

Pinnacles National Monument California Condor Reestablishment – Annual Report 2010



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ON THE COVER

Condor 317 perching at Nest Cavity RW6, Pinnacles National Monument, 2010.

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Introduction

During 2010, the Pinnacles National Monument Condor Reestablishment Program managed a flock of 26 condors, tracking the birds over a range of approximately 90 miles north to south and 60 miles east to west. The park also tracked two condor nests that involved condors originally released from Pinnacles, and released an additional four captive-reared condors to the wild in the autumn. One female of the Pinnacles flock, 310, mated with a Ventana Wildlife Society released condor, 219, to fledge condor 574, hatched in the wild from a wild-laid egg. This was the second condor fledged in the wild as a result of breeding involving a Pinnacles released condor. Among Pinnacles released condors, there were no mortalities in 2010. One nestling, 550, was evacuated from the park after it was identified to have an extreme lead level (250 µg/dL) and in-nest chelations failed to improve the bird's condition. One adult condor, 400, recovered from severe lead poisoning only after staff at the Los Angeles (LA) Zoo surgically removed a lead fragment from her digestive tract. One four-year old condor, 421, was removed from the wild after it repeatedly exhibited attraction to human activity sites.

Methods

Condor Monitoring

Throughout the year, Pinnacles biologists track condors in the central California flock primarily from established survey points in the field and using remote sensing techniques, but also using and documenting new field survey points as needed when condors are found in new locations. Priority is given to confirming visual observations of key behaviors such as foraging or breeding, followed by visual observations as health checks, then movement or presence via radio telemetry signals, and GPS locations. In the field, biologists use standardized equipment to track and monitor condors. This equipment includes the following:

- Telemetry receiver: Communication Specialists, Inc. - Model R-1000
- Yagi antenna: AF Andronicus, Inc - Model F165-3FB or Model F164-165-3FB
- Omnidirectional antenna, magnetic mount: PCTEL, no model # available
- Handheld radios: Motorola XTS 3000 – Model H09KDF9PW7BN – and Bendix King Digital – Model DPH5102X
- Handheld GPS: Garmin etrex Vista HCx
- Handheld GPS: Garmin etrex
- Handheld GPS: Trimble Juno SB
- Condor GPS transceiver: Microwave Telemetry 45g Argos/GPS solar PTT-100 units for California condors
- Tail mount VHF transmitter: Holohil - Model RI-2CM(12)
- Patagial mount VHF transmitter: Advanced Telemetry Systems (ATS) "micro" - Model A5510
- Patagial mount VHF transmitter: Advanced Telemetry Systems (ATS) "large" - Model Custom2 for adult condor wing mount.
- Blood Lead Test Kit: ESA Magellan Biosciences - Lead Care I & II Analyzers

Condor biologists also use 20-60x scopes, tripods, 10x42 binoculars, field notebooks, radios, and compasses as standard equipment. Mortality signals or prolonged stationary GPS locations for condors are tracked down with handheld receivers and antennas to confirm dropped tags or presence of sick or deceased condors.

Remote monitoring techniques include GPS transceivers, video, and motion-sensitive still cameras. Approximately 1/3 of the condor flock is monitored remotely using Microwave Telemetry GPS transceivers. Through daily retrieval of CLS America GPS data and incorporation of downloads to an ArcGIS project, and additionally the same data reformatted by USGS for display on Google Earth data, biologists track movements of GPS-tagged birds. Remote video cameras stationed at the captive facility and Pinnacles bait sites record real-time data that biologists review in the Pinnacles Visitor Center office to further document observations of individual birds. Additionally, memory cards from motion-sensitive “game cameras” at bait sites are retrieved each time food is placed and still photographs are reviewed for presence of birds and bird weights (from scales with perches stationed at the bait sites.)

Data from daily tracking and monitoring are entered into Access databases and Excel spreadsheets. The following Microsoft Access databases are currently used by Pinnacles condor recovery program staff:

- **PINN_CACO_Tracking:** This database contains the bulk of the program’s activities and replaced a former Pendragon database in January 2010. All condor observations, including movements, feeding events, roost locations, breeding behavior, and transmitter detections are entered into this database. Additionally, trapping summary details, captive condor observations, hazing events and transfers get entered here. Finally, interpretive contacts, landowner contacts, carcass placements, carcass runs, and any high priority crew notes are entered here as well.
- **PINN_CACO_Handling:** This database contains all of the information collected when condors are handled and harbors all such data documented since the beginning of the Pinnacles program. It includes general health notes, blood draws, injections, transmitter changes, and feather sampling data.
- **PINN_CACO_Still_Photos:** This database contains all condor observations gathered from remote still camera photographs and was created in the fall of 2010.
- **CACO_VideoObservations:** This database contains all condor observations gathered from the remote digital video camera system and was created in 2009. Observations come from four cameras, three of which are located at the captive facility and the fourth at the Hilltop bait station.

The methods listed above are used to record results from the following types of condor monitoring at Pinnacles:

- Daily population tracking & monitoring at Pinnacles: Biologists track condors in the central California flock within the NPS boundaries at Pinnacles, from survey points at the High Peaks, Grassy Canyon, and North Chalone Peak. This tracking and monitoring is augmented by daily GIS checks to determine movements of GPS-tagged birds, and regular observations of remote video and still camera data. Mortality signals are tracked

with handheld receivers and antennas to determine bird status and to recover dropped radio tags.

- Mobile tracking: Biologists use four-wheel drive vehicles, handheld receivers, and both vehicle-mounted and handheld antennas to track condor locations with the goals of determining movements, feeding events, courtship and breeding behaviors, flock interactions, and mortality signals. This work is accomplished through all accessible portions of San Benito County, portions of western Fresno County, and eastern Monterey County.
- Nest monitoring: Biologists monitor active nest sites from survey locations 300-800 meters from the nest depending on topography, and perform nest entries when feasible to confirm egg incubation, hatching, nestling age, general health and behavioral interactions, adult-nestling feeding events, and fledging of young.
- Captive monitoring: During trap-up periods and prior to initial releases of young juveniles, biologists monitor captive condor health and interactions from the Grassy Canyon facility and through observations of remote video capture at the Pinnacles Visitor Center.

Documenting and Mitigating Risk Factors

At Pinnacles, the main risk factor threatening the recovery of the central California condor population is lead exposure, predominantly from ammunition fragments in scavenged carcass remains. Other risk factors may include microtrash consumption, West Nile Virus exposure, electrocution at or near power poles, and human interactions. Pinnacles biologists adhere to standardized procedures and established protocols to both study and mitigate these risk factors using the following methods.

- Trapping and processing of condors: In tandem with Ventana Wildlife Society staff, Pinnacles biologists conduct trapping of the entire central California condor flock twice per year to measure lead levels in free-flying condors as well as perform transmitter maintenance and other tissue sampling related to partner research. In 2010, birds with lead levels above 25 µg/dL on a LeadCare II kit were held for chelation treatment. Removal from the wild for short periods has the additional benefit to condors of reducing their exposure loads over the course of the year. The “Spring” trapping season runs from the end of April through approximately the first week of June and the “Autumn” season runs from the end of August through approximately the first week of October (overlapping with the later half of deer hunting season in our zone.) Staff receive extensive training in handling, bleeding, and inspecting birds both at the LA Zoo and from experienced co-workers at Pinnacles that are listed under the Fish & Wildlife permit to perform such duties. Personal protective equipment (PPE) includes eye protection, long-sleeved shirts and pants, closed-toe boots, leather gloves, and latex gloves for inspectors. West Nile Virus vaccinations and boosters are administered on a schedule provided by collaborating veterinarians. Captive condors are held at the Grassy Canyon facility to minimize human interactions. An electrified power pole at the flight pen delivers negative reinforcement to modify condor behavior and discourage them from landing at/near power poles when they are free-flying.

- Emergency response: Condors with high lead levels are treated with calcium EDTA chelations at Pinnacles or transported to the Monterey Avian Exotic Clinic or LA Zoo for radiographs, emergency treatment, or surgeries (e.g. patagial repairs, etc.). Again, only staff with proper training and PPE oversee these emergency response activities.
- Nest entries: During the condor breeding season, active nest sites are entered by qualified Pinnacles biologists following standardized procedures for egg-swapping, and checks of nestlings at ages of 30, 60, 90, and 120 days old. During nest entries PPE includes all appropriate climbing equipment, leather and latex gloves, etc. to insure staff and condor safety. Nestlings are checked for lead levels, general health, vaccinated against West Nile Virus, and nest sites are sifted for microtrash (removed when found) and egg-shell fragments. Annual nest entry trainings are conducted at Pinnacles by qualified instructors, and monthly “mini-trainings” are organized to keep staff experienced with relevant skills. High lead exposure in nestlings leads to evacuations and emergency response procedures as outlined above.
- Research efforts and scientific papers: Pinnacles biologists work closely with researchers at University of California (UC) Davis and UC Santa Cruz to gather scientific data detailing condor responses to environmental risk factors. Blood samples from handlings, emergency responses, and nest entries are sent to both universities as well as to Louisiana State University (LSU) to confirm blood lead levels and to provide a basis for measuring isotopic signatures of lead in condors. Feather samples are sent to UC Santa Cruz to measure lead exposure events in individual condors over time. These data are being used to confirm which environmental lead sources condors are ingesting and how this affects condor health, behavior, and survivorship over time.
- Tracking General Health Indicators: Pinnacles biologists use baiting stations in order to generate regular photographs and video of free-flying condors. Weights are tracked using scales mounted near bait. These scales are customized with integrated perches. Both still photos and video allow biologists to track the weight and general condition of free-flying condors. Pinnacles biologists use “clean” food supplies acquired from regional organic dairies, and place these carcasses approximately bi-weekly at one or two of the established bait stations. These bait stations are the Grassy Canyon flight pen, Hilltop semi-permanent bait site, and Command Post temporary bait site. Established safety requirements include proper PPE, four-wheel drive training, and placement of carcasses by at least two biologists in tandem. Carcass placements are conducted at night to minimize interactions with condors and associations with humans as food suppliers.
- Identifying non-proffered food: Pinnacles biologists respond to observations of non-proffered carcasses – made by local landowners and Pinnacles staff – by promptly contacting landowners and attempting to gain access to identify carcasses. When possible, sub-samples or the entire carcass are retrieved. Carcasses not believed to be potential lead sources are not retrieved. Any lead fragments found in non-proffered carcasses are sampled and sent to UC Santa Cruz for further analysis.

Personnel

In 2010, the Pinnacles Condor Program staff was comprised of four full-time, all-year employees (one program manager, two crew leaders, and one field technician); two full-time, 4-6

month employees (lead outreach coordinator and raptor biologist); two full-time, all-year interns; two full-time, three-month interns; and many volunteers.

In 2010, the Pinnacles Condor Program had over 20 volunteers that put in a total of 1,406 hours. In addition to the efforts of volunteers, six interns worked with the Condor Program during the course of the year, contributing over 5,000 hours of labor. Volunteers and interns assisted in tracking, trapping, field observations, carcass placements, and a wide diversity of logistical tasks that support management of the species. They perform all of these tasks with only a small monetary incentive. The Condor Program could not accomplish all of its goals and objectives without the significant efforts and dedication of these individuals and groups.

Monitoring

Population Status

At the beginning of 2010, there were 26 condors managed by Pinnacles National Monument in the Central California flock – 17 males and 9 females. The one fledgling of the year involving a Pinnacles parent, Condor 574, a male, hatched in May and fledged in November. The nest site was in The Rocks region of the Santa Lucia Mountains and is included in population summaries for the condors that the Ventana Wildlife Society manages. Two juveniles (1 male and 1 female) from Oregon Zoo and two juveniles (both female) from The Peregrine Fund World Center for Birds of Prey were transferred to Pinnacles in June. Releases of these four juveniles took place in the fall and all four were “free-flying” by late November. A single male, Condor 421, was trapped in September 2010 and transferred to the Oregon Zoo in January 2011 for long-term captivity due to behavioral concerns. Due to the gain of four captive-reared birds and loss of one via transfer to captivity, by the end of 2010, Pinnacles National Monument managed 29 “free-flying” condors – 18 males and 12 females.

Reproduction

Two nesting efforts involving Pinnacles-released condors were documented during the 2010 season.

318-317 at Nest Cavity RW6 in Pinnacles NM. (Site formerly used by Prairie falcons and nest cavity name derived from raptor monitoring program.)

The first condor nest within the boundaries of Pinnacles National Monument in over 100 years was confirmed at a cliff cavity on Resurrection Wall. The nesting pair was comprised of 317 – a six-year old Pinnacles female – and 318 – a six-year old VWS male. Courtship between the two condors was observed through early spring, and egg incubation was confirmed at the nest in mid-February. A nest entry was performed at the site to swap out the wild-laid egg, which was found to be infertile. A second nest entry was conducted to swap in a pipping egg, and the hatching of 550 marked the first condor nestling hatched at Pinnacles during the recovery program. During a 30-day nest entry, Condor 550 appeared to be healthy but when the blood lead level was determined by the lab, it was discovered that she had high blood lead levels. Initially 550 was returned to the Resurrection Wall nest site but was subsequently evacuated after exhibiting dehydration and reduced activity levels in her behavior. Condor 550 was transferred to LA Zoo and puppet-reared.

219-310 at Nest Cavity TR01 in Los Padres National Forest (No former information on site). The second condor nest effort was documented at “The Rocks” area on USFS property, accessed via private land east of Greenfield. The nesting pair was comprised of 310 – a six-year old Pinnacles female – and 219 – a nine-year old VWS male. Given the remote and previously undocumented location of the site, movement patterns suggesting nesting were documented using GPS locations of the adults and later confirmed by two ground hikes to locate the nest cavity. An initial nest entry was performed to confirm the presence of Condor 574, the first wild nestling hatched (without biologist assistance) from a Pinnacles female in central California. A subsequent, 120-day nest entry was performed to confirm status of Condor 574, administer a West Nile Virus vaccination, and to place a wing tag on the nestling. Almost no microtrash was identified in the nest. This condor fledged in November and arrived at the Big Sur release area by the end of March 2011.

Mortalities

No Pinnacles condors died in 2010, but Condor 400 almost certainly would have died of lead toxicosis without intensive intervention received at the LA Zoo. See the case study below regarding this condor.

Disease Surveillance

West Nile Virus - The only disease that is routinely monitored and vaccinated for is West Nile Virus. Nestlings are typically vaccinated at 30 and 90 days old. Blood samples are taken and tested at least once per year for every condor in the flock. When titer results indicate little resistance to the virus, a booster shot is administered. Veterinarians at the LA Zoo, UC Davis, and volunteer veterinarian Amy Wells were all consulted in 2010 on titer results to develop a prescription list for booster vaccinations.

Other Diseases - Pinnacles National Monument provided blood and cloacal swab samples to collaborators at UC Davis for research into emerging avian diseases. Study results are pending.

Case Studies

Condor 400 - This female condor hatched on April 11, 2006 at the World Center for Birds of Prey, in Boise, Idaho. She was reared by her parents and then released at Pinnacles on April 24, 2007. 400 was trapped for a routine health check and transmitter change on September 21, 2010 at Ventana Wildlife Society’s flight pen. She was not handled until September 29th. When her blood lead level was checked on the LeadCare field test kit, it read “High.” The lab score came back at 560µg/dL. This is one of the highest blood lead levels Pinnacles biologists had seen in the flock. Prior to being captured she was not showing any clinical signs of lead poisoning. The bird was transported to the LA Zoo on September 30th for intensive chelation treatment. During her initial radiograph at the zoo, it was found that she had a radio-opaque object in her ventriculus. The keepers and veterinarians hoped that she would be able to cast this piece and fed her rat skins to aid in that process. During her zoo stay, she was seen open-mouth breathing and

beginning to have difficulty moving food through her crop. She also was being displaced by younger birds while in the pen. After several days of her not casting the metal fragment, it was decided to surgically remove the piece. On October 10th, veterinarians successfully removed the metal object that had been in her ventriculus. After the fragment was removed and chelation was continued, 400's blood lead level dropped to 48µg/dL by October 23rd. Following three complete rounds of chelation treatment, she was returned to the Pinnacles' flight pen on November 15, 2010. At the time she weighed just 14.6 pounds. She fed well in captivity, but was isolated and park managers chose to release her back to the wild for more natural stimulus. She was released back into the wild on November 23, 2010. Upon her release, 400 was seen at bait-stations prior to and after all other condors were present and was displaced from feeding by younger birds. Previously one of the more dominant condors, she only slowly started to reintegrate into the flock. Over the course of the winter her condition seemed to improve and by her subsequent trapping on May 14, 2011 and handling the following day her weight has returned to 18.5 pounds.

Condor 421 - A male condor that hatched on May 16, 2006 at the LA Zoo, 421 was puppet-reared and then transferred to Pinnacles National Monument in the fall of 2008. 421 was released into the wild on January 13, 2009. From the time he was released, the field crew noted behavioral concerns, such as perching and roosting on the ground, and landing close to people and on trails. During the first year of his release, he spent the majority of his time near the release site and did not travel far distances outside of the park compared to the other juveniles in the flock. Toward the end of 2009, he spent more time in areas of the park that have public trails and began landing in relatively close proximity to people. The Pinnacles crew noticed that hazing appeared to have only a temporary impact on the bird's behavior. In early 2010, 421 was hazed several times from landing close to people. He was easily approached and often would return to the area after the initial hazing event. There were six events in the first half of 2010 in which it was seen by or reported to Pinnacles condor biologists that 421 was perched at an unsafe distance to humans or human structures. He was then trapped on April 29th and held for over a month as a "time-out." He was released back into the wild on June 6 and less than two months later was seen again landing in a high visitation area of the park, close to trails and people. This time he was seen with younger juveniles who prior to spending time with 421, had not perched near people. In August 2010, 421 was seen repeatedly feeding pre-release juveniles through the flight pen fence. He also began guarding the baited trap from younger juveniles and temporarily prevented them from being trapped for autumn health checks. 421 was then trapped on September 14, 2010 for removal from the wild. He was initially held in the Pinnacles' captive flight pen and then was transferred to Ventana Wildlife Society's pen on September 21st. He was held at this pen for several months. Condor 421 was transferred to the Oregon Zoo in Portland on January 16, 2011 for long-term removal from the wild population.

Condor 550 - On March 24, 2010, Condor 550 hatched at the Pinnacles Resurrection Wall nest to foster parents 318 and 317. This nest was readily visible from a popular park trail and was witnessed by thousands of park visitors during the incubation stage and early nestling development. The park instituted a hard closure of a large area around the mountain with the nest and staffed an overlook during weekends to discuss the nest and overall condor program with park visitors. This opportunity fostered an enriched dialog with park visitors but also constrained to some degree biologist activities at the nest, as all nest entries were planned for very early

morning hours during weekdays in order to minimize the number of visitors that could see human activity near the nest. Following the standard nest entry protocol, a nest entry team entered the nest on April 26th to perform a 30-day nestling check. At this entry, the nestling appeared healthy and alert, and the field lead tester malfunctioned, preventing generation of a lead result on site. Lab lead results received three days later indicated a significant exposure. Initially, the park's program manager decided to evacuate the nestling immediately, but after consultation with Dr. Janna Wynne at the LA Zoo, determined to attempt in-nest chelation. Temporary evacuation to produce a radiograph of the nestling was not chosen due to the need to leave a biologist inside for hours inside a highly visible nest. In retrospect, such an operation would have been a good outreach and education opportunity. Over the two weeks following the discovery of the lead exposure, the nestling was chelated four times (Table 1). At the first chelation of 550, a hand-held metal detector wand was waved below her abdomen and no metal was noted, the bird's crop was full, and all other indicators checked by Dr. Amy Wells were within normal limits. At the second chelation, 550 still appeared to be in good condition. Dr. Wells' notes included, "BAR (bright, alert, responsive), strong & active, lungs auscult WNL (within normal limits), crop empty, no palpable masses or foreign material in ventriculus, no changes in behavior or neuro signs." However by the third chelation, 550 was showing a clear decline in health – dehydrated and losing weight – so it was decided to make preparations for evacuation during the next entry. Two days later, she was chelated for a fourth time, had shown no signs of improvement and was therefore evacuated from the nest and transported to the LA Zoo for further treatment (Table 2). Over the following six weeks, 550 underwent six rounds of chelations at the LA Zoo. Despite all of these handlings, her lead levels dropped and general health indicators improved. She was eventually placed in a pen where she could interact with other condors.

The Pinnacles staff members involved in these entries were Gavin Emmons, Daniel George, Scott Scherbinski, and Alacia Welch. Dr. Amy Wells, DVM, from the Avian and Exotic Clinic of the Monterey Peninsula was the veterinarian on site for every entry except the final one. Joe Burnett from Ventana Wildlife Society also assisted in two of the entries and Sayre Flanagan, also from VWS, transported the condor to the LA Zoo. All of the nest entries were performed with the safety of all crew and condors in mind and there were no safety incidents during the five nest entries.

In consideration of this series of events, the Pinnacles Condor Program concluded that attempting to chelate a nestling in the wild is ill-advised. In the future, if a nestling has a lead level that condor veterinarians determine requires treatment, the bird will be evacuated as rapidly as is practical and treated at an appropriate zoo or other facility designated by the US Fish & Wildlife Service (USFWS). The safety concerns to staff members performing these entries is paramount and in particular, nest entries that require technical climbing are highly demanding and should not be performed repeatedly on a tight schedule. Additionally, more rapid evacuation and clinical examination of the exposed bird could have provided greater insight into the source of the exposure. Finally, health effects of lead poisoning can be more quickly addressed in captivity.

Tables 1 and 2 follow on the next page.

Table 1. Nest entries for Condor 550

Date	Reason for Entry	Lab Lead Result (µg/dL)	Lab Result Date	Condor Weight (lbs.)	Notes
4/26/2010	30-day check	110	4/29/2010	4.7	Healthy and hydrated
5/3/2010	1 st chelation	250	5/5/2010	6.7	Healthy, hydrated, full crop, no metal detected
5/6/2010	2 nd chelation	None		7.0	Alert, empty crop
5/10/2010	3 rd chelation	None		5.7	Dehydrated, empty crop
5/12/2010	Evacuation	130	5/13/2010	5.55	Dehydrated, less keel muscle. Taken to LAZ

Table 2. Chelation Treatments for 550 at LA Zoo

Chelation Initiation Date	Round of Chelation	Lead Result (µg/dL), after round completed	Date of Lead Result
5/13/2010	First	65	5/17/2010
5/20/2010	Second	47	5/24/2010
5/27/2010	Third	40	6/1/2010
6/4/2010	Fourth	35	6/9/2010
6/9/2010	Fifth	22	6/15/2010
		37	6/24/2010
6/30/2010	Sixth	14	7/4/2010

Management

Hazing

A total of 13 Pinnacles condors were hazed in 2010 from seven different locations with a total of 20 hazing events. The condors hazed were: 312 (One Pine – due to proximity to infrastructure / park personnel); 478, 330, 421, and 463 (Scout Peak – due to proximity to park trail and visitors); 478 (High Peaks Visitor Lunch Spot – due to proximity to park trail and visitors); 431, and 448 (High Peaks Juniper Canyon Trail – due to proximity to park trail and visitors); 421 (Scout Peak – due to proximity to park trail and visitors); 340, 411, 421, 438, and 448 (North Chalone Fire Tower – due to proximity to infrastructure); 547 (One Pine – due to proximity to infrastructure / park personnel); 405 (Hwy 1 Big Sur area – due to proximity to a major road); 306 (Hwy 1); 312 (Hwy 1); 312, 340 (Hwy 1). Five condors were repeat offenders including: 478 (2), 421 (3), 448 (2), 340 (2), and 312 (3). The hazing methods used included running and clapping, throwing pebbles near but not at a condor, and spraying with a water cannon.

Proffered Baiting

There are three distinct baiting locations where proffered carcasses are placed at Pinnacles – Facility, Hilltop, and Command Post. The majority of carcasses are calves from a consortium of organic dairies in Modesto, CA. In 2010, 114 calves, 5 pigs, 1 cow, 1 sheep, 2 deer, and 12 bags

of rats (approximately 25 rats per bag) were placed. Carcass types and placement locations are detailed in Table 3 below.

At each site, the carcasses are surrounded by fencing to deter terrestrial predators from the bait. Additionally, a motion-activated camera is installed at Hilltop and Command Post facing a scale to capture images of condors at the site and weights if they perch on the scales. A remote video system is also used at Hilltop and the Facility to keep track of which condors feed and other observations.

Table 3. Carcass Types and Placements

Carcass Type	Inside Pen	Hilltop	Command Post	Total
Calves	54	46	14	114
Cows		1		1
Pigs	2	3		5
Piglets	2	2		4
Bags of rats (15-25/bag)	8	3	1	12
Sheep		1		1
Deer	1	1		2

Surgeries

In 2010, Pinnacles-released condors underwent three patagial hole surgeries, one surgery to repair a torn out patagium, one to suture a wounded toe, one to remove a metal fragment from the gastrointestinal tract, and one to remove a shotgun pellet under the skin of a wing.

Condors 317, 345 and 463 all had patagial holes that had enlarged to the point of requiring surgical intervention to prevent transmitters from causing a tear. While some patagial pierced holes will close on their own, holes on these three birds were particularly large. 317 had her left hole (>20mm) stitched shut, 345 had both closed (19.5mm on left and 14mm on right), and 463 had the right sutured (24 mm hole). All of these surgeries were performed by Dr. Amy Wells at the Avian and Exotic Clinic of the Monterey Peninsula. Each condor had a successful surgery and they all recovered well.

Condor 401 had a patagial transmitter tear out in June 2010. In late July, the veterinarians at the LA Zoo Health Center surgically repaired the patagial area of the left wing. The recovery process from this type of surgery took over eight weeks at the zoo. This condor was then transferred back to Pinnacles and held in the flight pen for an additional four weeks to make sure he was able to use his wing. The wing appeared to heal well and he was re-released in early October.

Condor 543 was found to have the tip of her toe broken and the toenail severed. Dr. Amy Wells sutured the tip of the toe and 543 healed well, although her toenail did not grow back.

Condor 400 underwent abdominal surgery to have a metal fragment removed from her gastrointestinal tract in October 2010 at the Los Angeles Zoo. Her surgery went smoothly and

she quickly began to recovery from lead toxicity. See her Case Study on page 8 for further details. She also had a shotgun pellet lodged in her wing tissue that was surgically removed and sent to UC Santa Cruz for further testing.

Chelations

In 2010, 16 Pinnacles condors were treated for elevated blood lead levels. Of those, six were treated on two different occasions in the year. Ten condors were treated at Pinnacles and nine were treated at the LA Zoo. In 2010 field biologists used the threshold of a blood lead value of 25 µg/dL or greater on a LeadCare II Analyzer to determine initiating chelation. This threshold was the same for at least the prior two years, but LeadCare I Analyzers were used until September of 2008. Typically if the value is greater than 65 µg/dL (“High” on the Analyzer), a condor will be transported to the LA Zoo for treatment. Exceptions to the latter guideline may take place if other medical or logistical considerations suggest transport is a better option. In 2010, at least one condor was transported to LA Zoo for treatment of a blood lead level below 65 µg/dL. The total number of Pinnacles condors, not including those released in the fall of 2010, was 26. Therefore, 10 condors were not treated for lead in 2010.

Radiographs

A minimum total of 44 radiographs were taken of 14 condors in 15 separate events in 2010. Thirteen of these events were for lead exposure. One was in response to a toe injury that occurred while the condor was in the wild and one was in response to a toe injury that occurred while the condor was in captivity. In 2010, we assisted two clinics to conduct radiographs of condors: the Health Center at the LA Zoo and the Avian and Exotic Clinic of the Monterey Peninsula. Radiography revealed that four condors (400, 401, 514, and 550) had radio-opaque objects in their digestive tracts; all were recovered at the LA Zoo and transferred to UC Santa Cruz for analysis. Radiography also revealed a pellet embedded in the right wing of one condor (400).

West Nile Virus

Records on file at Pinnacles National Monument show that in 2010, 16 West Nile Virus (WNV) vaccinations were given to 15 condors. Additionally, 64 blood samples were taken from 31 condors to determine resistance to WNV. All samples were stored through the year and analyzed late in the year. When there were multiple samples from one condor, only the most recent was tested. Titer results for 30 condors were received. Based on data compiled by the LA Zoo, 10 of 31 condors in the Pinnacles flock were protected against WNV in 2010. However, many of the vaccinations administered in 2010 were at the same time as the most recent draw for titer analysis, so there are likely more protected condors than the data indicates.

Research

UC Santa Cruz – Feather and Blood Pb Isotopic Fingerprinting

Pinnacles National Monument continued collaboration with Dr. Don Smith’s Environmental Toxicology laboratory at UC Santa Cruz on projects analyzing blood and feather samples for Pb

concentration and isotopic ratios. Following up on 2009's work to find opportunities for sampling multiple feathers that grew in sequence with one another and therefore represent longer time periods of the condor's life, Pinnacles staff attempted to measure and mark at least one growing feather every time a free-flying condor was trapped. The death of 303 in late 2009 led to the opportunity to sample three feathers that in sequence represent over half of the year prior to her death. Pinnacles staff determined that another such research opportunity has high value. Regular marking of feathers is necessary to prepare for such an eventuality. In order to focus on gathering full length samples and also allow condors to retain 100% of feather vane through the winter, focus was shifted in 2010 to marking feathers for retrieval in the spring of 2011. Therefore, in 2010 only high priority samples from known Pb exposure periods were gathered. However, nearly every condor in the flock is now ready for a full length sample in 2011 that will represent at least one growth period during 2010.

Sampling from prior years, data review, and consultation with Drs. Finkelstein and Smith led in 2010 to the publication of:

Finkelstein, et al. 2010. Feather lead concentrations and 207Pb/206Pb ratios reveal lead exposure history in California condors (*Gymnogyps californianus*), *Environmental Science and Technology*. 44, 2639-2647.

UC Davis Condor Health Screening

In 2010, field staff at Pinnacles collaborated with Dr. Christine Kreuder Johnson and Dr. Terra Kelly at the Wildlife Health Center at UC Davis to generate whole blood, serum, plasma, and cloacal swab samples. Review of hematology, chemistry, and indicators of exposure to common pathogens and other disease-causing agents will generate a suite of data useful for comparison to disease issues that may occur in the future. Results will be generated by UC Davis.

Recovery Program Lead Sampling

Field biologists at Pinnacles National Monument continued biennial blood sampling of condors using the same calendar as 2009. Spring trapping initiates in late April and ends once 100% of the flock has been trapped. However, if some birds do not return to the park for several weeks, trapping may end once at least 90% of the flock has been trapped and sampled. The "Autumn" cycle began in late August, two weeks after the opening of deer season. Additional blood samples are sometimes generated at other times of the year when a condor is trapped for transmitter maintenance or other management issues.

Blood samples were sent for analyses to either the UC Davis California Animal Health and Food Safety Laboratory or Louisiana State University for generation of higher quality values than are possible to generate with field LeadCare kits.

Results of these analyses were provided to the USFWS for inclusion in a summary report for the entire state of California and are therefore not included here.

Trash in Condor Nests

During all condor nest entries, a visual inspection is made of the nest surface and the substrate is sifted in order to document the presence of anthropogenic materials. Nestlings are also palpated to identify foreign material when possible. In 2010, the amount of trash found in two condor nests was relatively marginal in comparison to nests managed by other release sites that have led to trash impaction in nestlings. No data summaries have taken place, since by the end of 2010, only three nests have been investigated by the Pinnacles program.

Feather Growth Rates

When a condor is being held for a week or longer for chelation or another management issue or if a bird is trapped twice while a single feather is growing, Pinnacles staff collected feather length measurements on multiple dates on the same primary feather. The sample size remains small at present, but eventually we hope to develop sufficient data to review feather growth rates. A primary goal will be to determine how consistent growth rates are.

Chelation Effectiveness

Laboratory Pb values were generated for blood drawn after two and after four chelation treatments in order to contribute to a future review of chelation effectiveness.

Outreach

The Blue Ribbon Panel identified lead outreach as one of the most important tools that can positively impact condor recovery throughout California. To meet this objective, Pinnacles staff employ varied outreach funds and efforts in attempts to educate diverse public groups and affect policy decisions on the impacts of lead on condors, other wildlife, human safety, and the benefits of removing lead from the landscape.

Targeted Outreach Efforts

The National Park Service has funded Jim Petterson at Pinnacles ½ time annually to focus on lead awareness outreach efforts not only in San Benito County, but throughout California, and indeed at several collaborating NPS units west of the Mississippi. These efforts have been focused primarily on direct outreach to shooters, but have also been expanded to include transfer of materials to other NPS units and outreach to key staff and community leaders that are well positioned to replicate the message. From 2007 to 2009, The Institute for Wildlife Studies (IWS) was funded through a major National Fish and Wildlife Fund grant to complement these objectives. Jake Theryl held that position and focused most of his outreach efforts within a 50-mile radius surrounding Pinnacles National Monument. Again, in 2010, primarily through NPS funding, IWS employed Leland Brown to continue lead outreach efforts. One half of his position is dedicated to lead awareness outreach. During the other half of his time, Leland assists the park in pig eradication efforts. Together, Jim and Leland create and distribute posters, brochures, web content, and videos. Each has also presented at agency and non-profit meetings to expand the existing audience and identify new outreach opportunities.

Pinnacles and IWS biologists also organize shooting events annually to raise local lead awareness and to provide non-lead bullet trials and opportunities to regional landowners, ranchers, hunters, and organizations. Additionally, impromptu outreach efforts are regularly undertaken by field staff while mobile tracking. Each staff member keeps a kit of brochures and a binder of key images to assist discussions with individuals that stop on the side of the highway to discuss the program with field personnel.

General Community Outreach

Pinnacles staff from all divisions assist in organizing a condor release event or celebration event annually, drawing diverse groups of visitors to share in the varied aspects of the condor recovery effort. In 2010, approximately 180 members of the public attended the release event held at the park. The venue provided in-depth discussion with the public over the course of five hours. Dubbed “Condor Comeback 2010,” the park for the first time facilitated the event through use of a live video feed from the condor flight pen to large screen televisions at the park visitor center.

Interpretation and education at Pinnacles and in the local community is an ongoing component of the Pinnacles condor program. Throughout the year and particularly in spring, Pinnacles biologists and interpreters stationed themselves in the High Peaks to provide outdoor education opportunities to park visitors. Pinnacles staff also make regular visits to classrooms in local schools to raise student awareness about condor biology and management issues. In 2010, Pinnacles staff spoke with over 4,000 visitors on trail and approximately 250 students in classrooms about condor recovery, nesting at Pinnacles, and lead awareness.

Recommendations and Discussion

- The Resurrection Wall nest was highly visible to park visitors. Logistically, this allowed for excellent interpretive and outreach opportunities to park visitors. The site also required a very technical nest entry and therefore required careful attention to nest entry protocols to ensure safety of biologists and condors involved.
- CACO 550 was initially left in the Resurrection Wall nest despite documented high blood lead levels in an attempt to treat the bird in the nest, but was eventually evacuated to the LA Zoo after subsequent observations of lethargy and dehydration. In the future, condor biologists at PINN would benefit from a standardized protocol outlining evacuation thresholds and response plans prior to discovery of high lead exposures to condor nestlings and nesting adults.
- The remote nature of “The Rocks” nest led Pinnacles biologists to perform only 30-day and 120-day nest entries. Given the difficulty of organizing enough personnel and transport to the site, the less-intensive, “hands-off” nest entry approach seemed warranted and could provide a model for future nest entries as the central California population continues to expand its numbers and range.
- The technical nature of nest entries for the Resurrection Wall and The Rocks sites underscored the value of having highly-trained technicians and handlers to perform the nest entries. As Pinnacles and VWS condors continue to expand their numbers and

annual nesting efforts, it will be essential to maintain these skills and to incorporate additional long-term staff into the process to allow biologists to effectively balance daily workloads with nest entry duties and safety requirements.

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Volunteers

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Interns

Carmel de Bertaut, Eric Falquist, Jennie Jones, Dannielle Matassa, Laura Mendenhall, Erica Uhor