead reduction information was published in the AGFD hunting regulations.
- A condors and lead web page was added to the AGFD condor web page.
- The lead reduction message was added to every condor educational presentation.
- AGFD contracted the University of Arizona to conduct a lead isotope study.

- AGFD and TPF presented a lead reduction update at the Utah Wildlife Society meeting.
- Project cooperators met for “one voice” training on condor-lead issues
- A post-hunt survey was conducted to evaluate free non-lead ammo program.
- AGFD and TPF presented a lead reduction update at AOU Conference.
- Funds were transferred to TPF to purchase satellite transmitters, x-ray machine, medical/rehabilitation facility supplies, trailer and freezer for calf carcasses, optics, telemetry receivers, and data entry system.
- AGFD recruited three local sportsman’s groups (Arizona Deer Association, Arizona Antelope Foundation, Arizona Desert Bighorn Sheep Society) to join the Condor Coalition and support lead reduction efforts in condor range.

2006

- Second year of free non-lead ammo program was implemented. Over 1,400 summer and fall big game tag holders in core condor range were eligible for the program. An additional hunt unit was added to the program. More loaded calibers and grain weights, bullets for hand-loaders, and muzzleloader ammunition were also added.
- 5,200 fall big game tag holders were mailed letters asking them to take lead reduction actions on their hunt within condor range.
- A full-page article with condor-lead data and lead reduction information was published in the AGFD hunting regulations.
- Condor-lead research and post-hunt survey results were added to the AGFD condors and lead web page.
- AGFD presented a lead reduction update at the Arizona Wildlife Society meeting and Arizona Colorado Plateau research meeting.
- AGFD and TPF trained GRCA interpretive staff for public dissemination of the lead reduction message.
- AGFD and TPF hosted a non-lead shooting booth with Federal Ammunition at the Department’s shooting showcase.
- The Department persuaded two more local sportsman’s groups (Arizona Elk Society, the Arizona chapter of the National Wild Turkey Federation) to join the Condor Coalition and support lead reduction efforts in condor range.
- AGFD and TPF assisted with and attended the first non-lead ammunition shooting showcase for the condor program in California.
- Posted flyers in public locations during the Kaibab Plateau deer seasons to raise awareness of the lead issue.