Bald Eagle Restoration on the California Channel Islands

January — December 2013

12th Annual Report

MONTROSE SETTLEMENTS RESTORATION PROGRAM

MSRP

Restoring Natural Resources
harmed by DDTs and PCBs

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January — December 2013

12th Annual Report

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EXECUTIVE SUMMARY

Bald eagles (*Haliaeetus leucocephalus*) once nested on all the California Channel Islands off the coast of Southern California, but disappeared by the early 1960s. Human persecution contributed to the population decline, but the introduction of DDT into the Southern California Bight, starting in the late 1940s, is thought to have led to their ultimate extirpation from Southern California.

The Institute for Wildlife Studies (IWS) began bald eagle restoration efforts on Santa Catalina Island in 1980, but residual DDT continued to impact the birds and successful reproduction was inhibited. In 2002, IWS initiated a 5-year bald eagle restoration feasibility study on Santa Cruz Island, in cooperation with the National Park Service, to determine whether the eagles could reproduce successfully if located farther from the primary DDT source off the Palos Verdes Peninsula. IWS released 61 eagles on Santa Cruz Island from 2002-2006. In 2006, the first known nesting attempts occurred on the northern Channel Islands. Two pair of eagles successfully fledged one chick each from nests at Pelican Harbor and Malva Real on Santa Cruz Island. Since 2006, we have banded 81 chicks that hatched successfully in nests on Santa Cruz, Santa Rosa, Anacapa, and Santa Catalina islands, and IWS has not manipulated eggs or nestlings at any nest on Santa Catalina Island since 2009.

In 2013, there were seven known nesting attempts on Santa Catalina Island, five on Santa Cruz Island, one on Anacapa Island, and two on Santa Rosa Island. A total of 19 chicks hatched (11 on Catalina, 4 on Santa Cruz, 3 on Santa Rosa, 1 on Anacapa) in 12 nests. On Santa Catalina Island, twins were produced at the Rattlesnake, Seal Rocks, and Pinnacle Rock nests, and the West End nest had triplets. Single chicks were produced at the Two Harbors and Middle Ranch nests. One of the Rattlesnake chicks disappeared prior to banding, but the 10 remaining Santa Catalina chicks successfully fledged. Three chicks are known to be dead, one is known to be alive, and six are of unknown status as of 31 December 2013.

On Santa Cruz Island, the Sauces, Fraser Point, and Cueva Valdez nests hatched and fledged one chick each, and the Los Pinos pair hatched two chicks, but fledged only one. The Pelican Harbor and Fry's Harbor pairs did not breed in 2013. This season was the first time that the Fraser Point and Los Pinos pair successfully reproduced.

On Santa Rosa Island, the Lopez Canyon pair successfully raised two eaglets to fledging, but one was found dead on a mainland beach. The Trap Canyon pair reused a nest they last used in 2011. They hatched at least one chick, but it died prior to banding.

Due to the presence of nesting seabirds, we had limited access to West Anacapa Island to be able to see the Oak Canyon nest clearly. We accessed the island twice during the season: once before eggs were laid and once to band a single chick about 9 weeks old.

As of the end of December 2013, there were a minimum of 42 bald eagles on the California Channel Islands. There were 23 eagles known to be on the northern Channel Islands, 18 eagles on Santa Catalina Island, and one eagle on San Clemente Island. Five additional eagles were on the mainland and were either tracked via their GPS transmitters or were sighted and reported by mainland observers.

We expect to have additional nesting attempts in 2014, especially among the birds on Santa Cruz Island. We estimate that there will be seven nests on Santa Catalina Island, 12 nests on the northern Channel Islands, and one nest on San Clemente Island. We will continue our annual surveys for new nests and monitoring of known nests through the 2014 breeding season.

ACKNOWLEDGMENTS

IWS thanks the National Park Service (NPS), U.S. Fish and Wildlife Service (FWS), California Department of Fish and Wildlife, National Oceanic and Atmospheric Administration (NOAA), The Nature Conservancy, the U.S. Navy, the Santa Catalina Island Conservancy, and the Ventura County Office of Education. We also would like to thank this year's field crew: David Rempel, Maria Dominguez, Joe Barnes, Andrew Rosenberg, Ania Wrona, Yozora Tadehara, Sanders Ho, and Lindsay Gedacht. Jim Campbell-Spickler provided assistance in some of our more difficult nest entries and Jeff Sieger conducted aerial telemetry for our Catalina eagles during the fall. We also thank the UC Santa Barbara Natural Reserve System, especially Lyndal Laughrin and Brian Guerrero, for allowing our crew to stay at the field station on Santa Cruz during the first half of the field season. Funding for the project was made available by the Montrose Settlements Restoration Program.

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INTRODUCTION

Bald eagles (*Haliaeetus leucocephalus*) once bred on all 8 of the California Channel Islands, but the population was extirpated by the early 1960s (Kiff 1980), most likely due to the introduction of the organochlorine pesticide DDT into the Southern California Bight. DDE (a metabolite of DDT) levels have been found to be inversely correlated with eggshell thickness and productivity in bald eagles (Hickey and Anderson 1968, Wiemeyer et al. 1984). The Institute for Wildlife Studies (IWS) initiated reintroduction efforts on Santa Catalina Island, California (Catalina; Fig. 1), with the release of 33 young eagles from hacking towers between 1980 and 1986. Breeding attempts in 1987 and 1988 failed, most likely due to residual DDE (Garcelon et al. 1989). Mean levels of DDE in egg remains removed from nests were twice as high as that which has been shown to cause complete reproductive failure (Wiemeyer et al. 1984). Eggs also exhibited thinning of the shell (L. Kiff, Expert Report) and areas of gross structural abnormalities of the eggshell that resulted in rapid water loss and a weakening of the eggshell (Risebrough 1998).

Figure 1. California Channel Islands located off the coast of southern California, USA.

From 1989 through 2008, the reintroduced population on Catalina was maintained by placing artificial eggs in nests and removing the weakened eggs for artificial incubation. Sixty-six chicks were fostered into active nests and 21 additional birds were released from hacking towers. Foster chicks were from mainland wild nests (4 chicks), produced by captive adults at

the Avian Conservation Center (ACC) at the San Francisco Zoo (38 chicks) or hatched from eggs removed from the Catalina nests and artificially incubated (24 chicks).

IWS expanded bald eagle restoration to the northern Channel Islands in 2002 with the release of 61 eagles from hacking towers on Santa Cruz Island (Santa Cruz) over a 5-year period. In 2006, two separate pairs on Santa Cruz successfully hatched and fledged one chick (Sharpe 2007), the first known bald eagle chicks to hatch naturally in the wild on the California Channel Islands since 1950 (Miller 1950). As a result of increased hatching success during artificial incubation and natural breeding on Santa Cruz, we began leaving eggs in some Catalina nests in 2007 and discontinued egg removals altogether in 2009.

The number of breeding pairs on the Channel Islands is slowly increasing, and we have documented successful breeding on 4 islands. As of 2013, there were 7 pairs on Catalina, 7 pairs on Santa Cruz, 2 on Santa Rosa Island (Santa Rosa), and 1 on Anacapa Island (Anacapa). This report summarizes the results of our 2013 bald eagle surveying and monitoring efforts.

STUDY AREA

In 2013, we monitored bald eagles on Catalina, Santa Cruz, Santa Rosa, and Anacapa. Catalina is located 34 km south of Long Beach, California. Catalina Island is 34 km long, 0.8 to 13.0 km wide, and covers 194 km^2 (Fig. 1). Elevations range from sea level to 648 m. Mean annual minimum and maximum temperatures in Avalon are approximately 12 and 20^o C, respectively, and yearly precipitation averages 30.2 cm (Western Regional Climate Center Website; http://www.wrcc.dri.edu).

The northern Channel Islands (NCI), which are composed of San Miguel Island (San Miguel), Santa Rosa, Santa Cruz, and Anacapa are located approximately 19 to 44 km off the coast of Ventura and Santa Barbara counties (Fig. 1). Santa Cruz is the largest of the eight California Channel Islands, measuring about 38 km in length and 12 km wide at its widest point (Fig. 1). The island is approximately 249 km^2 with a maximum elevation of 753 m. Santa Cruz is the most rugged and topographically diverse of the NCI and has a Mediterranean climate, with mean monthly temperatures ranging from 11.7 - 20.9^o C and a mean annual rainfall of 50 cm (Junak et al. 1995). The NPS owns and manages the eastern 24 percent of the island and The Nature Conservancy (TNC) owns the western 76 percent of the island.

Santa Rosa is the second largest of the Channel Islands and is owned by the NPS (Fig. 1). The island encompasses approximately 214 km^2 and is less topographically diverse than Santa Cruz. A central mountain range reaches an elevation of 484 m, and the coastal habitat varies from gentle slopes and sandy beaches to sheer cliffs (Channel Islands National Park website, http://www.nps.gov/chis).

Anacapa, which is comprised of three islets (East, Middle, and West Anacapa) is owned by the NPS and is the smallest of the Channel Islands (Fig. 1). The island encompasses approximately 2.8 km^2 and is about 8 km from end to end (Channel Islands National Park website, http://www.nps.gov/chis).

METHODS

Permitting

IWS has the required Memorandum of Understanding with the California Department of Fish and Wildlife to conduct bald eagle research on the California Channel Islands and a banding permit from the United States Geological Survey's Bird Banding Laboratory allowing us to band and radio-tag eagles.

Surveying and Nest Monitoring

Observations of adult eagles began in January or February at each of the known territories. We also conducted weekly ground surveys of Catalina, Santa Cruz, and Santa Rosa to locate new nesting pairs. Bald eagle surveys were conducted concurrently with surveys for peregrine falcons. We used GPS units to record our survey routes, which were downloaded daily to the free Garmin Basecamp™ program, and allowed us to evaluate areas that needed additional surveys and to share data among our biologists. Once we confirmed nesting eagles, we set up observation blinds or found partially hidden locations from which to observe the nests. We monitored the chronology of nesting through incubation and chick-rearing. We established video cameras prior to the nesting season at 4 active nests on Catalina (West End, Rattlesnake, Twin Rocks, and Two Harbors), 1 nest on Santa Cruz (Sauces), and 1 nest on Santa Rosa (Lopez Canyon), which enabled close, remote observations of nesting activity. The West End, Two Harbors, and Sauces nests were available for live viewing on our website (http://www.iws.org).

During banding we affixed a VHF transmitter (Advanced Telemetry Systems, Isanti, Minnesota) on each chick. We attempted to locate each bird once per week for the first month after fledging using a VHF telemetry receiver (R-1000; Communications Specialists, Inc., Orange, California) and yagi antenna. On Catalina, we attempted to observe, or at least

determine that the birds were moving, a minimum of once per week through December, or until they left the island. We reduced the staffing on the NCI to 1 person at the end of the breeding season, so radio-tracking was conducted when time permitted during the late summer and fall.

Marking and Sampling

We entered each nest when the eagle chicks were approximately 8 weeks old to equip them with federal leg bands, wing markers (orange on Catalina, light blue on NCI), and a backpack-style VHF radio-transmitter (described above). We also collected a blood sample (~10 cc) for future contaminant analyses, and made morphological measurements to determine sex (Bortolotti 1984, Garcelon et al. 1985). Sex was confirmed later with a blood sample sent for DNA analyses (Avian Biotech International, Tallahassee, FL).

Monitoring of Previously Released Eagles

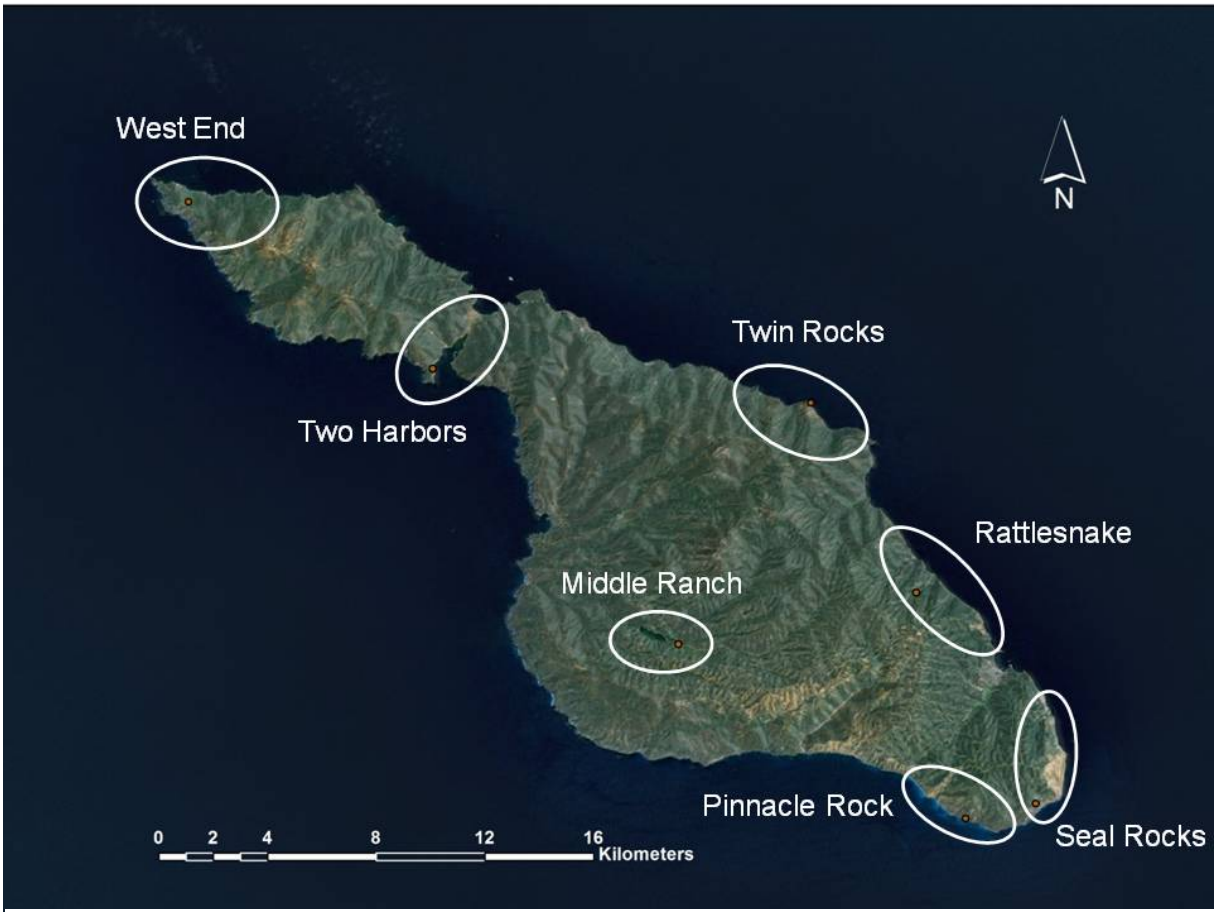
We closely monitored the status of eagles from previous years that had been outfitted with GPS-PPTs (Microwave Telemetry Inc., Columbia, Maryland). On Catalina, we used vehicle-based telemetry VHF receivers to scan for previously released eagles that had stayed on or returned to the island. During monitoring and other field work we searched for other eagles that were no longer carrying functioning transmitters. We entered sighting information from observers on the islands and the mainland in a database (Paradox, Corel Corp., Ottawa, Ontario).

RESULTS

Surveying and Nest Monitoring

Santa Catalina Island

Nests were located in February and March in all 7 previously active territories on Catalina (Pinnacle Rock, Seal Rocks, West End, Two Harbors, Twin Rocks, Rattlesnake, Middle Ranch; Fig. 2). We surveyed much of the island for new territories in conjunction with peregrine falcon surveys.



West End Territory. The West End pair (Fig. 2) used the same nest that has been used since 1991. The male, K-01, was produced by captive birds at the ACC and fostered into the Pinnacle Rock nest in 2000. The female was released at the Sweetwater hacktower in 1986. We monitored the nest primarily via our live web cam, and birds were seen at the nest throughout February. The first egg was laid on 22 February, a second egg was laid on 25 February, and a third was laid on 1 March. The first two chicks hatched on 4 April and the third hatched on 7 April.

We entered the nest on 27 May to equip the birds with leg bands, VHF transmitters, and wing markers, and to obtain blood samples (Fig. 3, Table 1). We continued to monitor the birds until they fledged between 29 June and 12 July (Table 1). K-27 was found struggling in the water below the nest on 4 August and was brought to Two Harbors. He was released back at the west end of the island and was last seen on the island on 9 September in the vicinity of the Seal Rocks territory (Fig. 2). K-28 was found swimming in Catalina Harbor near the Two Harbors nest on 29 July. She was uninjured, so we drove her back to the west end of the island and released her. She

again was found in the water near the West End nest on 4 August, brought to Two Harbors for evaluation, and again released near the west end of the island. She remained on the island through the end of the year and was seen on the West End nest multiple times via the nest cam. K-29 was found dead on Huntington State Beach, California, on 11 August. She was last seen alive in the Seal Rocks territory on 7 August. We retrieved K-29 on 25 September and shipped the carcass to the National Eagle Repository.

Figure 3. The West End triplets at banding on Santa Catalina Island, CA, 2013.

The West End female appeared to have a leg or foot injury, perhaps a fish hook in her foot, in mid-August. We began placing bait at a potential trap site in early September and dropped food until 1 October, but she never visited the bait site. We observed her for several hours on 1 October, at which time she was putting all her weight on her injured leg/foot and fishing successfully. There were no other confirmed sightings of her through the end of the year. Another female, K-87, hatched at the Two Harbors nest in 2009, began showing up at the nest in October and appears to have replaced the previous nesting female.

Pinnacle Rock Territory. The Pinnacle Rock pair used the same nest as in 2012. The female, K-56, was hatched from a Seal Rocks egg and fostered into the Seal Rocks nest in 2005. The male, K-73, hatched from an egg removed from the West End nest in 2007 and was fostered back to the West End nest. We observed the first egg on 21 February and a second egg on 24 February. We confirmed that there were two chicks in the nest on 1 April.

We entered the nest on 28 May to equip the birds with leg bands, VHF transmitters, and wing markers, and to obtain blood samples (Fig. 4, Table 1). We continued to monitor the birds until they fledged around 1 July (Table 1). K-14 was last located on Catalina on 26 August and

was found dead on Aliso Beach in Laguna Beach, California, on 7 September. We retrieved K-14 on 6 October and shipped the carcass to the National Eagle Repository. K-16 was last located on Catalina on 9 August along the Palisades on the southwestern coast of the island.

Figure 4. The Pinnacle Rock chicks at the time of banding in 2013.

Table 1. Biographical data for bald eagle chicks hatched at nests on Santa Catalina Island, CA, during 2013.

Federal Band	Sex	Wing Tag	Date Fledged	Territory	Status[a]	Comments
679-04131	M	K-30	6/12	Middle Ranch	Unknown	Last detected on Catalina 8/31/13
679-04132	M	K-31	~6/10	Seal Rocks	Unknown	Last seen on Catalina 7/15/13
679-04133	F	K-32	~6/19	Seal Rocks	Unknown	Last detected on Catalina 8/29/13
679-04134	F	K-38	6/21	Two Harbors	Unknown	Last detected on Catalina 9/26/13
679-04135	F	K-39	~6/25	Rattlesnake	Dead	Dead in Laguna Beach 8/25/13
679-04136	M	K-27	6/29	West End	Unknown	Last seen 9/9/13
679-04137	F	K-28	7/12	West End	Alive	Repeatedly visited natal nest
679-04138	F	K-29	7/6	West End	Dead	Dead on Huntington Beach 8/11/13
679-04139	M	K-14	~7/1	Pinnacle Rock	Dead	Dead in Laguna Beach 9/7/13
679-04140	F	K-16	~7/1	Pinnacle Rock	Unknown	Last seen on Catalina 8/9/13

[a] As of 12/31/13

Seal Rocks Territory. The Seal Rocks pair used a different nest than in 2012. The female, K-34, is from the captive ACC eagles and was hacked at the Bulrush tower in 1993. The male, K-25, hatched from an egg from the West End territory and was fostered into the Pinnacle Rock nest in 1992. The first egg was seen in the nest on 11 February, and we were unable to confirm a second egg until 18 February. The first chick was seen in the nest on 20 March and a second chick was present on 21 March.

We entered the nest on 13 May to equip the birds with leg bands, VHF transmitters, and wing markers and to collect blood samples for contaminant analyses (Fig. 5, Table 1). We continued to monitor the birds until they fledged between 10 and 19 June (Table 1). K-31 was last seen on the island on 15 July, when he visited the West End nest. K-32 was last detected on the island on 29 August near the town of Two Harbors.

Figure 5. A view of the Seal Rocks nest on Santa Catalina Island, CA, in 2013.

Two Harbors Territory. The Two Harbors pair used the same nest as last season. The male, K-81, is an ACC-produced eagle that was fostered into the West End nest in 1998. The female, K-82, hatched from an egg removed from the West End nest in 1998 and was fostered into the Pinnacle Rock nest. The nest was monitored primarily via our live web cam. The first egg was laid on 15 February and the second egg on 18 February. One of the eggs broke on 24 February, but the remaining egg hatched on 25 March.

Figure 6. The Two Harbors chick at banding on Catalina, 2013.

We entered the nest on 18 May to equip the bird with leg bands, VHF transmitter, and wing markers and to collect blood samples for contaminant analyses (Fig. 6, Table 1). We continued to monitor the bird until it fledged on 21 June. K-38 was last seen on 26 September at Thompson Reservoir on Catalina.

Rattlesnake Territory. The Rattlesnake pair used the same nest in Gallagher's Canyon that they have used since 2010. The male, K-80, was produced by eagles at the ACC in 1998 and was fostered into the West End nest. The female, K-47, was produced by eagles at the ACC in 2004 and was fostered into the Seal Rocks nest. We confirmed the birds were incubating on 29 February and saw 2 eggs on 21 February. The first chick hatched around 27 March and the second had hatched by 31 March. One chick disappeared from the nest around 2 May.

We entered the nest on 19 May to install a leg band, VHF transmitter, and wing markers on the remaining chick, and to obtain blood samples (Fig. 7, Table 1). We monitored the nest until the eaglet fledged around 25 June. On 7 August, she was found swimming off the coast of Catalina near Empire Landing. She was kept overnight for observation and then released back to her natal territory. She was last seen in the vicinity of her nest on 20 August, but washed ashore at Sleepy Hollow Beach in Laguna Beach, California, on 25 August. Animal Control with the Laguna Police Department collected the carcass.

Figure 7. The Rattlesnake chick at the time of banding on Santa Catalina Island, CA, in 2013.

Middle Ranch Territory. The Middle Ranch pair used the same nest as in 2012. The male, K-93, was produced by eagles at the ACC in 1999 and was hacked at the Bulrush hacktower on Catalina. The female, A-37, was produced by eagles at the ACC in 2005 and hacked from the South Tower on Santa Cruz. The first egg was laid on 10 February and a second egg was seen on 15 February. One egg was broken on 18 February and the remaining egg hatched on 20 March.

We entered the nest on 12 May to install a leg band, VHF transmitter, and wing markers on the chick, and to obtain blood samples (Fig. 8, Table 1). We monitored the nest until the chick fledged on 12 June. He remained on Catalina until at least 31 August, after which we received no more signals from his transmitter.

We received a report that K-93 was hanging upside down from a tree on 17 October. He was alive, but had a broken leg. We transferred him to Serrano Bird and Animal Hospital in Lake Forest, California, on 18 October, but the tissue damage was too extensive to save the leg and the bird was euthanized. His carcass was shipped to the National Eagle Repository on 6 October.

Figure 8. The Middle Ranch chick at the time of banding on Santa Catalina Island, CA, 2013.

Twin Rocks Territory. The Twin Rocks pair used a nest that was last used in 2011 (no breeding in 2012). The male, K-00, hatched at the Pinnacle Rock nest in 2007. The female, K-17, was a bird released at the Bulrush hacktower in 1984. The birds were found incubating on 18 February, but the eggs never hatched. The nest was abandoned around 15 April, and there were no further nesting attempts.

Santa Cruz Island

We surveyed the 7 known breeding territories on Santa Cruz and located nests in 6 territories (Fraser Point, Cueva Valdez, Fry's Harbor, Sauces, Malva Real, Los Pinos; Fig. 9). No nesting by the Pelican Harbor pair was evident. We surveyed much of the island for new territories in conjunction with peregrine falcon surveys, but we located no other breeding pairs.

Sauces Canyon Territory. The Sauces Canyon pair (Fig. 9) used the same nest as in 2012. Male A-40, a bird from the ACC, was hacked on Santa Cruz in 2005. The female, A-27, was collected from Alaska and hacked on Santa Cruz in 2004. The first egg was laid on 24 February and a second was laid on 27 February. Normal incubation continued until 4 March, at which time A-27 stopped returning to the nest. A-40 incubated alone until he left the nest on 7 March, at which time ravens flew away with the two eggs (Fig. 10). On 12 March, the Fraser Point female, A-49, was seen visiting the nest, although she had eggs at her own nest by this date (see below). A-49 showed up on the nest until 15 March, at which time A-48, an ACC-produced bird released in 2006, was seen at the nest. A-48 was seen in the territory through the end of the year.

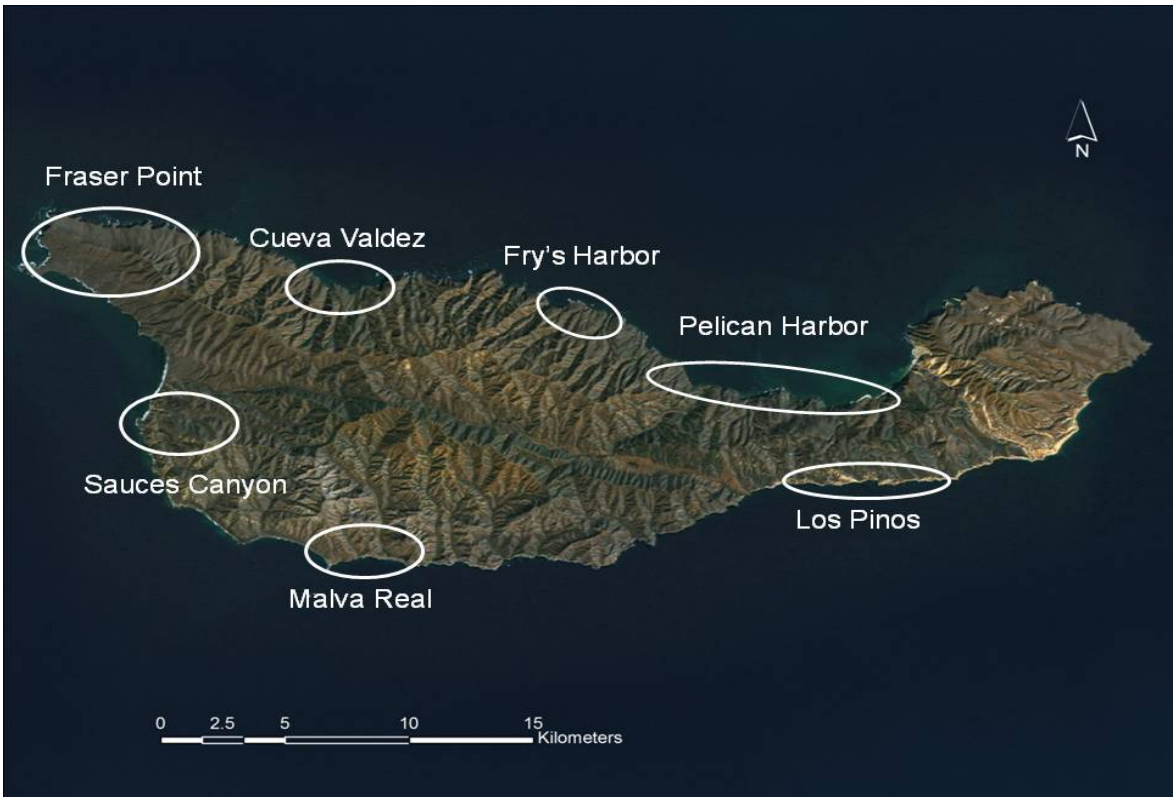


Figure 9. Active bald eagle territories Santa Cruz Island in 2013.

Pelican Harbor Territory. The Pelican Harbor pair (Fig. 9) is composed of male K-10, produced by the ACC and fostered into the Twin Rocks nest on Catalina in 2001, and female K-26, produced by the ACC and fostered into the West End nest on Catalina Island in 2002. There was no evidence of nesting by this pair in 2013.

Cueva Valdez Territory. The Cueva Valdez pair (Fig. 9) built a new nest in a canyon east of the 2012 nest canyon. The male, A-00, was produced by the ACC and hacked on Santa Cruz in 2002. The

Figure 10. A raven removing an egg from the Sauces Canyon nest on 12 March 2013.

female, A-16, was removed from a nest in Alaska and hacked on Santa Cruz in 2003. We found the adults brooding a chick on 13 April.

We entered the nest on 1 June to install a leg band, VHF transmitter, and wing markers on the eaglet, and to obtain a blood sample (Table 2). The chick fledged by 22 June and remained in its natal territory until at least 12 August. On 22 August its transmitter signal was coming from the direction of Santa Rosa, but she was seen on the eastern portion of Santa Cruz on 23 August, which was the last time she was detected.

Table 2. Biographical data for bald eagle chicks hatched at nests on the northern Channel Islands, CA, during 2013.

Federal Band	Sex	Wing Tag	Date Fledged	Territory	Status[a]	Comments
679-04128	F	A-85	~6/4	Lopez Canyon	Unknown	
679-04129	M	A-86	~6/4	Lopez Canyon	Dead	Found at McGrath State Park 7/22/13
679-04130	M	A-87	~6/11	Los Pinos	Unknown	
679-04141	F	A-88	~6/22	Cueva Valdez	Unknown	
679-04142	F	A-89	~7/13	Fraser Point	Unknown	
679-04145	M	A-90	~7/28	Oak Canyon	Unknown	

[a] As of 12/31/13

Malva Real Territory. The Malva Real pair (Fig. 9) built a new nest in Malva Real Canyon. We were unable to determine the identities of the breeding adults. The male has no wing markers, but may still be K-11, produced at the ACC and fostered into the West End nest on Catalina in 2001. It is not uncommon for the wing markers to degrade and fall off over time, and we were unable to get close enough to see leg bands. The female had blue wing markers, but we were never able to read the number. We assume it is still A-35, an ACC-produced bird that was released on Santa Cruz in 2005. We found the birds in incubation posture on 3 February, but there was never any indication that chicks hatched. The birds were still incubating on 6 April, but the nest had failed by our next check on 14 April.

Figure 11. The first chick produced by the Los Pinos pair, Santa Cruz Island, CA, 2013.

Los Pinos Territory. We located the Los Pinos pair at a new nest located in a canyon east of the 2012 nest (Fig.

9). The male had no tags, but is likely A-45, an ACC-produced male released in 2005. We found the adults incubating on 19 February, at least 1 chick was present on 25 March, and we observed 2 chicks on 7 April.

There was only 1 chick present when we entered the nest on 11 May to install a leg band, VHF transmitter, and wing markers, and to obtain a blood sample (Fig. 11, Table 2). We continued to monitor the nest until A-87 fledged around 11 June. He remained near the nest until at least 30 June, but there was no signal in the area on 6 July. The last time he was seen was in the Cueva Valdez area on 10 July.

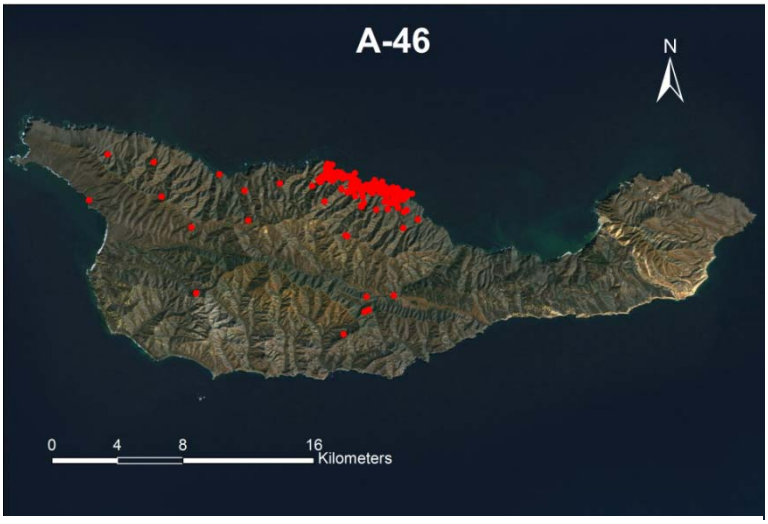


Figure 12. Locations of Eagle A-46 on Santa Cruz Island, CA, in 2013.

Fry's Harbor Territory. Eagle A-46, a 2006 ACC-produced male, and A-24, a female collected in Alaska in 2004, were found constructing a new nest on 1 March (Fig. 9). The pair worked on the nest throughout most of the season, but never laid eggs. A-46 is still carrying a functioning GPS transmitter (attached 8 June 2006) and remained in his territory throughout most of the year (Fig. 12). If the transmitter continues to function in 2014, it will allow us to more easily locate their nesting location.

Figure 13. The Fraser Point chick on Santa Cruz Island, CA, in 2013.

Fraser Point Territory. We located the Fraser Point pair with a new nest on the northwestern coast of the island (Fig. 9). Female A-49 hatched at the Pelican Harbor nest in 2006, the first chick to hatch naturally since bald eagle restoration efforts began on the Channel Islands. The male, also hatched at the Pelican Harbor

nest in 2008, so it is related to A-49. We found the adults incubating on 10 March, and a chick was present on 14 April.

We entered the nest on 6 June to install a leg band, VHF transmitter, and wing markers on the eaglet, and to obtain a blood sample (Fig. 13, Table 2). A-89 fledged around 13 July and remained in her natal territory until at least 12 August. We picked up her signal from the direction of Santa Rosa on 22 and 24 August and 4 September.

Santa Rosa Island

We located active nests in the two known active territories on the island, Trap Canyon and Lopez Canyon (Fig. 14), and surveyed most of the coastline for new territories.

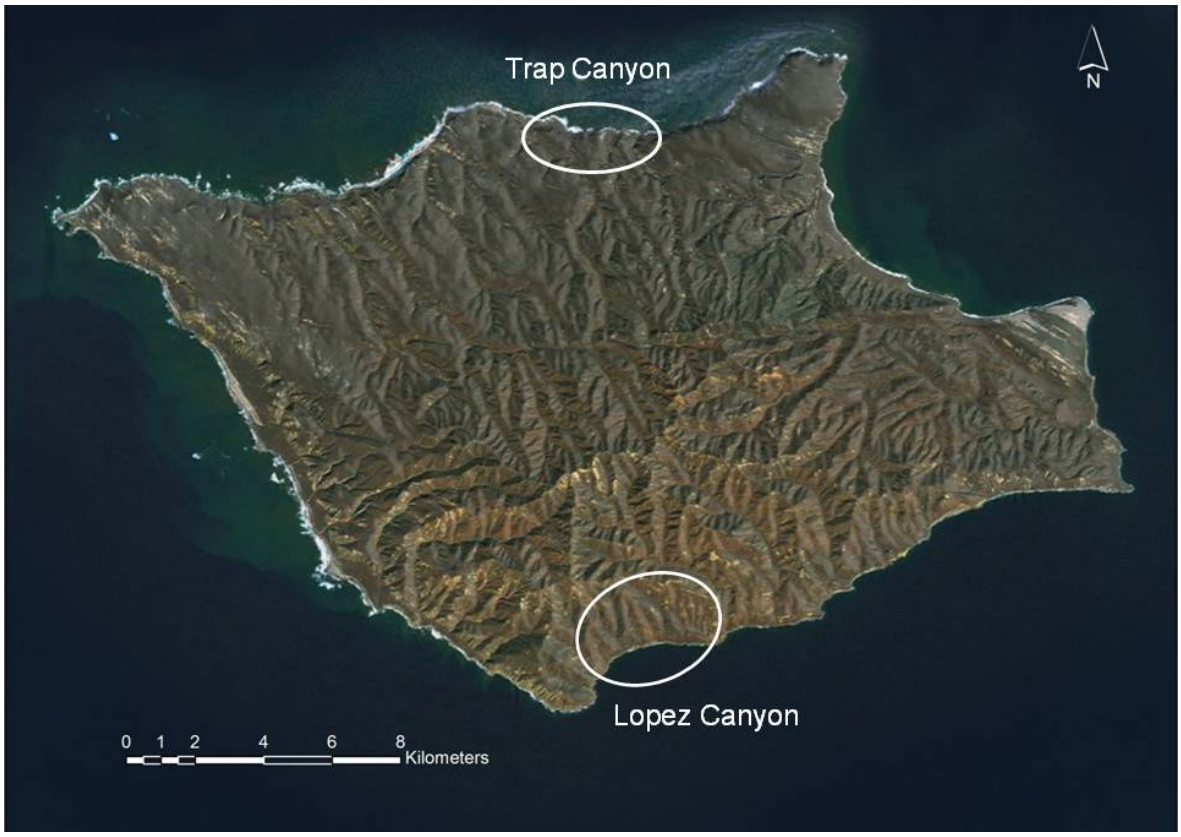


Figure 14. Bald eagle territories on Santa Rosa Island, CA in 2013.

Trap Canyon Territory. The Trap Canyon pair used the nest they last used in 2011 (Fig. 14). The male, A-08, was removed from a nest in Alaska and hacked on Santa Cruz in 2002. The female, A-22, was produced by the ACC and hacked on Santa Cruz in 2004. We found the adults

incubating on 12 February and a chick was seen in the nest on 31 March. The nest failed by 25 April and no further nesting activity was observed.

Lopez Canyon Territory. The Lopez Canyon pair (Fig. 14) used the same as in previous years. Both the male, A-39, and the female, A-43, were produced by the ACC and hacked on Santa Cruz in 2005. The birds were observed incubating on 6 February. The first chick hatched on 15 March and a second chick hatched on 19 March.

Figure 15. The Lopez Canyon bald eagle chicks at the time of banding in 2013.

We entered the nest on 7 May to attach leg bands, wing markers, and VHF transmitters on the eaglets, and to draw blood for contaminant analyses (Fig. 15; Table 2). We continued to monitor the nest until the chicks fledged around 4 June. The birds were still in their natal territory on our last visit on 22 June. On 22 July, A-86 was found dead on the beach at McGrath State Park in Oxnard, CA.

Anacapa Island

We surveyed Anacapa from our Zodiac and during peregrine falcon surveys aboard "The Retriever". We found a nesting pair in the previously known Oak Canyon territory (Fig. 16).

Oak Canyon Territory. The pair on West Anacapa Island used the same nest as in 2011 (Fig. 16). Access to the island is restricted because of seabird nesting, but we were able to access the island on 5 May, at which time there were no eggs in the eagle nest. The adults appeared to be incubating on 1 April, and we saw a chick on 10 June.

We were able to access the island again on 25 June and found a single chick about 9 weeks old. We fit the bird with a leg band, wing markers, and a VHF transmitter, and collected blood for contaminant analyses (Table 2). The eagle fledged by 28 July and was last detected on 10 August, at which time it was still on Anacapa.

Figure 16. The Oak Canyon bald eagle territory on Anacapa Island, CA in 2013.

Nesting Summary

Based upon our observations and the number of chicks that hatched in nests on the Channel Islands, we estimate that the eagles laid 24-29 eggs this season, of which 19 (66-79%) hatched (Table 3). Sixteen chicks (84%) fledged and 1-12 (6-75%) of the fledged eaglets survived until the end of the year (1 known alive, 4 known dead, 11 of unknown status).

Monitoring of Previously Released/Hatched Bald Eagles

We continued to monitor the eagles that had been released or hatched naturally on the Channel Islands prior to 2013. Twenty-nine bald eagles that were released or hatched on Catalina in previous years were seen during 2013 (Table 4). Nineteen of the birds were on Catalina, 3 on Santa Cruz, 1 on San Clemente, and 6 on the mainland.

As of 31 December, 6 of the eagles previously released or naturally hatched on Santa Cruz and Santa Rosa are being monitored via satellite GPS transmitters, and 26 others were identified during our surveys or through sightings by other observers in 2013 (Table 5).

Table 3. Summary of nesting attempts by bald eagles on the California Channel Islands in 2013.

Island/Nest	Eggs Incubated	Chicks Hatched	Chicks Fledged	Number Surviving Until End of Year
Santa Catalina Island				
West End	3	3	3	1-2
Pinnacle Rock	2	2	2	0-1
Seal Rocks	2	2	2	0-2
Two Harbors	2	1	1	0-1
Rattlesnake	2	2	1	0
Middle Ranch	2	1	1	0-1
TOTAL	13	11	10	1-7
Santa Cruz Island				
Pelican Harbor	0	0	0	.
Sauces	2	0	0	.
Cueva Valdez	1-2	1	1	0-1
Malva Real	1-2	0	0	.
Fraser Point	1-2	1	1	0-1
Los Pinos	2	2	1	0-1
Fry's Harbor	0	0	0	.
TOTAL	7-10	4	3	0-3
Santa Rosa Island				
Trap Canyon	1-2	1	0	0
Lopez Canyon	2	2	2	0-1
TOTAL	3-4	3	2	0-2
Anacapa Island				
Oak Canyon	1-2	1	1	0-1
TOTAL	1-2	1	1	0-1
All Islands Combined	24-29	19	16	1-12

A-17 Movements

Eagle A-17 is carrying a transmitter that has been functioning since 8 October 2007, when she was last trapped. She spent the first part of the year on Santa Rosa, but made trips to Santa Cruz on 27 January to 8 February, 20-27 February, 7-14 March, and 24-30 March. On 30 March, she flew to the mainland and spent most of her time in central

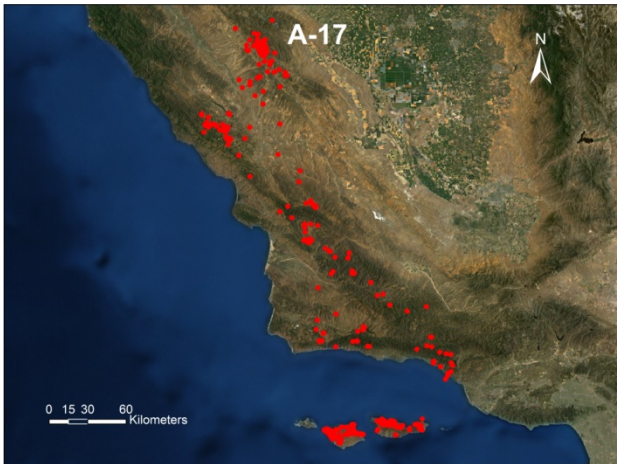


Figure 17. Movements of Eagle A-17 in 2013.

California (Fig. 17). She returned to Santa Rosa on 2 November and remained there through the end of the year, except for a visit to Santa Cruz on 8 December.

Table 4. Status of bald eagles released or fledged from nests on Santa Catalina Island, CA, prior to 2013 and seen in 2013.

FWS Leg Band	Sex[1]	Patagial Marker	Nest/Release Tower	Fledge Year	Status, Latest Location[2]
629-16077	F	K-17	Bulrush Tower	1984	Alive, Twin Rocks pair, Catalina Is.
629-16085	F	NA	Sweetwater Tower	1986	Alive, West End pair, Catalina Is. 10/1/13
629-19925	M	K-25	Pinnacle Rock	1992	Alive, Seal Rocks pair, Catalina Is.
629-19928	F	K-34	Bulrush Tower	1993	Alive, Seal Rocks pair, Catalina Is.
629-39815	M	K-80	West End	1998	Alive, Rattlesnake pair, Catalina Is.
629-39816	M	K-81	West End	1998	Alive, Two Harbors pair, Catalina Is.
629-39817	F	K-82	Pinnacle Rock	1998	Alive, Two Harbors pair, Catalina Is.
629-29497	M	K-93	Bulrush Tower	1999	Euthanized, former Middle Ranch male
629-29498	M	K-01	Pinnacle Rock	2000	Alive, West End pair, Catalina Is.
629-29499	F	K-02	West End	2000	Alive, Lake Hemet, CA
629-02780	M	K-10	Twin Rocks	2001	Alive, Pelican Harbor pair, Santa Cruz Is.
629-02793	F	K-26	West End	2002	Alive, Pelican Harbor pair, Santa Cruz Is.
629-47371	F	K-47	Seal Rocks	2004	Alive, Rattlesnake pair, Catalina Is.
629-47395	M	K-51	Pinnacle Rock	2005	Alive, Catalina Island
629-47398	F	K-56	Seal Rocks	2005	Alive, Pinnacle Rock pair, Catalina Is.
629-52425	M	K-00	Pinnacle Rock	2007	Alive, Twin Rocks pair, Catalina Is.
629-52428	M	K-73	West End	2007	Alive, Pinnacle Rock pair, Catalina Is.
629-52430	M	K-76	Twin Rocks	2007	Alive, San Clemente Island 11/5/13
629-52434	F	K-03	Seal Rocks	2007	Alive, Catalina Island
629-52442	F	K-83	Two Harbors	2008	Alive, Three Rivers, CA 5/20/13
629-52443	M	K-88	Twin Rocks	2008	Alive, Catalina Island
629-52449	F	K-87	Two Harbors	2009	Alive, West End Pair
629-52450	F	K-91	Two Harbors	2009	Alive, Santa Cruz Island 2/2/13
679-03431	F	K-05	Seal Rocks	2010	Dead, Washington State 2/22/13
679-04101	F	K-18	Two Harbors	2011	Alive, Catalina Island 9/20/13
679-04102	F	K-07	Seal Rocks	2011	Alive, Big Bear, CA 3/1/13
679-04104	F	K-15	Rattlesnake	2011	Alive, Catalina Island
679-04105	M	K-19	Rattlesnake	2011	Alive, Wickiup Reservoir, CA 9/21/13
679-04118	M	K-21	Seal Rocks	2012	Alive, Vancouver Island, BC 1/4/13

[1] Determined by karyotyping and/or morphometrics.
[2] As of 12/31/13 unless otherwise noted.

Table 5. Status of bald eagles released or fledged from nests on Santa Cruz and Santa Rosa Islands, CA, in 2002-2012 and known to have been alive in 2013.

FWS Leg Band	Sex[1]	Patagial Marker	Source[2]	Fledge Year	Status, Latest Location[3]
629-02795	M	A-00	Zoo	2002	Alive, Cueva Valdez pair, Santa Cruz Is.
629-14045	M	A-08	Alaska	2002	Alive, Trap Canyon pair, Santa Rosa Is.
629-14048	F	A-11	Alaska	2002	Alive, Oak Canyon pair, Anacapa Is.
629-47359	F	A-16	Alaska	2003	Alive, Cueva Valdez pair, Santa Cruz Is.
629-47360†	F	A-17	Alaska	2003	Alive, Santa Rosa Is.
629-47356	M	A-21	Alaska	2003	Alive, Oak Canyon pair, Anacapa Is.
629-47366	F	A-23	Zoo	2004	Alive, Fort Hunter-Liggett, CA
629-47372	F	A-24	Alaska	2004	Alive, Fry's Harbor pair, Santa Cruz Is.
629-47375	F	A-27	Alaska	2004	Alive, Sauces pair, Santa Cruz Is.
629-47388	F	A-37	Zoo	2005	Alive, Middle Ranch pair, Catalina Is.
629-47390	M	A-39	Zoo	2005	Alive, Lopez Canyon pair, Santa Rosa
629-47391	M	A-40	Zoo	2005	Alive, Sauces pair, Santa Cruz Is.
629-47399	F	A-43	Zoo	2005	Alive, Lopez Canyon pair, Santa Rosa
629-52404†	M	A-46	Zoo	2006	Alive, Fry's Harbor pair, Santa Cruz Is.
629-52406	F	A-48	Zoo	2006	Alive, Santa Cruz Is.
629-52407	F	A-49	Pelican Harbor	2006	Alive, Fraser Point pair, Santa Cruz Is.
629-52410	F	A-51	Zoo	2006	Alive, Los Pinos pair, Santa Cruz Is.
629-52419	F	A-57	Zoo	2006	Alive, Santa Cruz Is.
629-52420†	M	A-58	Zoo	2006	Alive, Santa Cruz Is.
629-52422†	M	A-60	Malva Real	2006	Alive, Santa Cruz Is.
629-52438	M	A-64	Pelican Harbor	2008	Alive, Fraser Point pair, Santa Cruz Is.
679-03432	M	A-67	Trap Canyon	2010	Alive, Point Mugu Lagoon
679-03436†	M	A-69	Pelican Harbor	2010	Alive, Point Conception
679-03440†	F	A-70	Lopez Canyon	2010	Alive, Santa Rosa Is.
679-03444†	M	A-72	Cueva Valdez	2010	Alive, Santa Cruz Is.
679-04109	M	A-73	Sauces	2011	Alive, Stockton, CA 1/9/13
679-04110	F	A-74	Pelican Harbor	2011	Alive, Santa Rosa Is. 12/26/13
679-04119	F	A-80	Trap Canyon	2012	Alive, Santa Rosa Is. 5/18/13
679-04124	M	A-81	Sauces	2012	Alive, Santa Rosa Is. 9/18/13
679-04125	F	A-82	Sauces	2012	Alive, Santa Cruz Is. 7/26/13
679-04127	M	A-84	Pelican Harbor	2012	Alive, Santa Cruz Is. 8/25/13

[1] Determined by karyotyping for birds from San Francisco Zoo, and morphometrics for Alaskan birds.
[2] San Francisco Zoo (Zoo), wild nests near Juneau, Alaska (Alaska), or nests on Santa Cruz (Pelican Harbor, Malva Real, Sauces, Cueva Valdez) or Santa Rosa (Trap Canyon, Lopez Canyon).
[3] As of 12/31/13, unless otherwise noted.
† Carrying a GPS transmitter.

A-57 Movements

Eagle A-57 spent the year on Santa Cruz, but she dropped her transmitter on 16 February (Fig. 18).

Figure 18. Movements of Eagle A-57 on the northern Channel Islands, CA, in 2013.

A-58 Movements

Eagle A-58's transmitter has been functioning since he was banded on 29 June 2006. He began the year on Santa Rosa, but moved to Santa Cruz on 13 January and remained there through the end of the year, except for a visit to Santa Rosa from 22 September to 8 October (Fig. 19).

Figure 19. Movements of Eagle A-58 on the northern Channel Islands, CA, in 2013.

A-60 Movements

Eagle A-60's transmitter has been functioning since he was banded on 26 June 2006. He spent most of the year on Santa Rosa, but made 8 short trips to Santa Cruz on 29-31 January, 18-23 February, 21-23 March, 7-13 April, 23-30 July, 8-10 September, 12-14 October, 18-24 December, and 30-31 December (Fig. 20). He also made a single trip to San Miguel on 20-22 November. Data were sporadic in October and November, so there may have been more movement between the islands.

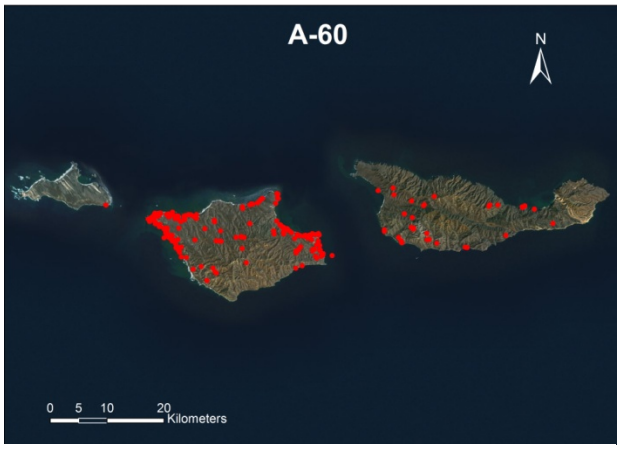


Figure 20. Movements of Eagle A-60 on the northern Channel Islands, CA, in 2013.

A-67 Movements

Eagle A-67, the 2010 Trap Canyon chick, visited all four of the NCI in 2013 (Fig. 21) before dropping his transmitter on 10 June on Santa Rosa. He began the year on Santa Rosa, but made trips to Santa Cruz on 7-19 January, 7-8 February, 10-14 February, 3 March-5 April, and

15-18 April. He also made trips to Anacapa on 8-10 February and 5-15 April, and a single trip to San Miguel on 8-11 May.

A-69 Movements

Eagle A-69, one of the 2010 Pelican Harbor chicks, moved between the NCI and the mainland 27 times during 2013 (Fig. 22). The longest stay on a single island was 13 May to 19 August on Santa Rosa. He started the year on Santa Cruz and made 11 visits to Santa Rosa, 8 additional visits to Santa Cruz, 5 visits to San Miguel, and 1 visit to Anacapa. On 13 December he was near Point Conception and remained in the area through the end of the year.

A-70 Movements

Eagle A-70, the 2010 Lopez Canyon chick, moved frequently between Santa Cruz, Santa Rosa, and San Miguel islands in 2013 (Fig. 23). She began the year on Santa Cruz and started moving between the islands on 17 January. The only time she spent more than 17 consecutive days on an island was on an 8 May-18 August visit to San Miguel. In total, she made 10 visits to Santa Rosa, 5 visits to San Miguel, and 6 additional visits to Santa Cruz, where she ended the year.

Figure 21. Movements of Eagle A-67 on the northern Channel Islands, CA, in 2013.

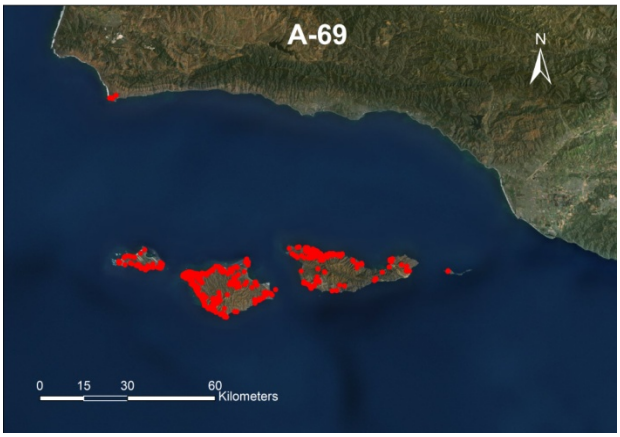


Figure 22. Movements of Eagle A-69 in southern California in 2013.

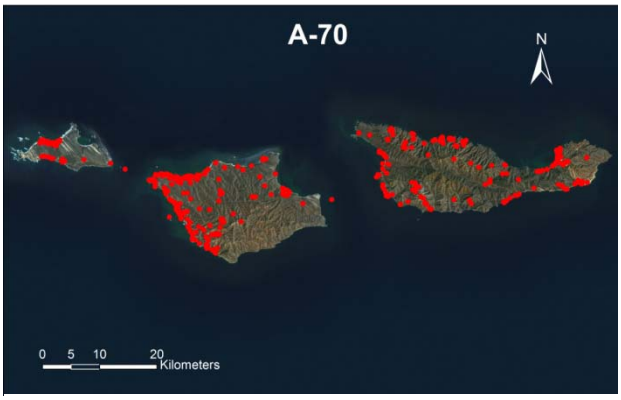


Figure 23. Movements of Eagle A-70 on the northern Channel Islands, CA, in 2013.

A-72 Movements

Eagle A-72, the 2010 Cueva Valdez chick, visited 3 islands in 2013 (Fig. 24). She began the

year on Santa Cruz, made a short visit to Anacapa on 7 February, and then returned to Santa Cruz until 22 July. She made trips to Santa Rosa on 22 July - 30 August, 19 September - 11 October, 17 October - 3 November, and 22 November - 3 December. She made a one -day visit to Anacapa on 15 November.

Figure 24. Movements of Eagle A-72 on the northern Channel Islands, CA, in 2013.

A-80 Movements

Eagle A-80, the 2012 Trap Canyon chick, visited all 4 NCI and the mainland in 2013 (Fig. 25). She spent 1 January-6 February on Santa Rosa. She flew to Santa Cruz on 6 February and then to Anacapa on 9 February. She flew back and forth between Santa Cruz and Anacapa, spending 11-13 and 17-19 February on Anacapa. She flew from Anacapa to the mainland on 19 February and returned to San Miguel on 22 February. She remained on San Miguel until 24 March, and then flew to Santa Cruz via Santa Rosa. She remained on Santa Cruz until 2 April and then spent 2-17 April on Anacapa. She flew to Santa Cruz on 18 April, returned to Anacapa 22-24 April. We received no data from 25 April to 8 May, at which time she was back on Santa Rosa. She visited Santa Cruz 9-18 May, before returning to Santa Rosa. Her transmitter malfunctioned on 27 May, and we received no more location data.

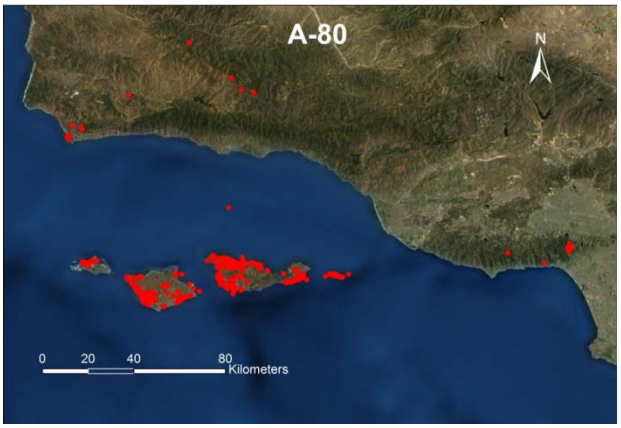


Figure 25. Movements of Eagle A-80 in 2013.

DISCUSSION

In 2006, after over 50 years of no known successful breeding by bald eagles on the Channel Islands, a chick hatched at the Pelican Harbor nest on Santa Cruz. This year, the bald eagle restoration program reached another milestone: the successful hatching and fledging of a chick at the Fraser Point territory that was produced by that 2006 Pelican Harbor chick (A-49)

and her biological brother, K-64 (2008 Pelican Harbor chick). We expect increasing reproduction by the first generation of naturally hatched eagles in the next couple years. We are aware of 5 females and 6 males on the islands or adjacent mainland that hatched on the islands between 2006 and 2010, and therefore will be of reproductive age in 2014. At least one, K-87, the 2009 Two Harbors chick, appears to have replaced the breeding female at the West End nest on Catalina.

We now have 5 years of productivity data from the Channel Island eagles since we last manipulated eggs and chicks. Average productivity from 2009-2013 was 0.97 fledgling/breeding attempt with 65% of breeding attempts resulting in the fledging of at least one chick. These productivity rates are nearly identical to the target of 1.0 fledgling/attempt and 65% nesting success set forth in the Pacific Region Bald Eagle Recovery Plan's target of (U.S. Fish and Wildlife Service 1986). There were equal numbers of nesting attempts on Catalina and the NCI (33 on each) over the 5-year period, but productivity and success rates were generally higher on Catalina (1.24 chicks/attempt, 73% success) than on the NCI (0.7 chicks/attempt, 58% success). The breeding population on the NCI is still becoming established and is made up of younger eagles than the population on Catalina. In 2013, the oldest bird on Catalina was 29 years old (Twin Rocks female, K-17), and the average age of individuals on the island, not including the 2013 cohort, was approximately 11.7 years old. In contrast, the oldest bird on the NCI was 11 years old (Pelican Harbor male, K-10) and the average age was only 6.8 years old. Therefore, the lower productivity rates on the NCI are likely a result of inexperience and should increase to levels similar to that seen on Catalina as the NCI population ages.

Santa Cruz territorial pairs and their nests have been subjected to aggressive interactions with non-mated eagles over the years, and 2013 was no exception. For instance, in 2008, the chicks in the Pelican Harbor nest were attacked and knocked out of the nest by an unknown subadult, and female A-17 is believed to have killed the Malva Real female (A-04). This season, the Sauces nesting attempt apparently was disrupted by the appearance of females A-49 and/or A-48, driving off the nesting female, A-27 (later seen along the north coast of Santa Cruz). The Pelican Harbor breeding season may have been disrupted by the appearance of female K-91, an eagle that hatched at the Two Harbors nest on Catalina in 2009. She was seen perched near the Pelican Harbor pair in early February and could have interfered with their breeding cycle.

It is possible that aggression in earlier years was a result of a skewed sex ratio on the NCI. Among the 61 eagles collected from the San Francisco Zoo or Alaska and released on

Santa Cruz between 2002 and 2006, the sex ratio was skewed towards females (1.8:1), so there may have been competition for males during the initial years of breeding. However, the sex ratio of bald eagles of breeding age (4+ years) known to be on the NCI in 2013 was 1.2:1 (12 females:10 males), including birds from both the NCI and Catalina. Aggression in 2013 could still be a result of the slightly skewed sex ratio, or could indicate that the majority of high-quality territories are occupied and floaters are trying to displace territorial adults.

At the end of 2012 we were optimistic that there would soon be breeding on San Clemente Island because K-51 (male) and A-32 (female) were seen on the southern portion of the island multiple times. However, K-51 appeared on Catalina with female K-03 this season and appears to be establishing a territory on the northern coast to the west of Two Harbors. Therefore, we may add a new breeding pair on Catalina in 2014. Another potential pair on San Clemente in 2013 was male K-88 and female K-87. However, these birds also moved to Catalina in the fall of 2013, and K-87 is now part of the West End pair and K-88 appears to have replaced the Middle Ranch male that was euthanized due to a severe leg injury. IWS personnel on San Clemente will continue to monitor the island for breeding bald eagles.

In 2014, we expect the number of bald eagle nests to remain stable on increase on Santa Rosa, Santa Cruz, and Catalina. We expect the Fry's Harbor birds to begin nesting, as well as a pair that has been in the Smuggler's area (A-57 and A-58). The Pelican Harbor pair should also resume breeding and there are several other birds that will be 4+ years old that have yet to breed. IWS personnel will be conducting peregrine falcon surveys again on all 8 Channel Islands, so we will likely find any breeding bald eagles on islands where they are not currently known to breed.

RECOMMENDATIONS

The usefulness of the VHF transmitters on the NCI is limited due to the ability of the eagles to move readily among the islands and the reduction of personnel to a single individual after July. We recommend discontinuing the use of VHF transmitter on the NCI.

Because of the unknown status of bald eagles on San Clemente, and the sightings of untagged juveniles, an effort should be made to survey the southern portion of San Clemente Island to determine if there is a nesting pair there. Continued efforts should be made to survey the more inaccessible portions of the islands by foot and boat.

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