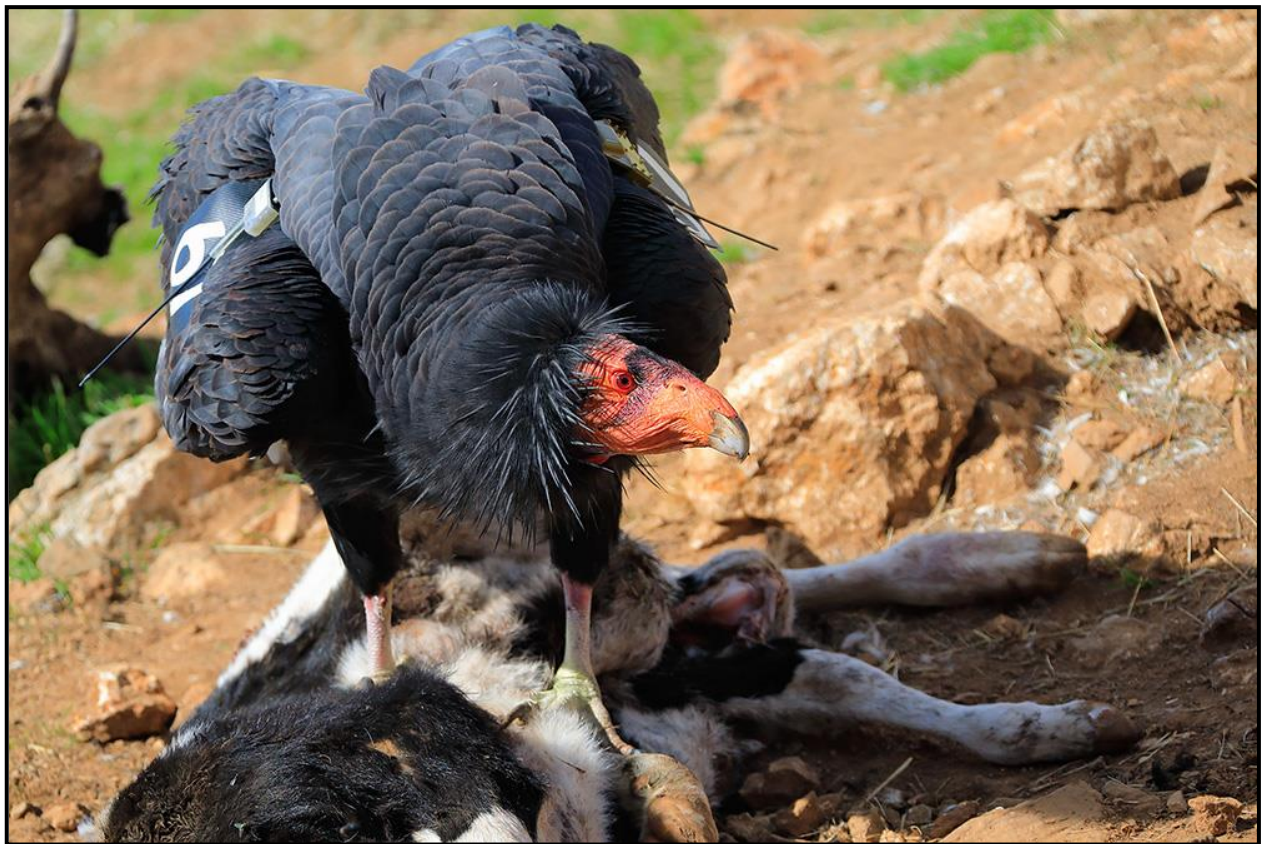


Pinnacles National Park California Condor Reestablishment – Annual Report 2017

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



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Cover photo: *Condor at proffered bait site. NPS Photo by Gavin Emmons.*

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Volunteers

Joseph Belli, Richard Neidhardt, Mike Baird, Jeff Robinson, Darryl Zimmerman, Bob Quaid, Sean and Sarah Parnell, Tia Alexander, Barbara Lutes, Rakesh Agarwal, Megan Gnekow, Ben Sims, Bettina Boemans, Maggie Hirshauer, and Sonny Punzalan

Interns

Janette Perez-Jimenez, Savannah Robinson, and Kyle Tibor

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:

- 1) monitoring central California condor population trends by documenting foraging, movements, nesting, and reproduction;
- 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 approximately 90 condors in central California. During 2017, the Pinnacles condor program monitored all birds using the central CA area: those managed by PNP and VWS. PNP-managed condors and VWS-managed condors make up a single flock, overlap in range, feed together, and are captured at two release sites: one based in the park and one in Big Sur, CA. This report summarizes data on birds managed by PNP and also includes some VWS data on the condors they manage.

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 and locate 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

Less than half the condors managed by PNP 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, traditional satellite and GSM data are available through Movebank's online interface. PNP staff uses ArcGIS and Google Earth to map and view all condor location data daily. In 2017, all CTT tags were removed from birds due to

tag malfunction. PNP is focusing on increasing the proportion of traditional satellite tags over GSM tags due to poor cellular coverage in the central California condor range.

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 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 2017 to measure condor blood lead levels, perform transmitter maintenance, and collect samples for research studies. The spring trapping season spanned March through early July. The autumn trapping season was from late September through late November. Opportunistic trapping occurred throughout the year to place transmitters as needed and 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 45-60 and 120 days of age. As in 2016, VWS and PNP aimed to conduct two nestling checks per accessible nest, in addition to an egg fertility check.

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 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 or health, 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. Rose Fielding 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 or monitored more closely. 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.

For the first time this year, biologists installed a remote video camera in a nest in the park. They followed an installation design and method developed by the USFWS Condor Program. After locating the nest cavity, they entered the nest for the egg fertility check and to install the video camera. They set up a solar panel and battery within a few hundred feet of the nest and ran ethernet cable through conduit to an internet camera secured within the nest. A microwave link was also powered with the solar power system and sent the video signal to a receiving antenna that connected to a computer running video monitoring software based in a park office. This software recorded video so they could review multiple days of recordings or watch live feed.

The video camera greatly increased the number of hours of nest observations, enhanced the quality of observations, and reduced the amount of time field biologists spent hiking to the remote nest. The camera allowed biologists to observe nestling health and nestling-parent interactions in a nest so deep that it could not be seen from any observation points.

Baiting

Biologists use "clean" food supplies acquired from organic dairies and place carcasses approximately twice per week at one or two established bait sites in the park. Other carcasses may be provided after they are radiographed to ensure there are no foreign or metallic objects in the carcass, such as spent ammunition. Bait sites include the captive facility and 'Hilltop' semi-permanent site, both located in areas in the park that are closed to the public. Safety protocols during baiting require proper PPE, four-wheel drive training, and placement of carcasses by at least two people. Carcasses are placed 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 data that biologists review to observe individual birds. 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 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 question or 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 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 in to the wild.



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 Rose Fielding.

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, Photo 4. 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 5. The threshold used to initiate chelation treatment is a blood lead value of 35 $\mu\text{g}/\text{dL}$ 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 may be emailed to veterinarians for their review after being taken. Birds with possible metallic densities in their gastrointestinal tract, or any bird with blood lead levels $>65 \mu\text{g}/\text{dL}$, are transported to the Oakland or LA Zoos for treatment. Condors with clear radiographs and blood lead levels between 35-65 $\mu\text{g}/\text{dL}$ 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 $\mu\text{g}/\text{dL}$ 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. Analyzing blood sample at facility. NPS Photo.

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 2017, 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 captured birds.

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 an air horn, and throwing pebbles near a condor.

Collaborative Research

In 2017, PNP biologists continued to work closely with researchers at Colorado State University (CSU) on a spatial risk analysis, San Francisco State University (SFSU) on a blood parasite project, and the University of California at Santa Cruz (UCSC) to gather scientific data to measure condor responses to environmental risk factors. PNP also works with US Geological Survey (USGS) and Integral Ecology Research Center to study potential impacts of rodenticides on condors. New research projects 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 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 can build a foundation that fosters communication and understanding. 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 staff time 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 interacts 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.

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.

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 with 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 2017, PNP's wildlife health outreach coordinator position was vacant for more than half the year.

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 assist in tracking, field observations, and a wide variety of logistical tasks that support management of the species. In 2017, 15 volunteers contributed over 2,361 hours.



Photo 6. Gavin Emmons during a nest entry to install nest camera and check egg fertility. NPS photo by Kris Vanesky.

RESULTS

Population Monitoring

In January 2017, PNP managed 38 condors, which comprised just under half of the flock in central California. There were four mortalities in 2017. Four captive reared birds were released this year: two juveniles received from zoos in 2016 were released in February 2017 and an additional two arrived in September 2017 and were released in November and December. There were ten nesting attempts in central CA in 2017, with seven of those including at least one PNP condor. Four central CA nests successfully fledged chicks. Two new fledglings are now managed by PNP, and two by VWS. The total number of PNP-managed condors at the end of 2017 was 39, plus one 'missing' bird (19 males, 20 females, and one unknown gender).

Combined with birds managed by VWS, there were 88 birds occupying the central CA area by the end of the year, and two additional birds that could not be located and are classified as 'Unconfirmed (missing),' Figure 1.

1997-2017 Wild-fledged Condors and Captive-reared Releases in Central CA population, including Deaths Per Year

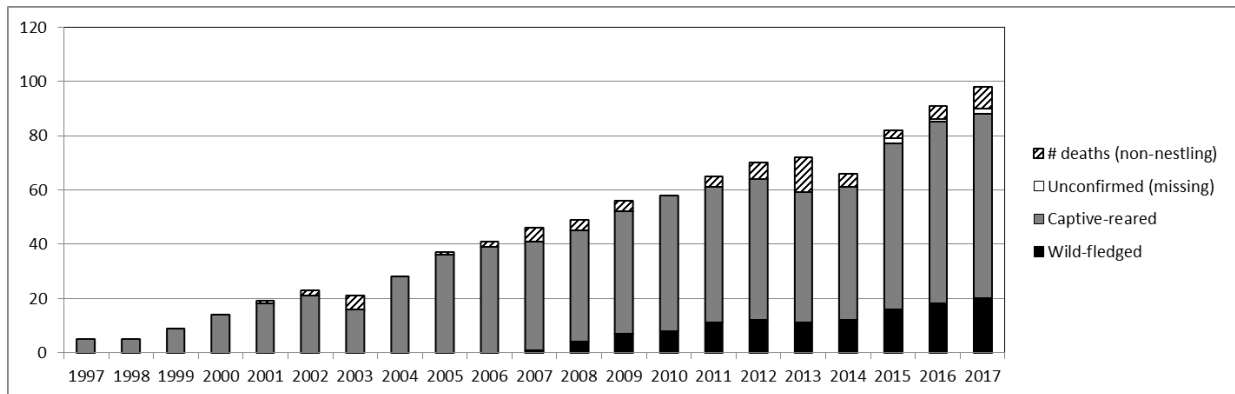


Figure 1. Chart presents total number of condors in the wild (both wild-fledged chicks and captive-reared) currently managed by PNP and VWS in the central California area, in addition to the number of condor deaths each year. Condor nestling deaths are not included in this chart. Condors missing <12 months are categorized as 'Unconfirmed (missing)' but still make up part of the population total. *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 3,255 visual observations of wild condors by PNP biologists. Including birds monitored in captivity, there were 3,666 visuals of condors by PNP biologists. On 359 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. Hundreds of thousands of GPS locations were downloaded from GPS tags on 24 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 2017. 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.

Pinnacles National Park California Condor Recovery

National Park Service
U.S. Department of the Interior

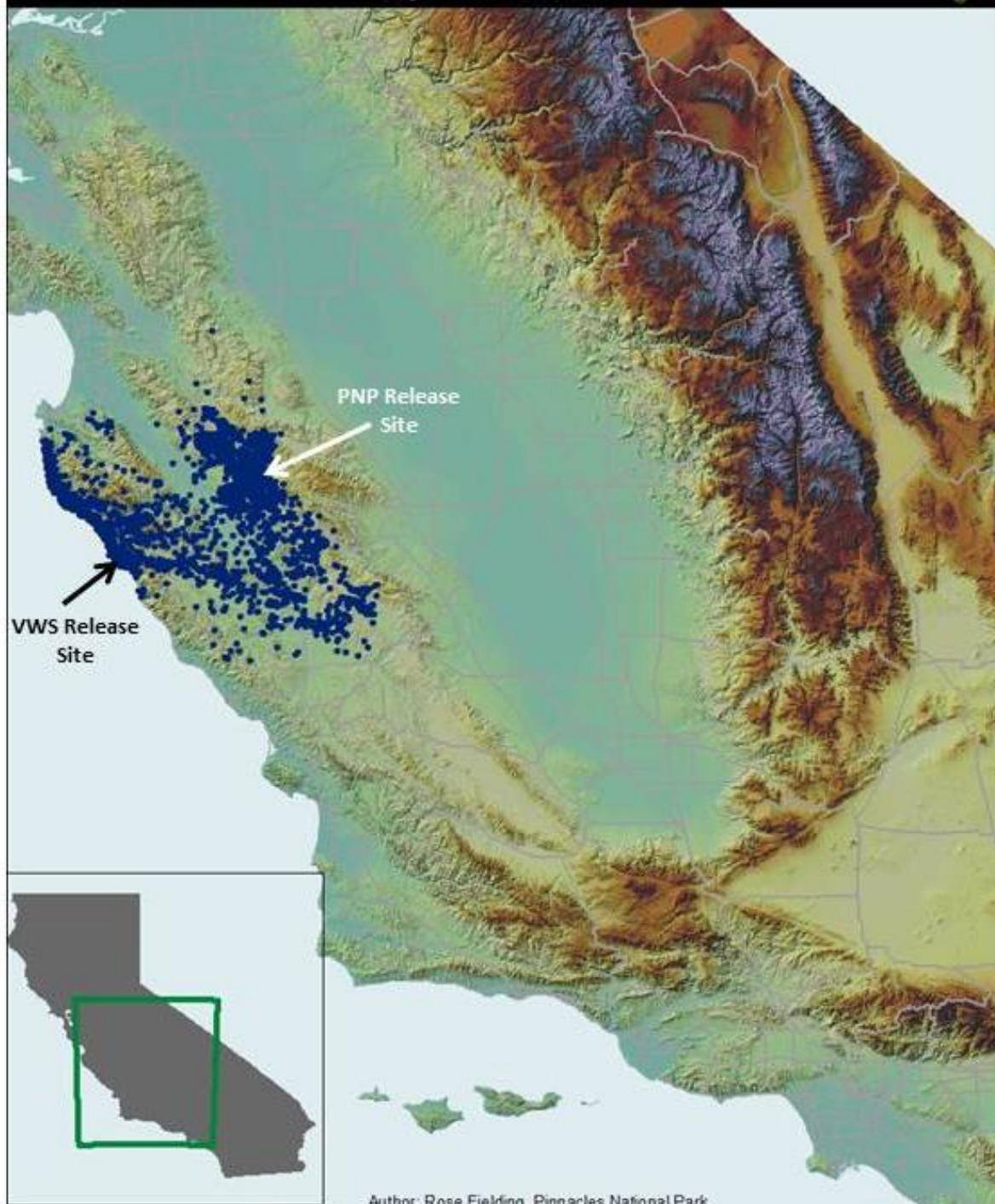


Figure 2. Location data from selected PNP-managed condors with GPS tags.

Long Range Movements

In 2017, condor 564 took a long range flight during 25-30 August. He went from the Big Sur coast east toward Coalinga, then north past San Jose near Livermore. The flight distance was approximately 310 miles.

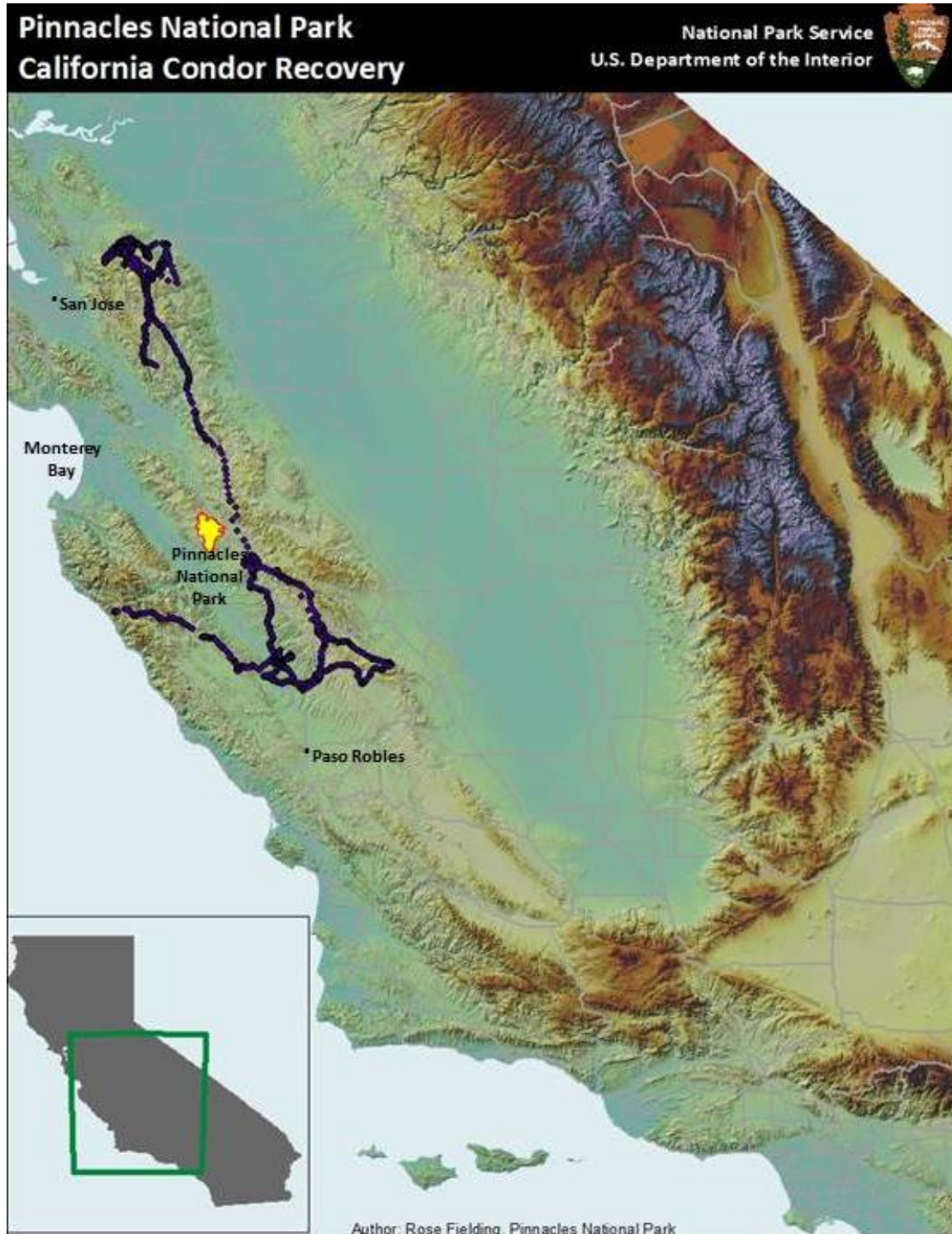


Figure 3. Long distance movement for 564 based on GPS tag data.

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
335	6/1/2013	PINN	Lead Toxicosis
686	6/1/2013	VWS	Unknown, chick recovered in desiccated state
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 (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
481	4/22/2016	PINN	Missing (last detected 4/21/2016)
742	5/1/2016	PINN	Septicemia
251	7/4/2016	VWS	Lead Toxicosis
838	12/1/2016	VWS	Trauma, fledgling euthanized due to injuries
514	3/17/2017	PINN	Necropsy report pending, anticoagulant toxicity, per USFWS
703	7/6/2017	VWS	Necropsy report pending, lead toxicosis, per USFWS
460	7/7/2017	PINN	Necropsy report pending, egg bound, per USFWS
597	7/19/2017	VWS	Necropsy report pending, drowning, per USFWS
760	7/19/2017	VWS	Necropsy report pending, drowning, per USFWS
525	8/1/2017	PINN	Necropsy report pending, lead toxicosis, per USFWS
787	12/24/2017	VWS	Necropsy report pending, drowning

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

Mortality

There were three mortalities collected this year, Table 1. However, a fourth condor was recorded as a mortality because it had been missing for over one year. Therefore, the total loss from the PNP-managed birds in 2017 was four. The necropsy reports for the three collected were still pending USFWS-Sacramento office at the time of this report. Condor 514 was found dead in March, condor 460 in July, and condor 525 in August. Per communication with USFWS (January 2018), the causes of death were anticoagulant toxicity, egg bound, and lead toxicosis, respectively. Condor 481 was missing since April 2016 and was therefore added to the list of mortalities.

Missing Birds

One PNP condor, 534, has been missing since April 17, 2017. 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.'

Trapping

PNP had two focused trapping seasons in 2017, March-early July and late September-November. In addition to scheduled trapping, some occurred opportunistically through the year when specific birds were captured for transmitter replacement or health issues. Trapping was also conducted by VWS. In total, 27 PNP-managed condors were trapped in 2017 at PNP and



Photo 7. G. Emmons, R. Fielding, and K. Tibor handling a juvenile condor at Pinnacles condor facility. NPS photo.

VWS facilities combined. Seven were trapped in both the spring and autumn seasons. An additional three condors were trapped opportunistically outside of the regular trapping seasons, Table 2.

In 2017, PNP staff spent 150 person-days trapping, which resulted in 45 captured condors, (up from 23 in 2016 when spring trapping efforts were constrained by reduced staffing). 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. 2017 PNP trapping effort and captures of PNP and VWS-managed condors at PNP.

Trapping Season	Date Range	Total handling days*	Total captures**	Total individuals captured***	Person Days
Spring	March - early July	10	26	26	69
Autumn	Late September - November	7	12	12	47
Opportunistic	Year Round	3	7	7	34
	Totals	20	45	45	150

**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 2017, there were ten nests in central California, Table 3. Eight PNP-managed condors attempted to nest this year. Six were paired with a VWS-managed condor and two PNP birds paired at one nest. One PNP female attempted to nest with a VWS female and possibly an unknown male. This year, PNP managed four of the ten nests in central CA. Two of the four failed during the egg stage, and biologists removed a dead/infertile egg from one of the two failed nests. Another nest was suspected of fledging a chick but was unconfirmed at the time of this report, and the fourth successfully fledged 878 in November. In all, PNP and VWS believe there were four central California fledglings in 2017, although one remains unconfirmed visually. Of the PNP-managed nests, one was monitored exclusively via GPS data.

Table 3. 2017 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
PC	351	222	CC117	02/07/17	0	Failed during egg stage	No	NA	NA	Fail
SMC	No male	317/171	CC217	02/10/17	0	Failed during egg stage	No	NA	NA	Fail
SB2		375	CC317	02/11/17	0	Wild egg hatched in nest	No	NA	877	Fledge
NC-7	589	569	CC417	02/15/17	8	Wild egg hatched in nest	No	NA	878	Fledge
SF	199	438	CC517	02/16/17	0	Wild egg hatched in nest	No	NA	NA	Fail
RB	566	597	CC617	03/01/17	0	Failed during egg stage	No	NA	NA	Fail
SB3	463	583	CC717	03/01/17	0	Failed during egg stage	No	NA	NA	Fail
SB4	405	525	CC817	03/03/17	1	Infertile/Dead egg	No	NA	NA	Fail
SBC	574	538	CC917	03/16/17	0	Wild egg hatched in nest	No	NA	892	Fledge
NBC	559	543	CC1017	3/25/2017	0	Wild egg hatched in nest	No	NA	901	Fledge

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 flock reaches breeding age, which should increase the number of nesting attempts over time.

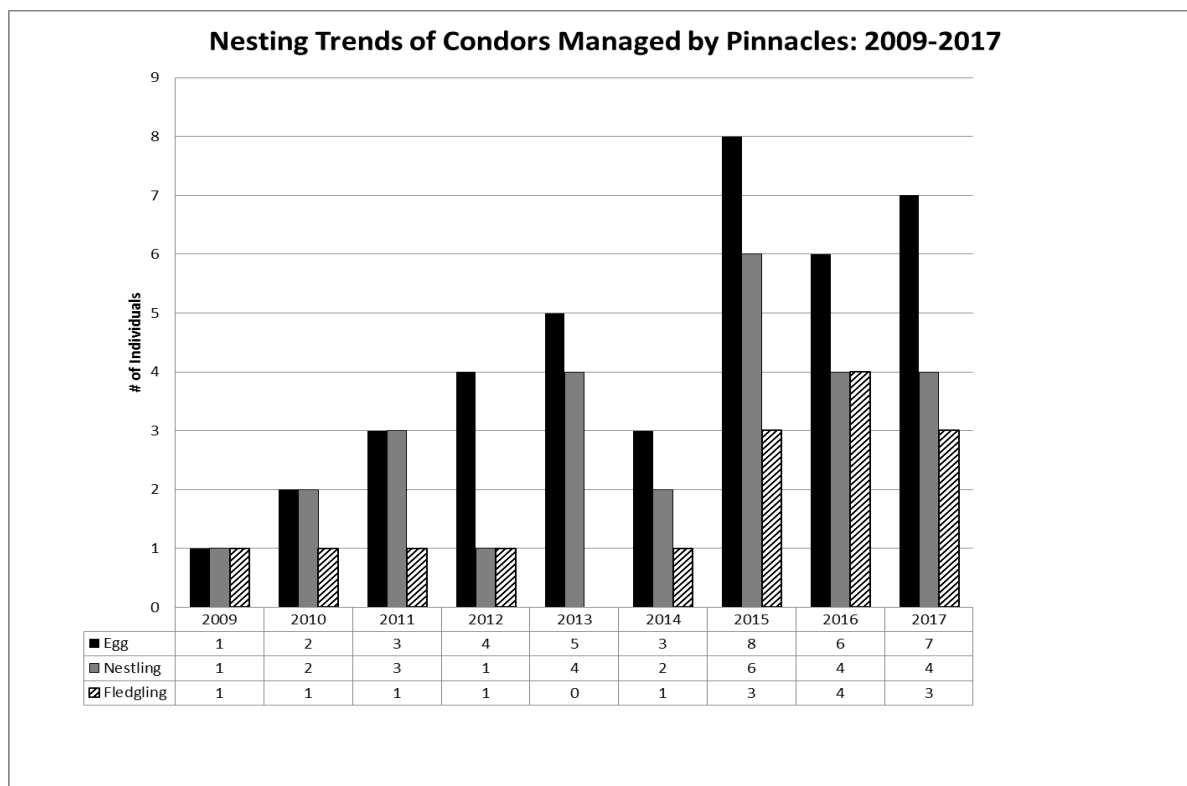


Figure 4. Eggs, nestlings, and fledglings for PNP-managed condors, 2009-2017. Note: these data include nests that had a PNP-managed breeder but the nestlings were not necessarily PNP-managed because VWS and PNP manage nestlings based on nest location, not parents.

The first nest to include a PNP-managed condor was in 2009, six years after PNP began its condor program. The PNP 2015 Annual Report summarized all nesting since 2009. 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 2017, PNP had its second fully successful condor nest within the park boundary in over 100 years, with a successful fledgling leaving the nest.

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 ten central CA nests in 2017, PNP managed four: one in the park and three in San Benito County on private land.

PNP biologists only enter nests when conditions are suitable. This year biologists entered two of the four PNP-managed nests: NC7 and SB4. The other two were on private property and access was not requested.

NC7 was in the park and had a video camera installed in it. Park staff entered the nest to check the fertility of the egg and install the camera when the egg was approximately 50 days old. Biologists were unable to install the camera on the first try and entered the nest two more times to complete installation. During the third entry, they checked the egg again and it had internally pipped. It hatched approximately five days later. Following the guidance of USFWS and other release sites, PNP waited to do the first nestling check until it was 40 days old. At that time, the nestling, 878, had an elevated lead level and was given a chelation shot and fluids and returned to the nest. Biologists monitored her behavior closely using the video camera and performed nest entries at 60, 90, 120 and 150 days old. She never exhibited any clinical signs of lead poisoning and her lead levels declined in each subsequent blood sample. Her overall development however, was slower than normal. Her feather growth and body weight more closely matched a nestling about a month younger. At 120 days old her wings had not developed enough to safely place a wing tag and transmitter. Therefore, PNP staff performed an unusual nest entry when she was 150 days old. She successfully fledged, although a few weeks later than expected.

The nest camera was extremely helpful in monitoring this nest with 929 hours of observations over 120 days of video recorded. The camera provided an opportunity to monitor the nestling's health, growth, and development and provided the option for staff to respond quickly if her health noticeably declined due to lead or other issues.

PNP biologists also entered SB4 in San Benito County. They had trapped the female of the pair for her annual health check and she had a very high lead exposure that required weeks of treatment. Because her egg was due to hatch in a few weeks, biologists entered the nest to collect it and place it into captivity but it was either infertile or had died early in its development.



Photo 8. Condor 569 with nestling 878. NPS photo.

Microtrash

During nest entries, staff searched for microtrash within the nest whenever possible. Since 2009, 56 nest entries at 14 nests included a search for micro-trash. The searches resulted in locating and removing micro-trash from 6 of the 14 nests searched. The park's nest in 2017 contained over 200 pieces of plastic trash and two pieces of metal, which staff removed during six nest entries. 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 .07 and 26.9 grams.

Baiting

In 2017, biologists placed 176 calves procured from organic dairies near 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 site 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. Remote camera photo at Hilltop. NPS photo.

Non-proffered Food

Biologists observed five non-proffered feeding events that resulted in at least ten condor observations feeding on carcasses other than those provided at the PNP facility as bait. 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 2017, two in February and two in November-December. The first two arrived at PNP from captive breeding facilities in Fall 2016 and the second two in September 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 2017, a total of 28 PNP-managed condors were tested. Birds with levels $<35 \mu\text{g/dL}$ on a field lead test kit did not receive chelation treatment. Note that lab values are often greater than field values.

Treatment

Chelation: In 2017, sixteen PNP condors were treated for elevated blood lead levels. Five condors were treated at PNP, ten at the Oakland Zoo and one condor was treated twice, once at the LA Zoo and once at PNP. Figure 5 includes the number of PNP condors that received chelation treatment, at PNP or elsewhere, following capture since 2007.

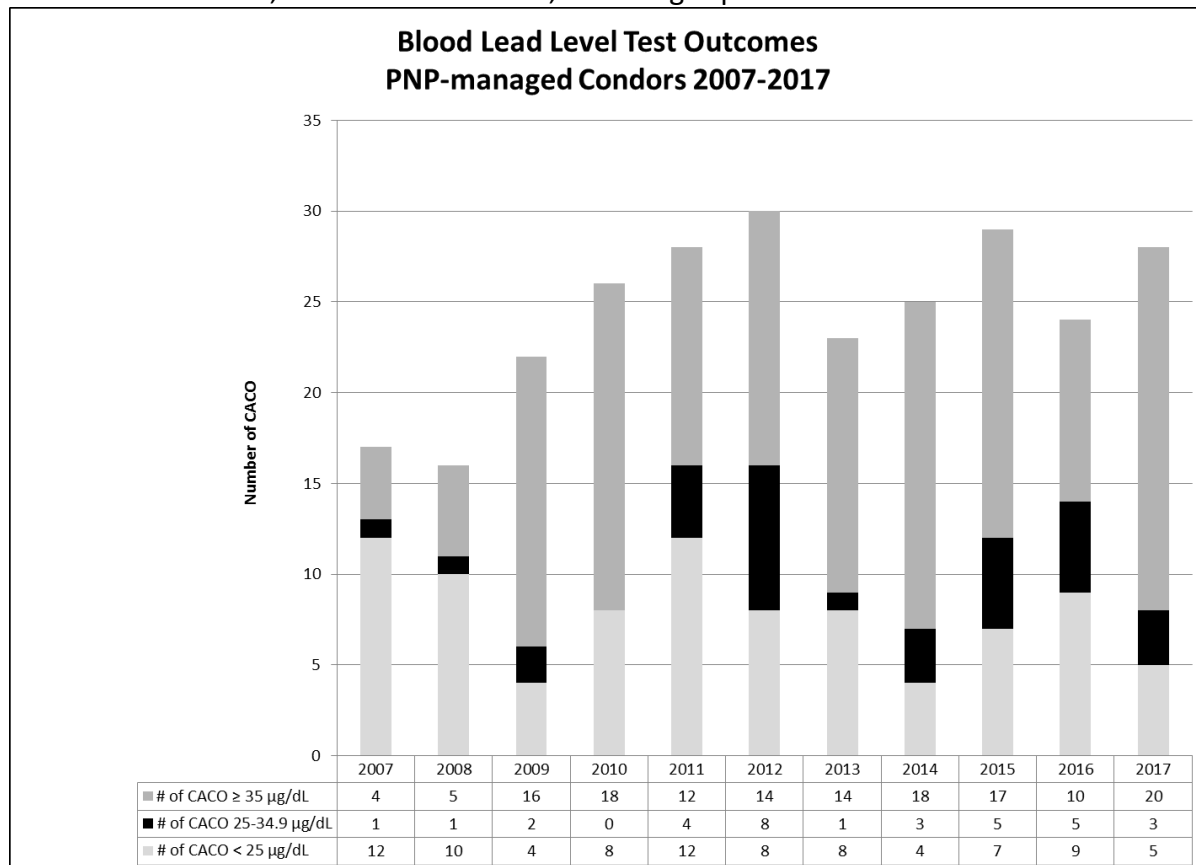


Figure 5. Blood lead values for PNP-managed condors 2007–2017.

Radiographs: Condors with blood lead levels >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.

Surgeries: In 2017, no PNP-managed condors required surgery.

Vaccination

In 2017, West Nile Virus vaccinations were given to 22 PNP condors.

Hazing

In 2017, staff hazed 16 condors. Four of them were hazed twice during the year.

Table 4. Radiograph information for PNP-managed condors in 2017.

Bird	Location	Purpose	Density	Outcome
525	Oakland Zoo	Elevated lead	Yes	6 metal fragments. Fed rabbit skins to encourage casting; at least one fragment was lead based on lab analysis
340	PNP	Elevated lead	No	
463	Oakland Zoo	Elevated lead	No	
614	PNP	Elevated lead	Yes	Density in left thigh, not GI tract
606	PNP	Elevated lead	No	
799	Avian Clinic	Medical	No	
340	PNP	Elevated lead	Yes	Opaque object seen; taken to LA Zoo where radiographed again
340	LA Zoo	Elevated lead	Yes	Two metallic densities in lower GI
744	Oakland Zoo	Elevated lead	No	Radiographed to check for metal fragments; opportunistically checked old toe injury (left foot, digit #3): healed
448	Oakland Zoo	Elevated lead	No	
431	Oakland Zoo	Elevated lead	No	
745	Oakland Zoo	Elevated lead	No	
687	Oakland Zoo	Elevated lead	No	
704	Oakland Zoo	Elevated lead	Yes	No metal opacities, multiple minerals visible in ventricular region.
795	Oakland Zoo	Elevated lead	No	
547	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.

Collaborative Research

Working collaboratively with USFWS, VWS, universities, and other researchers is a high priority for PNP and helps 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. Evaluating lead concentrations and isotopic compositions in sequential feather segments from individual birds is providing data on the degree, frequency, and severity of lead exposures in condors. These data will be considered with chelation history 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, they collected another sample when possible.

Blood Parasite Research

San Francisco State University (SFSU) researchers in collaboration with USFWS, VWS, and PNP, are analyzing blood samples for parasites that can be associated with diseases, such as avian malaria. This study involves a small blood sample, <1 ml from each condor in the central CA

flock. To date, 34 samples have been collected for analysis. Sample collection for this research will continue in 2018.



Photo 10. Sampling feather for lead analysis. NPS photo.

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 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: 2018-2020.

In addition, Redwood National Park and PNP are collaborating with Integral Ecology Research Center to conduct spatial

modeling of central and northern CA to determine what areas are high risk for the presence of illegal marijuana grow sites and their related toxins. This work will be conducted in 2018-19.

Condor Range and Movements Research

In 2017 PNP's research collaboration with Colorado State University continued. Researchers are analyzing 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 PNP's 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 was the second year of a three-year, multi-park condor project to ensure that all national parks with condors have consistent messages and interpretive materials about condors and 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 highly relevant. During 2017, the project shared existing materials among eight national park units, updated all interpretive brochures, created and shared hands-on interpretive materials, designed a new wayside, and conducted multiple shooting demonstrations tailored to NPS needs with support from partner organizations such as IWS, The Peregrine Fund, and the Yurok Tribe. The project will continue through 2018.



Photo 11. Chris Parish, The Peregrine Fund, conducts non-lead outreach event and training for NPS employees. NPS Photo by Rose Fielding.

PNP also conducted 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. This year condor staff and volunteers spoke with 4,059 park visitors within the park and 135 individuals while tracking outside of the park boundary. In addition to informal contacts, biologists presented three educational programs to over 75 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

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.

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. However, with PNP's Wildlife Health Coordinator position vacant for nine months, it was not possible to conduct as much outreach locally or state-wide as desired. Even so, during summer and fall 2017, IWS and PNP staff worked together with the Oregon Zoo, The Peregrine Fund, the Yurok Tribe, and VWS to coordinate outreach efforts as much as possible. In 2018, PNP will continue working with other agencies and non-profit partners to expand outreach.

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. Increasing the number of condors with GPS tags remains among the highest priorities to streamline and improve monitoring efficiency.

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, 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 outreach.

Recovery Planning and Multi-agency Coordination

Condor field team meetings (held approximately annually and coordinated by USFWS) bring together a diversity of perspectives including experts in the field, captive breeding programs, management agencies, and others. With an ever-increasing number of attendees at meetings, a need exists to develop an inclusive framework for discussion and decision making. Developing a decision making framework that could inform changes to management at release sites could ensure well-informed decisions that are based on the best available information from a diversity of expertise. It could also aid in research prioritization, joint funding proposals, and increased collaboration among the many interested stakeholders in condor recovery.



Photo 12. Condors 589 and 569 successfully nested and fledged young at PNP in 2017. NPS photo by Gavin Emmons.