

Pinnacles National Park California Condor Reestablishment – Annual Report 2016



Pinnacles National Park Report
Submitted to US Fish and Wildlife Service
Endangered Species Recovery Permit TE157291-1

Prepared by:

Rachel Wolstenholme, Condor Program Manager

Alacia Welch, Condor Field Crew Leader

Kris Vanesky, Condor Field Crew Leader

Rose Fielding, Condor Crew Bio-technician

National Park Service

Pinnacles National Park

5000 Highway 146

Paicines, CA 95043

Permit contact person:

Karen Beppler-Dorn, Superintendent, Pinnacles National Park

Cover photo: *Condor 828 in the nest at Pinnacles National Park during 60-day nestling check.*

NPS Photo by Gavin Emmons.

Please cite this publication as:

Wolstenholme, R. et al. 2017. Pinnacles National Park California Condor Reestablishment –

Annual Report 2016. Pinnacles National Park, National Park Service, Paicines, California. Pp. 30

Table of Contents

ACKNOWLEDGEMENTS	5
INTRODUCTION	6
METHODS	6
<i>Population Monitoring</i>	6
Survival Monitoring	6
Trapping	7
Nest Monitoring	7
Baiting	9
Remote Monitoring	9
Non-proffered Food	9
Monitoring of Captive Birds	9
<i>Management</i>	10
Treatment	11
Vaccination	12
Hazing	12
<i>Collaborative Research</i>	12
<i>Outreach</i>	12
<i>Personnel</i>	13
RESULTS	14
<i>Population Monitoring</i>	14
Survival Monitoring	15
Trapping	19
Reproduction	19
Microtrash	22
Baiting	22
Remote Monitoring	22
Non-proffered Food	23
<i>Management</i>	23
Captive-bred Releases	23
Lead Sampling	23
Treatment	23
Vaccination	25
Hazing	25
<i>Collaborative Research</i>	25
Chelation Efficacy Research	25
Contaminants Study	26
Chelation Treatment and Lead Depuration Study	26
Blood Parasite Research	26

Rodenticide Exposure Research	26
<i>Outreach</i>	27
NPS Education and Interpretation	27
Targeted Non-lead Outreach	28
General Community Outreach	28
RECOMMENDATIONS AND DISCUSSION	29
<i>Monitoring</i>	29
<i>Management</i>	29
<i>Research</i>	29
<i>Outreach</i>	30

ACKNOWLEDGEMENTS

We are thankful to many collaborators and partners that support our work to restore this species. We gratefully recognize the Ventana Wildlife Society, not only as the founder of the Pinnacles National Park condor release site, but as our primary partner in the management of central California condors. We would also like to thank staff at the Institute for Wildlife Studies, US Fish and Wildlife Service, UC Davis, UC Santa Cruz, NPS Biological Resources Division, Dr. Amy Wells and the staff at the Avian and Exotic Clinic of the Monterey Peninsula, the California Department of Fish and Wildlife, LightHawk, Los Angeles Zoo, Oakland Zoo, and the Bureau of Land Management. We would also like to thank multiple divisions at Pinnacles National Park for helping the condor program in many ways. The release of captive-reared condors would not be possible without the exhaustive efforts of the Los Angeles Zoo, San Diego Zoo Safari Park, The Peregrine Fund's World Center for Birds of Prey, and the Oregon Zoo. We give special thanks to the Amah Mutsun Tribal Band for ceremonial prayers. Trapping and the care of condors in temporary captivity would not be possible without the organic dairy farmers that generously provide calf carcasses to use as bait and food. Pinnacles Partnership provided direct support for condor recovery. Finally, we cannot thank our volunteers and interns enough for their indispensable support.

Volunteers

Joseph Belli, Richard Neidhardt, Jack Peabody, Mike Baird, Jeff Robinson, Darryl Zimmerman, Bob Quaid, Sean and Sarah Parnell, Tia Alexander, Barbara Lutes, Rakesh Agarwal, Megan Gnekow, Ben Sims, Sarah Erb, and Danielle Powell.



Photo: Mike Baird radio-tracking condors at Pinnacles National Park. NPS photo by Gavin Emmons.

Interns

Janette Perez-Jimenez, Yani Pohl, Kris Vanesky
Kathy Whyte, Richie King, and Katharine Rose Fielding

INTRODUCTION

California condors are one of the rarest bird species in the world and biologists have been committed to their recovery for over three decades. The Condor Reestablishment Program at Pinnacles National Park (PNP) has several objectives, with the goal of species recovery in the wild.

Project objectives include:

- 1) monitoring central California condor foraging, movements, nesting, reproduction, and population trends;
- 2) detecting mortalities and recovering condor carcasses so cause of death can be determined;
- 3) managing threats to condors;
- 4) increasing public awareness of threats to condors; and
- 5) conducting cooperative research to aid condor recovery.

Together with the Ventana Wildlife Society (VWS), PNP manages a flock of nearly 90 condors in central California. During 2016, the Pinnacles condor program monitored all birds using the central CA area, as well as monitoring PNP-managed condors that traveled beyond their typical range. PNP-managed condors and VWS-managed condors make up a single flock, overlap in range, feed together, and are captured at both release sites that are situated in the park and in Big Sur, CA. This report focuses on Pinnacles Condor Program management of birds released from the park but also includes some VWS-managed condor data, courtesy of VWS.

METHODS

Population Monitoring

Condors are monitored year-round to document reproduction, mortality, and movements. Condor health, foraging, interactions, and breeding behavior are monitored through visual observations. Biologists use standard equipment to radio-track, locate, and monitor condors. A detailed equipment list is available in: *Pinnacles National Park California Condor Reestablishment – Annual Report 2013. Pinnacles National Park, National Park Service, Paicines, California. Pp. 20.*

Survival Monitoring

Over one quarter of the condors in central California are monitored remotely via GPS wing tags, Photo 1. Argos GPS data are downloaded daily from CLS America and mapped in ESRI ArcGIS version 10.3. PNP has also deployed GSM (cell technology) GPS tags manufactured by Microwave Telemetry (MT) and Cellular Tracking Technology (CTT). Data from MT GSM tags are received via email when a tagged condor flies within range of a cellular tower. Data from CTT GSM tags are downloaded from the CTT website. In addition, both traditional satellite and GSM

data are available through Movebank's online interface as well as in daily Google Earth files. PNP staff uses ArcGIS and Google Earth to map and view all condor location data daily.

Radio tracking within and around PNP is conducted five to seven days per week. Biologists use high points to increase probability of hearing a signal. Monitoring outside of the park is conducted along public roads in San Benito County, portions of western Fresno County, northern San Luis Obispo County, and eastern to southern Monterey County. Prolonged stationary GPS locations or mortality signals (triggered by a radio transmitter that is inactive for four to ten hours) are tracked down using a handheld receiver and an antenna to confirm dropped tags or the presence of sick or deceased condors. This activity takes priority above most others to maximize the chance of treating a sick or injured bird or retrieving a carcass before it decomposes. PNP follows USFWS condor carcass collection procedures. Data from daily tracking and monitoring, and all other field activities are entered into Access databases and Excel spreadsheets.



Photo 1. Microwave Telemetry Satellite GPS Tag. NPS photo by Gavin Emmons.

Trapping

Trapping condors is critical to maintain vinyl identification tags and functioning VHF radio and GPS tags on as many individuals as possible. In coordination with VWS, PNP conducted two trapping seasons in 2016 to measure condor blood lead levels, perform transmitter maintenance, and conduct sampling for on-going research studies. The spring trapping season spanned early May through early July. The autumn trapping season was conducted from early October through late November. Opportunistic trapping occurred throughout the year for transmitter maintenance or other needs, and was focused on birds not captured during the spring or autumn efforts.

Before handling condors, biologists receive extensive training in handling protocols, collecting samples, and processing birds from highly experienced LA Zoo keepers and PNP co-workers who are already listed on PNP's USFWS recovery permit as approved handlers. Personal protective equipment (PPE) during handling includes eye protection, long-sleeved shirts and pants, closed-toe boots, and leather and nitrile gloves.

Nest monitoring

Biologists monitor active nest sites from survey locations 300-800 meters from the nest depending on topography. They look for egg incubation, hatching, nestling health, behavioral interactions, adult-nestling feeding events, and fledging of young. Where feasible, biologists enter active nests following standard procedures for egg candling as well as nestling checks, conducted at 60 and 120 days of age. In past years, PNP used to conduct four nestling checks, including 30 and 90-day old nestling checks. However, following this year's change in protocol

by the USFWS and discussion with VWS, PNP reduced nestling checks from four to two. Once a nest site is confirmed, biologists enter the nest when an egg is approximately 30 days old to check if it is fertile, Photo 2. They use a high-powered flashlight in a dark space to view inside the egg. If an egg is fertile, it is weighed, measured, and left in the nest. If an egg is not fertile, it is removed from the nest and replaced with an artificial egg until an egg laid in captivity is available to replace the artificial one. Access to nests on private property, nest location, parent and nestling behavior, and staff capacity may result in changes to planned nest entries to ensure safety for the field crew as well as the condors.



Photo 2. Veterinarian Amy Wells during nest entry. NPS photo by Gavin Emmons.

During nest entries PPE includes all appropriate climbing equipment, eye protection, and leather and nitrile gloves. Biologists and/or a veterinarian check a nestling's blood lead levels, general health, and vaccinate it against West Nile Virus. If a nestling has high lead exposure it may be evacuated from the nest for emergency care. Biologists search and/or sift nest sites for egg-shell fragments and micro-trash, which are removed when found. Annual nest entry trainings are conducted at PNP and additional technical ropes trainings are planned year-round to keep staff experienced with relevant technical skills.

Baiting

Biologists use “clean” food supplies acquired from organic dairies and place carcasses approximately twice per week at one or two established bait stations in the park. Other carcasses may also be fed to condors after they are radiographed to ensure there are no foreign or metallic objects in the carcass, such as spent ammunition. Bait stations include the captive facility and ‘Hilltop’ semi-permanent bait site. Established safety requirements include proper PPE, four-wheel drive training, and placement of carcasses by at least two biologists. Carcass placements are conducted at night to minimize interactions with condors and any association with humans as food suppliers.

Remote Monitoring

Remote video cameras stationed at the captive facility and Hilltop bait site record real-time data that biologists review to observe individual birds. In addition, memory cards from motion-sensitive cameras are retrieved each time food is placed and the photographs are reviewed for presence of birds and predators. Weight data are collected using scales with perches mounted near bait. Still photos and video allow biologists to track the general condition of condors.

Non-proffered Food

Non-proffered food is defined as any carcass that PNP or VWS biologists have not placed for condors at a bait site. When condors are observed feeding on non-proffered food, biologists identify the carcass species when possible. Observing condors feeding on private land from public roads limits biologists’ ability to identify carcass species. Landowners are only contacted about a carcass on their property when there is a specific concern.

Monitoring Captive Birds

Captive condors are held at PNP’s captive pen (also referred to as the flight pen or captive facility), Photo 3, to minimize interactions with humans. An electrified power pole at the flight pen delivers negative reinforcement to modify condor behavior and discourage them from landing on or near power poles when they are in the wild. During handling and prior to initial releases of young juveniles, biologists monitor captive condor health and interactions at the captive pen and through the use of remote video. When captive-reared young condors first arrive at PNP from zoos, they spend at least 60 days in the facility prior to their release.



Photo 3. Captive pen (facility), Pinnacles National Park. NPS photo by Gavin Emmons.

Missing Birds

When a condor goes completely undetected by any of our monitoring methods (visual observation, VHF radio signals, camera/video images, or GPS data) for over a week, monitoring efforts increase, such as extending the radio-tracking search area and planning aerial telemetry flights through partner organizations. If biologists are unable to locate the bird after an extensive and coordinated search, the bird's status is 'missing.' Following USFWS guidance, missing birds not detected for 12 months are considered dead and are removed from the population total.

Management

The main threat to central California condors is lead exposure from spent ammunition fragments in scavenged carcasses. Other risk factors may include micro-trash consumption, West Nile Virus exposure, electrocution from perching on power poles or flying into power lines, and human interactions. PNP biologists conduct management with established protocols to study and reduce the impact of these risks.



Photo 4. Collecting blood sample. NPS photo by Gavin Emmons.

Treatment

Lead exposure treatment

Trapping condors allows for tag and transmitter maintenance as well as managing risk factors that affect condor survival. Biologists take blood samples to determine blood lead levels each time a bird is captured from the wild. LeadCare Analyzers, suitable for field use, are used to collect immediate results that determine whether a condor requires treatment for high blood lead levels, Photo 4. The threshold used to initiate chelation treatment is a blood lead value of $35\mu\text{g/dL}$ or greater. Condors with elevated blood lead levels on a LeadCare Analyzer are radiographed in the park's Condor Care Unit (CCU), at zoos, or clinics to help inform treatment needs. Radiographs taken at PNP are emailed to veterinarians for their review after being taken, Photo 5. Birds with possible metallic densities in their gastrointestinal tract, or any bird with blood lead levels above $65\mu\text{g/dL}$, are transported to the Oakland or LA Zoos for treatment. Condors with clear radiographs and blood lead levels between $35\text{--}65\mu\text{g/dL}$ may be treated at PNP when there is sufficient staff capacity. In addition, condors with clear radiographs and blood lead levels between 25 and $35\mu\text{g/dL}$ may be monitored in the captive facility for two weeks at PNP for a lead depuration study unless they need to be released immediately.

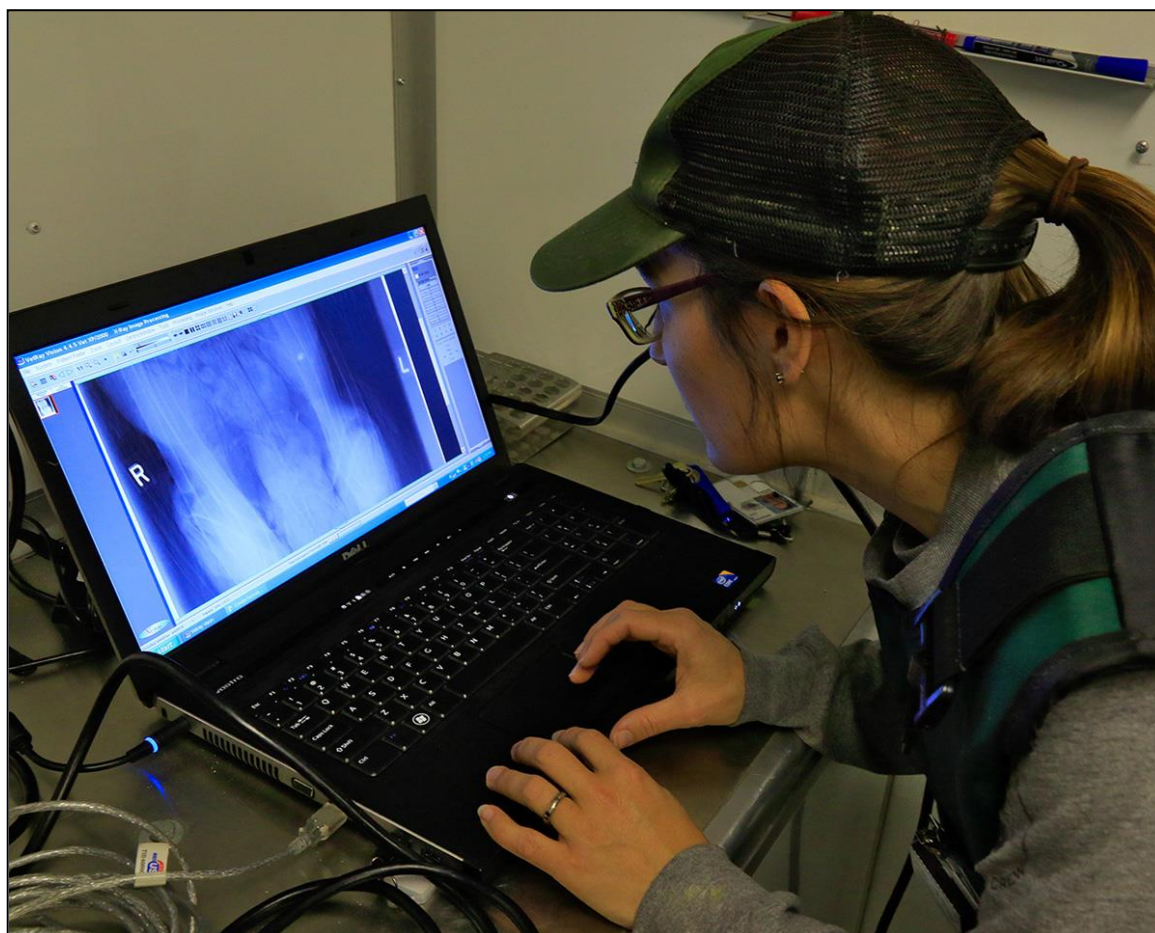


Photo 5. PNP Biologist Alacia Welch preparing a radiograph for veterinary review. NPS photo by Gavin Emmons.

Veterinary care

PNP biologists are permitted to conduct basic first aid for superficial wounds discovered during handling. Any treatment requiring veterinary care is conducted by or under the guidance of a permitted veterinarian in the field, at a clinic, or at a zoo.

Vaccination

Captured condors receive West Nile Virus vaccinations and boosters on a schedule provided by veterinarians. In 2016, the schedule remained the same as recent years, with a goal of vaccinating 100% of the flock on an annual basis. This protocol was followed for all birds captured in 2016.

Hazing

Hazing may be needed when condors endanger themselves by staying in close proximity to humans or human infrastructure. Hazing methods vary depending on location and include clapping and running, clapping wood blocks together, spraying water using a water cannon, using an air horn, and throwing pebbles near a condor.

Collaborative Research

In 2016, PNP biologists continued to work closely with researchers at the University of California at Santa Cruz (UCSC) to gather scientific data to measure condor responses to environmental risk factors. Biologists sent blood samples collected during handling, emergency responses, and nest entries to UCSC to measure isotopic signatures of lead in condors. Feather samples were also sent to UCSC to measure lead exposure events in individual condors over time and monitor the benefits of chelation treatment to long-term condor survival. Several new research projects being implemented in 2017 are described later in this report.

Outreach

The PNP Condor Program defines outreach as any activity that provides an opportunity for greater understanding of a particular resource or issue. Activities include but are not limited to: promoting awareness, presenting information, partnership building, education, volunteer efforts, and citizen science programs. Outreach is not stationary or static. Over time and with changing needs, PNP has adapted outreach strategies. Outreach to surrounding communities and those affected by conservation actions on public lands provide an opportunity for greater trust and cooperation between PNP and local residents. Building a foundation of trust and cooperation can lead to partnerships, with the ultimate goal to steward natural resources together.

Outreach is not unidirectional. It builds a foundation that fosters communication and understanding to flow in multiple directions. It increases understanding of the needs and concerns beyond the park boundary and opportunities to realize aspects of natural resource

conservation that have not been previously considered. This benefits immediate and long-term efforts, whether they are related to condor recovery, the use of non-lead ammunition, or any community conservation efforts that benefit from increased collaboration.

As lead exposure in wild condors continues to be the primary obstacle to recovery, PNP Condor Program staff members have continued outreach about the impacts of spent ammunition to scavenging wildlife with other park staff, local landowners, ranchers, hunters, and the general public. PNP has dedicated the time of one biologist to conduct outreach and work closely with the Institute for Wildlife Studies (IWS), VWS, and other partners to collaborate on outreach efforts. Additionally, during the course of routine fieldwork, the field staff speaks with park visitors and local residents. Outreach is conducted in the local community, statewide, and at larger scales in coordination with other partners and NPS Regional and National staff to address the complexity of this issue, from local perceptions to nationwide non-lead ammunition availability.

Hunting and ranching operations are essential to condor recovery. These operations depend on clean water and healthy habitats to sustain livestock and game species. Condors benefit from related water resources, as well as the availability of nesting and foraging habitat. Carcasses left on the land from hunting and ranching operations are important food for condors, as long as they have not been shot with lead ammunition. Hunters and ranchers already have a long tradition of wildlife stewardship. Increased partnerships and open communication are needed to address the impacts of lead ammunition, as condor recovery relies on eliminating their exposure to lead.

PNP's outreach strategy continues to promote education and voluntary efforts to reduce the impacts of spent lead ammunition on wildlife health. The primary message is focused on the fact that condors benefit from hunting and ranching operations when non-lead ammunition is used. With hunting and ranching audiences, available alternatives to lead ammunition are discussed, as well as how to achieve the best performance from non-lead ammunition. With park visitors and the general public, we stress the need for continued hunting and ranching, as well as how those traditions play an important role in wildlife conservation.

Personnel

Implementing a long-term endangered species recovery program requires consistent staff capacity, supporting highly-trained, experienced biologists. Our program consists of a manager, wildlife health outreach coordinator, two field crew leaders, a biological science technician, and two interns, all working full-time and year-round. An additional wildlife biologist works with the program full-time for six months per year. During the final quarter of 2016 PNP's wildlife health outreach coordinator position became vacant.

Volunteers provide vital program support and receive extensive training prior to assisting in the field. We ask volunteers to make a year-long commitment to the program for a minimum of

two days per month. Volunteers assisted in tracking, field observations, and a wide variety of logistical tasks that support management of the species. In 2016, 16 volunteers contributed over 3,264 hours.



Photo 6. Rose Fielding training American Conservation Experience intern, Janette Perez-Jimenez, in radio telemetry. NPS photo by Gavin Emmons.

RESULTS

Population Monitoring

In January 2016, PNP managed 32 condors, 18 males and 14 females, which comprised approximately half of the flock in central California. Four captive-reared birds that were transferred to PNP in fall 2015 were released in February and March 2016. In September 2016, two additional captive-reared birds (one male, one female) arrived at PNP from The Peregrine Fund's World Center for Birds of Prey in Idaho and will be released in early 2017.

There were eight nesting attempts in central CA in 2016, with six of those including at least one PNP condor. Four nests successfully fledged chicks. Two of the chicks are now managed by PNP, one is managed by VWS, and one died just after fledging.

Not including the captive-reared juveniles awaiting release (2), the total population of PNP-managed condors at the end of 2016 was 37 birds, plus one 'missing' bird that cannot be located. In total, there are 18 males and 20 females. Combined with birds managed by VWS, there were 85 birds occupying the central CA area, not including any that could not be located and were classified as 'missing,' Figure 1.

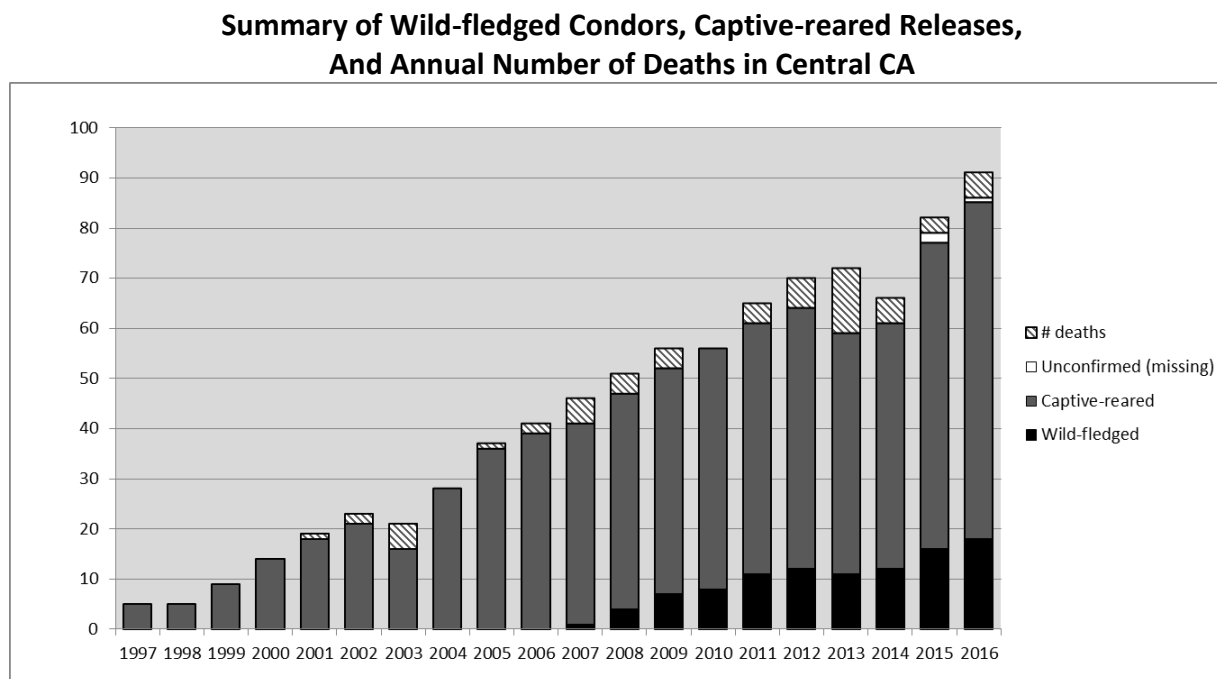


Figure 1. Chart presents total number of condors in the wild (both wild-fledged chicks and captive-reared) currently managed by PNP and VWS in the central California area, in addition to the number of condor deaths each year. Condor nestling deaths are not included in this chart. Condors missing <12 months are categorized as 'Unconfirmed, missing'. VWS data provided by J. Burnett, Big Sur Condor Program Coordinator and Senior Biologist.

Survival Monitoring

Throughout the year, PNP monitored radio and GPS-tagged condors almost daily. Condors without functioning tags were observed opportunistically, often when they were near other radio tagged birds that were being tracked. This year, there were 4,507 visual observations of wild condors by PNP biologists. Including birds monitored in captivity, there were 4,873 visuals of condors by PNP biologists. On 328 days of the year, staff recorded at least one visual observation of one or more condors. Whenever possible, biologists closely monitored any condor behaving abnormally and any bird with a GPS tag that did not move in over 24 hours to determine if the individual was injured or sick.

Staff used GPS data to efficiently locate approximately half of PNP-managed birds daily and these data often directed where staff focused efforts for a given day. Over 200,000 GPS locations were downloaded from transmitters on 21 PNP-managed condors throughout the year. Condors released by both VWS and PNP used the landscape in all directions surrounding

the park. Figure 2 maps a selection of satellite GPS location data from several PNP-managed condors and represents the core range used by condors in central California in 2016. Because condors are social, monitoring them via GPS transmitters adds great efficiency to locating all released condors, including those with no functioning radio or GPS transmitters.

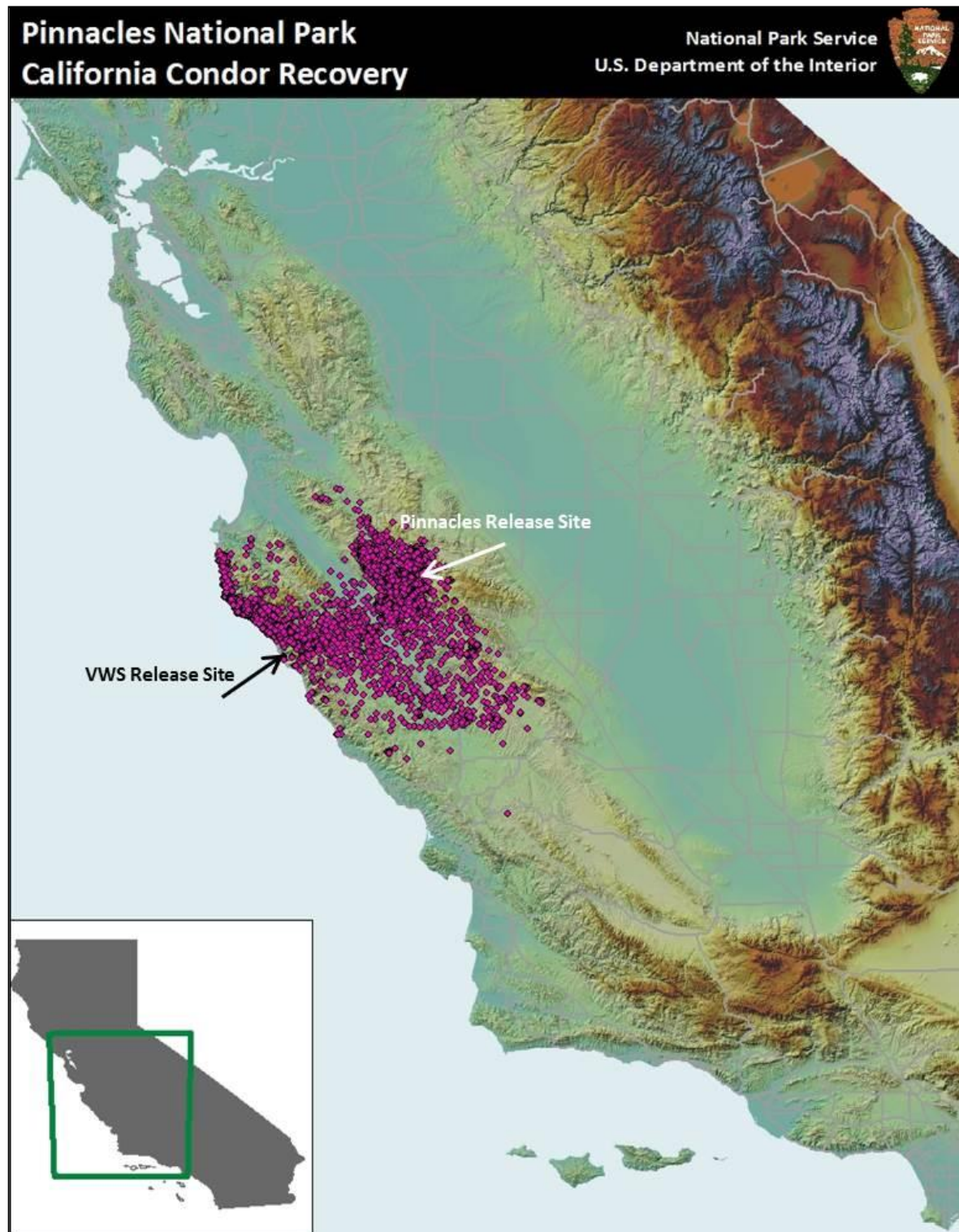


Figure 2. Location data from selected PNP-managed condors with GPS

Long Range Movements

In contrast to 2015, no extraordinary long-range movements were detected in 2016. Because not all condors in the flock have GPS tags, and radio-telemetry is not conducted beyond their usual range, such movements may have occurred but gone undetected.

Mortality

There were two mortalities recorded in 2016 of PNP-managed condors. Condor 742 died at the LA Zoo after being transported there by PNP staff who observed her abnormal behavior at the PNP flight pen. Following care at LA Zoo, her necropsy and lab results showed she died of septicemia. She had been released from PNP in February 2016 and spent two and half months in the wild. The second mortality recorded this year was 713. This bird had been undetected since the spring of 2015, Table 1. Following USFWS recommendations, birds missing 12 or more months are considered dead and removed from the population count.

Missing Birds

Condors that are not detected using telemetry, GPS data, or any other type of observations after 12 months are considered mortalities. Prior to 12 months, condors that cannot be located are considered 'missing.' One PNP condor, 481, has been missing since April 21, 2016. PNP staff will continue to monitor for this bird through April 2017.



Photo 7. Richie King radio-tracking at Pinnacles National Park. NPS photo by Gavin Emmons.

Table 1. Condor mortality of PNP and VWS-managed condors since 2001. *VWS data provided by J. Burnett, Big Sur Condor Program Coordinator and Senior Biologist.*

ID	Estimated Date of Death	Managed By	Cause Of Death
230	5/9/2001	VWS	Powerline Electrocution: Bird electrocuted on line (mid-span)
233	5/17/2002	VWS	Missing
212	10/30/2002	VWS	Powerline Electrocution: Bird electrocuted on line (mid-span)
254	2/19/2003	VWS	Powerline Electrocution: Bird electrocuted on line (mid-span)
260	5/20/2003	VWS	Malnutrition
170	6/15/2003	VWS	Lead Toxicosis
256	10/17/2003	VWS	Unknown: Bird recovered in desiccated state
179	12/20/2003	VWS	Missing: Bird disappeared after wildfire at Hopper NWR
164	9/30/2005	VWS	Unknown: Bird recovered in desiccated state
376	6/30/2006	VWS	Powerline Electrocution: Bird electrocuted on line (mid-span)
363	7/14/2006	VWS	Malnutrition: Bird died from poor body condition
417	5/12/2007	PINN	Trauma to neck, possible predator
301	5/15/2007	VWS	Powerline Electrocution: Bird electrocuted on line (mid-span)
307	5/16/2007	PINN	Unknown - possible snake envenomation
356	10/2/2007	VWS	Unknown: Found dead near release site in desiccated state
429	12/4/2007	VWS	Missing
278	6/25/2008	VWS	Missing
377	6/25/2008	VWS	Missing
336	9/7/2008	PINN	Lead Toxicosis
475	12/21/2008	VWS	Trauma
286	5/11/2009	VWS	Lead Toxicosis
503	7/6/2009	VWS	Trash Ingestion
422	7/12/2009	PINN	Unknown
303	10/23/2009	VWS	Lead Toxicosis
621	4/28/2011	VWS	Trauma
624	5/25/2011	VWS	Trauma
294	6/7/2011	VWS	Unknown: Bird recovered in desiccated state
499	11/9/2011	VWS	Aspiration
478	4/21/2012	PINN	Lead Toxicosis
588	7/21/2012	PINN	Unknown
298	10/22/2012	VWS	Lead Toxicosis
644	11/10/2012	VWS	Exposure: hypothermia.
318	11/30/2012	VWS	Lead Toxicosis
598	12/8/2012	PINN	Unknown
312	4/4/2013	PINN	Lead Toxicosis
681	4/13/2013	PINN	Unknown, chick - nothing in nest to recover, no necropsy report
715	5/20/2013	VWS	Unknown, chick disappeared
345	5/28/2013	PINN	Lead Toxicosis
686	6/1/2013	VWS	Unknown, chick recovered in desiccated state
335	6/1/2013	PINN	Lead Toxicosis
306	6/9/2013	PINN	Electrocution, possible indirect lead exposure
332	7/2/2013	PINN	Lead Toxicosis
194	7/11/2013	VWS	Missing
708	7/12/2013	VWS	Trauma, chick died in nest
313	8/6/2013	PINN	Lead Toxicosis
714	9/4/2013	VWS	Trauma, chick died in nest
693	9/8/2013	PINN	Unknown, chick - no collection based on remote nest location
501	9/25/2013	VWS	Missing
451	12/7/2013	PINN	Lead Toxicosis
739	4/28/2014	VWS	Unknown, chick disappeared before fledge
400	4/29/2014	PINN	Lead Toxicosis
401	6/15/2014	PINN	Lead Toxicosis (proximate) perforation of the ventriculus (immediate)
444	8/26/2014	VWS	Lead Toxicosis
411	12/6/2014	PINN	Unknown: Bird recovered in desiccated state
664	12/31/2014	VWS	Lead Toxicosis
753	4/16/2015	VWS	Missing (last detected 4/16/2015)
788	4/30/2015	VWS	Unknown, chick - nothing in nest to recover, no necropsy report
713	5/15/2015	PINN	Missing, presumed dead (last detected 5/15/2015)
782	5/23/2015	PINN	Unknown, chick - nothing in nest to recover, no necropsy report
798	6/10/2015	VWS	Unknown, chick - nothing in nest to recover, no necropsy report
242	7/30/2015	VWS	Lead Toxicosis
769	8/29/2015	VWS	Unknown, suspected trauma
615	11/17/2015	VWS	Trauma - Predation
742	5/1/2016	PINN	Septicemia
251	7/4/2016	VWS	Lead Toxicosis
838	12/1/2016	VWS	Necropsy results pending (suspect trauma - euthanized)

* For chicks with no carcass recovery, estimated nest fail date used

Trapping

PNP conducted two trapping cycles in 2016, May to early July and October through November. In addition to scheduled seasonal trapping, some opportunistic trapping occurred throughout the year when specific birds were captured for transmitter replacement or behavioral and health issues. Capture success in the spring was limited due in part to low staff capacity. Trapping in conjunction with VWS allowed for a greater number of condor captures, particularly in the spring. In total, twenty-two PNP-managed condors were trapped in 2016 at both PNP and VWS facilities combined. Thirteen of those 22 were trapped in both the spring and autumn seasons. An additional four condors were trapped opportunistically outside of the regular trapping seasons.

In 2016, PNP staff spent 116 person-days trapping and captured 23 condors, (down from 34 in 2015 with equal trapping effort). These results include opportunistic trapping efforts driven by the presence of target birds in the park, Table 2. Capture data summarized in Table 2 only includes condors that were captured at the PNP facility.

Table 2. 2016 PNP trapping effort and captures of PNP and VWS-managed condors at PNP.

Trapping Season	Date Range	Total handling days*	Total captures**	Total individuals captures***	Person Days
Spring	May - early July	3	6	5	24
Autumn	October - November	6	10	10	40
Opportunistic	Year Round	6	8	8	52
	Totals	15	24	23	116

**Days biologists initially handled any condors trapped at Pinnacles. These include condors caught for health checks, transmitter replacements, or as non-targets. Nestling handlings that took place at nests are not included.*

***Number of condors trapped including multiple captures of the same individual during the given time frame.*

****Number of individual condors trapped during the given time frame at Pinnacles.*

Reproduction

In 2016, there were eight nests in central California. Six of those nests included at least one PNP-managed condor, Table 3. Overall, eight PNP-managed condors attempted to nest this year at the six nests. Three individuals paired with VWS-managed birds, there were two PNP-managed pairs, and one PNP female was in a trio with two VWS-managed males. There were four fledglings from the central California flock in 2016 and all were from pairs that involved PNP-managed condors. Three of the eight central CA nests were remote and never visually confirmed, but GPS and parental behavior suggested they all failed during the egg stage. One additional remote nest was visually confirmed, but also failed during the egg stage.

Table 3. 2016 central California nesting summary. VWS data provided by J. Burnett, Big Sur Condor Program Coordinator and Senior Biologist.

Nest ID	Nesting Male	Nesting Female	Wild Egg ID	Estimated Lay Date	# of Nest Entries	Wild Egg Fate	Foster Egg Used	Foster Egg ID	Nestling Studbook	Nest Outcome
TO	204/470	534	CC516	02/27/16	0	Wild egg hatched in nest	No	NA	842	Fledge
AS	209	231	CC316	02/19/16	0	Failed during egg stage	No	NA	NA	Fail
TI2	219	310	CC116	02/15/16	4	Infertile/Dead egg	Yes	OZ07-16	835	Fledge
MAC5	340	236	CC216	02/19/16	2	Wild egg hatched in nest	No	NA	828	Fledge
CA	351	418	CC616	03/03/16	0	Wild egg hatched in nest	No	NA	838	Fledge
SB	405	525	CC716	03/15/16	0	Failed during egg stage	No	NA	NA	Fail
RB	566	597	CC416	02/24/16	0	Failed during egg stage	No	NA	NA	Fail
TC	477*	547	CC816	03/03/16	0	Failed during egg stage	No	NA	NA	Fail

Note* Male id unconfirmed

PNP Condor Nesting Details

VWS and PNP intensively manage condor nests to maximize the likelihood of them fledging young successfully. This includes replacing infertile eggs with viable ones, monitoring the health of nestlings, providing care or treatment if needed, and the removal of micro-trash if found within nest cavities. Nesting results should be interpreted with this in mind. In addition, each year a greater number of condors in the central CA reach breeding age, which should increase the number of nesting attempts over time. PNP 2015 Annual Report summarized all nesting since 2009.



Photo 8. Condor 340 with nestling 828. NPS photo by Gavin Emmons.

The first nest ever to include a PNP-managed condor was in 2009, six years after PNP began its condor program. Nesting attempts by PNP-managed condors have increased over time, Figure 4. A drop in reproduction in 2014 was most likely due to mortality of seven breeding-age condors the previous year. In 2016, PNP had its first fully successful condor nest within the park boundary in over 100 years, with a successful fledgling leaving the nest.

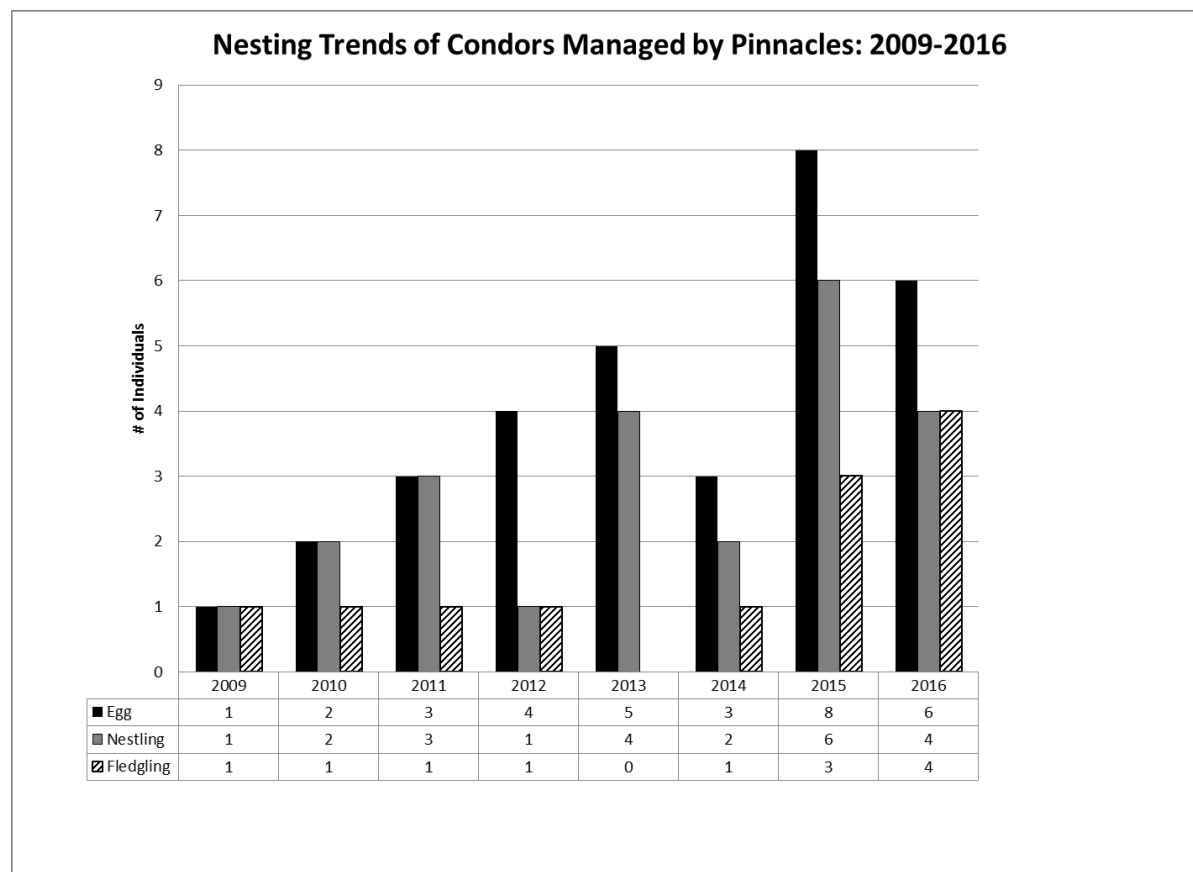


Figure 4. Egg, nestling, and fledgling counts for PNP-managed condors since 2009. *Note: these data include nests that had a PNP-managed breeder but the nestlings were not necessarily a PNP-managed bird because VWS and PNP manage nestlings based on nest location, not parents.*

PNP and VWS manage nests based on geographic location and ease of monitoring as opposed to who manages the adult condors. However, nest entries are conducted together when possible. Of the eight central CA nests in 2016, PNP managed two; one in the park and one in Monterey County on public land.

PNP biologists only enter nests when conditions are suitable. They entered MAC5 in the park just twice for the 60-day and 120-day nestling checks. They did not enter during the egg stage to reduce the risk of ravens, observed in the area, detecting the nest. During the 120 day check, biologists did not end up handling the nestling because it had the ability to avoid them by

leaving the nest along a rock ledge and potentially endangering itself. Condors 340 (managed by PNP) and 236 (managed by VWS) successfully fledged their chick, 828, in November.

PNP entered TI2 twice during the egg stage and twice during nestling stage, at 60 and 120-days old. The egg was infertile and therefore swapped with an artificial egg and then swapped with a viable egg from a captive breeding center. Fires in the area increased the level of coordination and planning needed to conduct the nestling checks, but both were successful. Condors 219 (VWS managed) and 310 (PNP managed) successfully fledged their chick, 835, from this nest.

Microtrash

During nest entries, staff searched for microtrash within the nest whenever possible. Since 2009, 48 nest entries at 13 nests included a search for micro-trash. The searches resulted in locating and removing micro-trash from 5 of the 13 nests searched. The park's nest in 2016 contained 5 pieces of plastic trash, which staff removed during one nest entry. In all, trash removed from nests over the years included items made of plastic, rubber, PVC pipe pieces, and bottle caps; and items weighed between .1 to 26.9 grams.

Baiting

In 2016, biologists placed 135 calves procured from organic dairies in Modesto, CA to bait the facility during trapping and to feed captive condors. During trapping seasons, carcasses were placed exclusively at the facility to increase trapping success with very minimal use of Hilltop bait station at other times of year.

Remote Monitoring

To supplement radio and GPS monitoring, thousands of still photos and video hours were collected and reviewed regularly, throughout the year, Photo 9.



Photo 9. Photo taken with remote camera.

Non-proffered Food

Biologists observed eight non-proffered feeding events that resulted in at least 39 condor observations feeding on carcasses other than those provided at the PNP facility as bait. Biologists observed condors feeding on three cows, two pigs, and three unidentified carcasses. Additionally, the public reported seeing condors feeding on two different occasions, once on a cow and once on an unidentified carcass. Many feeding events in the wild go unrecorded due to biologists' limited access to private land.

Management

Captive-bred Releases

PNP released four captive bred condors into the wild in February and March of 2016. The birds had arrived at PNP in September 2015 with two additional birds. One of those two was released late in 2015, the other was sent to the Oregon Zoo's captive facility in early 2016 because behavioral observations indicated it was not ready to be released. In September 2016, two more juveniles were transferred to PNP from USFWS to be released in early 2017.

Lead Sampling

Blood lead level sampling continued to be a priority management action for any bird captured at PNP, whether captured during a scheduled trapping season or opportunistically. Figure 5 summarizes the lab blood lead values for all PNP condors since 2007. In 2016, a total of 24 PNP-condors were tested. Based on the current recovery program protocol, birds with levels below 35 µg/dL on a field lead test kit do not receive chelation treatment. It should be noted that lab values are often greater than field values. When possible, condors captured at PNP with field test kit blood lead levels between 25 and 35 µg/dL are radiographed and held for a lead depuration study. However, due to limited staff in 2016 during trapping season, no birds were held for the study this year.

Treatment

Chelation

In 2016, six Pinnacles condors were treated for elevated blood lead levels. One bird was treated at two different times in the year. Chelation treatment for birds with field lead values between 35 µg/dL and 65 µg/dL can be administered in PNP's CCU and those greater than 65 µg/dL or showing clinical signs of lead poisoning are transferred to the Oakland or LA Zoo for treatment. However, this year PNP staff did not treat any condors in the park's CCU, due to limited staffing during trapping seasons. All six condors received treatment at the Oakland and LA Zoos and one condor was treated twice, once at each facility. Figure 5 includes the number of PNP condors that received chelation treatment, at PNP or elsewhere, following capture since 2007.

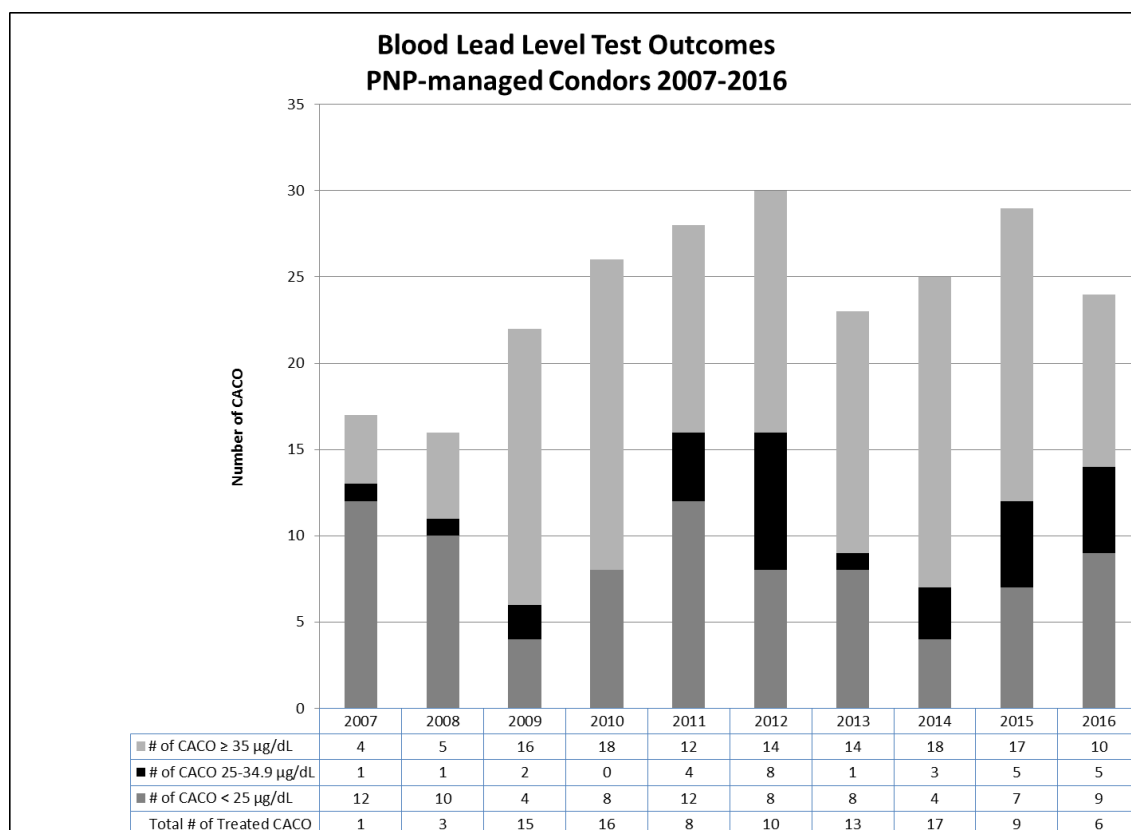


Figure 5. Treatment and blood lead values for PNP-managed condors 2007–2016.

Radiographs

Condors with blood lead levels greater than 35 µg/dL based on the LeadCare Analyzer were radiographed to determine whether metallic densities were present. All condors taken to Oakland or LA Zoo for chelation treatment were radiographed by veterinary staff there, Table 4.

Table 4. Radiograph information for PNP-managed condors in 2016.

Bird	Clinic	Purpose	Density	Outcome
317	LA Zoo	Elevated lead	No	
330	Oakland Zoo	Elevated lead	No	
340	Oakland Zoo	Elevated lead	No	
602	Oakland Zoo	Elevated lead	No	
688	Oakland Zoo	Elevated lead	No	
742	LA Zoo	Medical	No	
744	Avian Clinic	Toe injury	No	Fracture near distal end of middle toe on left foot
744	Avian Clinic	Toe injury	No	Continued evaluation of toe fracture
744	Oakland Zoo	Toe injury	No	Fractured toe healing
800	LA Zoo	Elevated lead	No	
800	Oakland Zoo	Elevated lead	No	

Note: this table lists all PNP birds radiographed either at PNP or elsewhere and if any VWS birds were radiographed by PNP.

Surgeries

In 2016, no PNP-managed condor required surgery.

Vaccination

In 2016, West Nile Virus vaccinations were given to 20 PNP condors, following the existing protocol of one vaccination per year.

Hazing

In 2016, staff hazed twelve condors. Four of them were hazed two to three times during the year.

Collaborative Research

Working collaboratively with USFWS, VWS, universities, and other researchers is a high priority for PNP with the aim of helping accomplish recovery goals. Multiple studies are underway to better understand threats to condors and how management can reduce their impacts to condors.

Chelation Efficacy Research

A PNP/UCSC chelation efficacy research study began in 2015 to evaluate the benefits of chelation on condors over time in terms of reduced mortality. Blood and feather sample collection supported this effort, Photo 7. Evaluating lead concentrations and isotopic



compositions in sequential feather segments from individual birds will provide data on the degree, frequency, and severity of lead exposures in California condors. These data will be considered with chelation history

Photo 10. PNP Biologist Jennie Jones inspecting feather growth. NPS photo by Gavin Emmons.

of individual birds. PNP measured and marked at least one growing feather when a condor had any growing primaries at the time of capture. If a condor had molted a previously sampled feather, we collected another sample when possible.

Contaminants Study

This research is a collaboration between PNP and USGS in Portland, OR. The purpose is to identify contaminant threats to condor health and assess nutritional adequacy of food resources to evaluate current management strategies and better understand ways to minimize risk to environmental contaminant exposure. The research is focused on four contaminant groups to which condors are likely exposed: Polychlorinated biphenyls (PCBs), Organochlorine pesticides (OCs); Polybrominated diphenyl ethers (PBDEs), and Mercury (Hg). Primary objectives include: analysis of condor food resources for contaminants and nutrient composition; analysis of wild condor blood samples for contaminants, and quantification of relative contributions of the variety of food sources to condor diets using stable isotope analyses. Sample collection began in 2013 and continued through fall 2014. In 2016, USGS conducted data interpretation and expects to publish their research in 2017. Results will quantify multiple environmental contaminants condors ingest and how those affect their health and survival.

Chelation Treatment and Lead Depuration Study

To better understand chelation effectiveness in condors, PNP took blood samples from birds that required treatment after they received two and four chelation treatments and then analyzed these samples for their lead values. These data will indicate how quickly chelation treatment reduces the lead load in condors. In addition, PNP measures natural lead depuration when chelation treatment is not given by collecting blood samples once per week for a two week period from condors with field blood lead values >25 and <35 $\mu\text{g/dL}$. These data may help inform future chelation effectiveness research. This work will continue in 2017.

Blood Parasite Research

In collaboration with USFWS, VWS, and PNP, San Francisco State University (SFSU) researchers are analyzing blood samples for parasites that can be associated with diseases, such as avian malaria. This two year study involves a small blood sample, <1 ml from 30 or more individual condors. All sample and data analyses are being conducted by researchers at SFSU. Sample collection for this research will continue in 2017.

Rodenticide Exposure Research

Research and sampling conducted on Prairie falcons within PNP in 2014 detected exposure to highly toxic, second generation rodenticides, and raised concerns that condors may also be consuming food contaminated by these toxins. In conjunction with PNP Resource Division staff and NPS NRSS Biological Resources Division, an initial set of samples of blood from live condors and liver tissue from condor carcasses was submitted for laboratory analysis. The preliminary results from the liver samples showed that some condors were being exposed and highlighted the need to continue this research to collect more samples over multiple years. The

collaboration with the NPS Washington office will continue in coordination with a USGS research project funded for three years to begin in 2017.

Condor Range and Movements Research

In 2016 PNP began a new research collaboration with Colorado State University. Their work will analyze condor behavior, environmental parameters, and GPS data to predict long range movements into areas beyond their current range. The research will help managers better understand condor behavior as well as new and current threats that exist in areas not presently occupied by condors.

Outreach

A large component of the Condor Recovery Program is educational outreach and interpretation. As the only condor release site in a national park, park visitation gives staff an opportunity to reach thousands of people from all over the world. Providing the public with information about the natural resources in the park and the surrounding landscape is an essential pathway to inspire environmental consciousness and enthusiasm and is one of the duties of a national park.

NPS Education and Interpretation

This year was the first of a three-year, multi-park condor project to ensure all national parks that have condors, or may in the near future, are sharing resources about condors, such as their biology, threats to their survival, and recovery efforts underway in California, Arizona, Utah, and Baja California, Mexico. Enhancing park visitors' experiences is the primary focus for this interpretive project, although non-lead education and outreach, both within parks and beyond their boundaries in local communities, is also highly relevant. During 2016, the project focused on sharing existing materials among eight national park units, as well as compiling requests for more resources and interpretive materials and recognizing gaps where more work is needed. The project will continue through 2017 and 2018.



Photo 11. Biologist Arianna Punzalan, at Golden Gate National Recreation Area's 2014 Bioblitz, teaches school children about wildlife conservation. Photo by Michael Silverman.

PNP also conducts education and interpretation in the park and in the surrounding communities. While in the field, biologists and trained volunteers were available to answer questions and provide visitors with informal interpretation about condors. Condor staff and volunteers spoke with 4,797 park visitors within the park and 53 individuals while tracking outside of the park boundary. In addition to informal contacts, biologists presented four educational programs to over 212 individuals.

Outreach about lead as an environmental contaminant is recognized as one of the most important actions that can positively impact condor recovery. PNP staff employed various outreach funds and efforts to educate diverse groups on the impacts of lead on condors, other wildlife, and human safety, as well as the benefits of removing lead from the landscape. The primary partners for non-lead outreach were VWS and IWS. PNP also had opportunities to offer technical support to VWS for their Free Non-lead Ammo program.

Targeted Non-lead Outreach

This year PNP continued conducting outreach related to the use of non-lead ammunition and lead poisoning in condors from the inadvertent ingestion of spent ammunition from animal remains left in the field. Over the past year, PNP and its partners participated in events to discuss non-lead issues with thousands of people. Throughout most of 2016, IWS and PNP staff worked together with the Oregon Zoo, The Peregrine Fund, and VWS to coordinate outreach efforts across multiple states. However, PNP's wildlife health coordinator position was vacated in September 2016, leaving a gap in efforts and slowing momentum that had been building for several years. PNP will work with partners to help fill this gap as soon as possible. In 2017, PNP will continue working with other agencies and non-profit partners to expand outreach.

General Community Outreach

PNP is surrounded by private lands, which provide condors and many other native wildlife species with important habitat. For park staff, outreach includes building relationships with land owners and land managers to encourage communication, helping address any human/wildlife conflicts, and creating trust within the community. PNP requests permission to access private lands as needed to locate dropped transmitters, sick or injured birds, and possible nesting activity. These informal meetings, as well as radio tracking along public roads, create opportunities to answer questions about the condor program and interact one on one with land managers and local residents who can have a direct positive impact on condor survival. Ranching and hunting lifestyles are compatible and necessary for condor recovery in central California. Working together with the community, the hope is that these traditions remain viable in the lands surrounding the park.

IWS continued their work with a local resident in San Benito County to implement projects that mutually benefit ranching operations and habitat conservation. Strengthened by efforts of the San Benito Working Landscapes Group, the program assisted with pest species management, distributed non-lead ammunition to local residents, and completed a water infrastructure improvement project that benefited livestock, wildlife, and area residents.

RECOMMENDATIONS

Monitoring

Maintaining staff capacity and efficient monitoring creates a well-rounded program, including outreach and research components that are coordinated with condor management. The increase in the number of condors with GPS tags over time has increased monitoring efficiency by reducing the number of 'missing' birds that were difficult to locate and by guiding the field crew's efforts after viewing GPS data each morning. Further increasing the number of birds with GPS tags would simultaneously result in more data of higher precision and better use of personnel time. In addition, although nest monitoring via radio tracking, observations, and GPS tags are sufficient to determine nest location and outcome, these tools cannot necessarily address questions on the fate of an egg or nestling. PNP received funding to install nest cameras into accessible nests to help address these questions and this effort will continue in 2017.

Management

Lead in the environment remains the primary threat to condor recovery. Condors will continue to use the public and private lands from PNP to the coast that offer excellent foraging and roosting habitat. Addressing the threat of lead on all these lands is an ongoing need, as is providing the best care possible to condors exposed to lead. A greater understanding of the efficacy of chelation treatment will help all condor release sites determine when it is most useful. Chelation treatment for condors should be further researched and evaluated to increase the understanding of the options it provides. The NPS/UCSC research collaboration on chelation efficacy will help inform this evaluation and will continue through 2018.

Research

Each research project conducted to date has informed management decisions that affect the recovery of the species. PNP biologists continue to work closely with researchers and prioritize the collection of samples and data that support scientific research. With funding for research limited, condor recovery partners should continue to work together with USFWS leadership and discuss highest priority needs, research proposals, joint funding opportunities, data sharing, and collaboration.

Outreach

Outreach efforts remain critical to inform the public about wildlife conservation, condor recovery, non-lead ammunition, and how lead affects all wildlife species. PNP staff regularly highlight the importance of a hunter's role in wildlife conservation, condor recovery and how hunting and ranching provide food resources for condors when carcass remains are left in the field. Developing strong partnerships will continue to be an important step in successful outreach efforts. Fostering inclusion and cooperation while addressing the issue of lead will create better understanding and appreciation among interest groups.

Outreach efforts, considered paramount for condor recovery, are limited by insufficient funding. However, multiple organizations and agencies work together to coordinate their efforts to reach the greatest number of people each year and to provide accurate information to interested hunters. Condor release sites and all recovery partners should continue to work together to coordinate and fund successful outreach.