Bald Eagle Restoration on the California Channel Islands

January — December 2015

14th Annual Report

MONTROSE SETTLEMENTS RESTORATION PROGRAM

MSRP

Restoring Natural Resources
harmed by DDTs and PCBs

Bald Eagle Restoration on the California Channel Islands
January — December 2015
14th Annual Report

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National Park Service
And
Montrose Settlements Restoration Program

February 2016

Recommended Citation:

Sharpe, P. B. 2016. Bald Eagle Restoration on the California Channel Islands, January - December 2015, 14th Annual Report. Unpublished report prepared by the Institute for Wildlife Studies, Arcata, California for the National Park Service and Montrose Settlements Restoration Program. 23 pp.

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 the population was maintained by artificial incubation of the fragile eggs, fostering of chicks to active nests, and continued release of birds from hacking towers. 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 and 2 pairs of eagles successfully fledged one chick each from nests at Pelican Harbor and Malva Real on Santa Cruz Island. The following year we began leaving eggs in some of the nests on Catalina and discontinued nest manipulations in 2009. Since 2006, we have banded 107 chicks that hatched naturally in nests on Santa Cruz, Santa Rosa, Anacapa, Santa Catalina, and San Clemente Islands.

In 2015, there were 18 known nesting attempts on the Channel Islands: 7 on Santa Catalina Island, 7 on Santa Cruz Island, 2 on Santa Rosa Island, 1 on Anacapa Island, and 1 on San Clemente Island. A minimum of 18 chicks are known to have hatched in 12 nests, of which at least 12 fledged (outcome of nesting on Anacapa is unknown due to inaccessibility of the island). Overall nesting success was only 47% and 0.71 fledglings were produced per breeding attempt with known outcome. This productivity was about 34% lower than in 2013 and 2014 (1.07 fledglings/attempt) and lower than in any year since 2009. The death of 5 chicks at 5 different nests was a major factor in the lowered productivity.

Based upon the sightings of birds this year, we estimate that there are at least 41 bald eagles on the Channel Islands. These primarily are breeding adults and it is likely that there are

additional juveniles/subadults present that have not been seen or identified. Fourteen additional eagles with wing markers were reported on the mainland.

We expect to have a similar number of nesting attempts in 2016, with the possibility of 1-2 new pairs on the northern Channel Islands. We will continue our annual surveys for new nests and monitoring of known nests throughout the 2016 breeding season.

ACKNOWLEDGMENTS

IWS thanks the National Park Service, U.S. Fish and Wildlife Service, California Department of Fish and Wildlife, National Oceanic and Atmospheric Administration, The Nature Conservancy, the Santa Catalina Island Conservancy, the U.S. Navy, and the Ventura County Office of Education. We offer special thanks to Kate Faulkner of the National Park Service and Annie Little of the U.S. Fish and Wildlife Service for the variety of assistance they provided to make this project successful. We also would like to thank this year's field crew: Nathan Melling, James Butch, Ivett Plascencia, Anna Fasoli, Sarah Dantuono-Brown, Jessica Rempel, Justyn Stahl, and Maria Dominguez. David Garcelon handled contract administration, permitting, and provided editorial comments on the final report. Funding for the project was made available by the Montrose Settlements Restoration Program through a National Park Service task agreement.

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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), likely due to the introduction of the organochlorine pesticide DDT into the Southern California Bight. DDE (a DDT metabolite) 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) by releasing of 33 young eagles from hacking towers between 1980 and 1986. Breeding attempts in 1987 and 1988 failed (Garcelon et al. 1989) and mean levels of DDE in egg remains recovered 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 beginning 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 pairs on Santa Cruz successfully hatched and fledged one chick each (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 territorial pairs and successful breeding on 5 of the 8 islands. As of 2015, there were 7 pairs on Catalina, 8 pairs on Santa Cruz, 2 pairs on Santa Rosa Island (Santa Rosa), 1 pair on Anacapa Island (Anacapa), and 1 pair on San Clemente Island (San Clemente). This report summarizes the results of our 2015 bald eagle surveying and monitoring efforts.

STUDY AREA

In 2015, we monitored bald eagles on Catalina, Santa Cruz, Santa Rosa, Anacapa, and San Clemente. Catalina, located 34 km south of Long Beach, California, is owned primarily by the Santa Catalina Island Conservancy (~90%). The island is 34 km long, 0.8 to 13.0 km wide, and has an area of 194 km^2, 80 km of coastline, and maximum elevation of 648 m (Junak et al. 1995; Fig. 1).

The northern Channel Islands, which are composed of San Miguel, Santa Rosa, Santa Cruz, and Anacapa Islands, 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 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 northern Channel Islands and has a Mediterranean climate, with mean monthly temperatures ranging from 11.7 - 20.9º C and a mean annual rainfall of 50 cm (Junak et al. 1995). The National Park Service (NPS) owns and manages the eastern 24% of the island and

The Nature Conservancy (TNC) owns the western 76% of the island.

Santa Rosa is the second largest of the Channel Islands and is owned by the NPS (Fig. 1). The island is approximately 24 x 16 km and encompasses about 217 km^2 with a central mountain range reaching an elevation of approximately 475 m (Junak et al. 1995, Rick 2009). The central highland is dissected by drainages; a relatively gentle marine terrace occurs north of the highland, whereas steep, deeply incised drainages comprise much of the south portion of the island (Coonan and Schwemm 2009).

Anacapa, which is composed of three islets (East, Middle, and West Anacapa; Fig. 1) is owned by the NPS. The island encompasses approximately 2.8 km^2, spanning about 8 km from end to end and reaching a maximum elevation of 283 m (Junak et al. 1995).

San Clemente, owned by the U.S. Navy, is the southernmost of the California Channel Islands, located approximately 92 km off the coast of California (Fig. 1). The island is 143 km^2, about 34 km long, and has a high point of 610 m (Willey 1997). It is characterized by a series of marine terraces on the west side and a steep escarpment on the east side (Kaiser et al. 2009).

METHODS

Permitting

IWS has the required Memorandum of Understanding and Scientific Collecting Permits (Permit #s SC-2485 [Peter Sharpe] and SC-0932 [David Garcelon]) with the California Department of Fish and Wildlife to conduct bald eagle research on the California Channel Islands, a banding permit from the United States Geological Survey's Bird Banding Laboratory (# 21564) allowing us to band and radio-tag eagles, and a research permit from the NPS (Permit # CHIS-2013-SCI-0004).

Surveying and Nest Monitoring

Observations of adult eagles began in January or February at each of the known territories. In conjunction with surveys for peregrine falcons (*Falco peregrinus*), we conducted weekly or bi-weekly ground surveys of Catalina, Santa Cruz, and Santa Rosa to locate new bald eagle nesting pairs. We used GPS units to record our survey routes and plotted the data using

Garmin Basecamp™, which allowed us to share data among our biologists and evaluate areas that needed additional surveys. Once we confirmed nesting eagles, we found partially hidden locations from which to monitor the chronology and outcome of nesting attempts. We had established video cameras prior to the nesting season at 4 active nests on Catalina (West End, Twin Rocks, Two Harbors, and Seal Rocks) and 1 nest on Santa Cruz (Sauces), 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).

Marking and Sampling

We entered each nest when the eagle chicks were approximately 6-8 weeks old to equip them with federal leg bands and patagial wing markers (orange on Catalina, light blue on NCI). 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). For birds that had measurements that could be large males or small females, 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-PTTs (Microwave Telemetry Inc., Columbia, Maryland). 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 using Paradox (Corel Corporation, Ottawa, Ontario) database software.

RESULTS

Surveying and Nest Monitoring

Santa Catalina Island

Nests were located in February and March in 7 previously active territories on Catalina (Pinnacle Rock, Seal Rocks, West End, Two Harbors, Twin Rocks, Rattlesnake, Empire; Fig. 2).

There was a single female in the Middle Ranch territory during the breeding season.

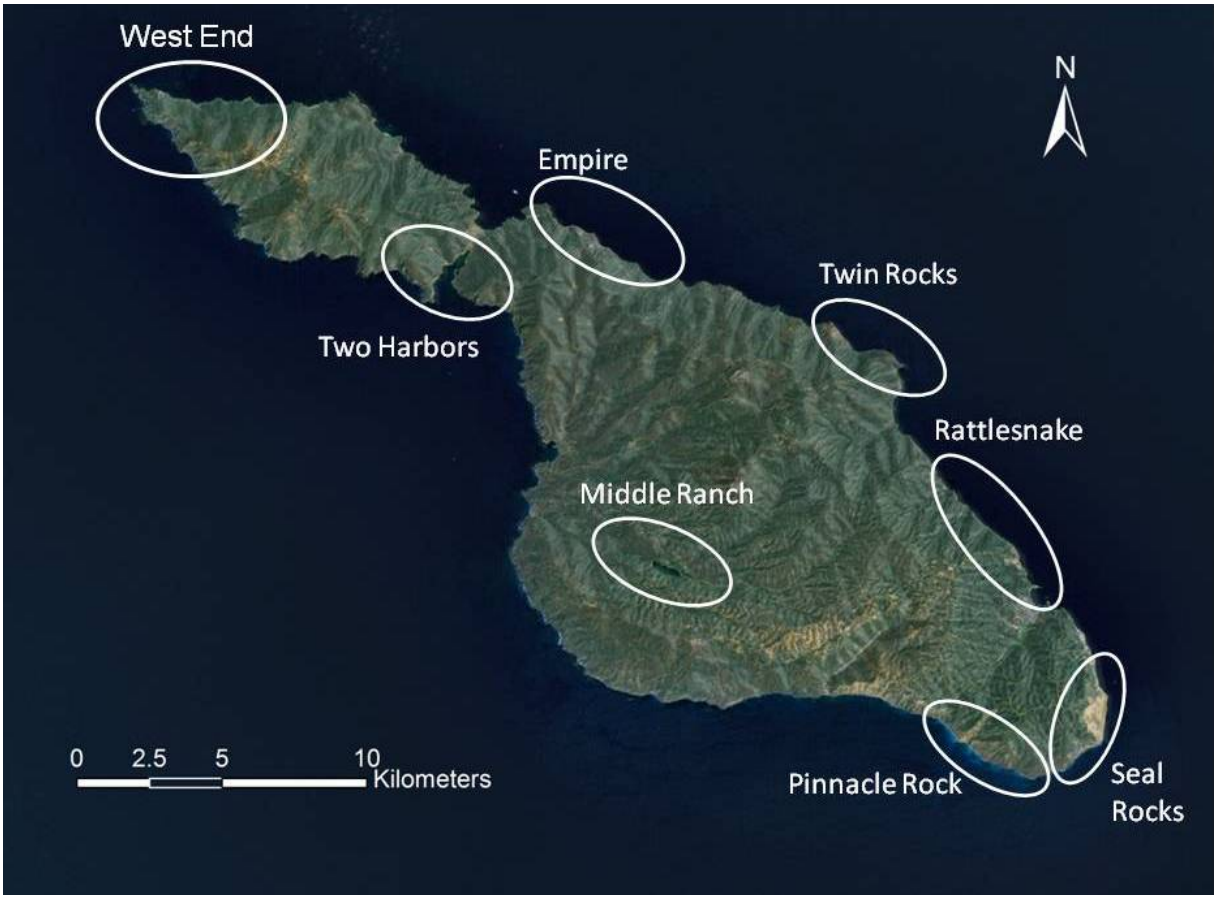

Figure 2. Bald eagle territories on Santa Catalina Island, CA, in 2015.

West End Territory. The West End pair (Fig. 2) used the same nest that has been in use in the territory since 1991. The female was K-91, a 2009 Two Harbors chick, and the male was K-01, a bird produced at the San Francisco Zoo and fostered into the Pinnacle Rock nest in 2000. K-91 laid her first egg on 23 February and a second egg on 26 February. One chick hatched on 5 April. We went to band the bird on 28 May, but the bird died suddenly about 30 seconds after being removed from the nest. We sent the bird to the California Department of Fish and Wildlife's Wildlife Investigation Laboratory in Rancho Cordova, California for a necropsy, the results of which were most consistent with acute septicemia (K. Rogers, personal communication).

Pinnacle Rock Territory. The Pinnacle Rock pair (Fig. 2) used the same nest as in 2014. The female has no wing markers and we could not confirm that she has one or more leg bands, so her identification is unknown. The 2014 male, K-73, was found dead in October 2014 in Washington

State. He was replaced by male K-88, who hatched at the Twin Rocks nest in 2008 and was the breeding male in the Middle Ranch nest in 2014. We observed the first egg on 24 February and a second egg on 26 February. We confirmed that there was a chick in the nest on 2 April, but it disappeared from the nest between 22 and 28 April. There were no further breeding attempts.

Table 1. Biographical data for bald eagle chicks hatched at nests on southern Channel Islands, CA, during 2015.

Federal Band	Sex	Wing Tag	Date Fledged	Territory	Status[c]	Comments
709-03076	F	K-55	~6/24/15	Seal Rocks[a]	Unknown	Seen at West End nest on 9/1/15
709-03077	F	K-57	~6/24/15	Seal Rocks[a]	Unknown	
709-03078	F		~6/24/15	Rattlesnake[a]	Unknown	Orange leg band 5/G on left leg
709-03079	M	.	~6/24/15	Rattlesnake[a]	Unknown	Orange leg band 5/R on right leg
709-03081	F	K-58	7/4/15	Two Harbors[a]	Unknown	
709-03082	M	.	~7/2/15	Bald Canyon[b]	Unknown	Orange leg band 5/D on right leg
709-03083	F	.	~7/2/15	Bald Canyon[b]	Unknown	Orange leg band 5/M on left leg

[a] Catalina
[b] San Clemente
[c] As of 12/31/15

Seal Rocks Territory. The Seal Rocks pair (Fig. 2) used the same nest as in 2014. 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 birds were found incubating on 10 February, but we could not see the eggs. We were able to confirm the presence of two eggs on 18 March and two chicks were present on 22 March.

Figure 3. The Seal Rocks chicks and one of the adults prior to banding on Santa Catalina Island, CA, in 2015.

We entered the nest on 13 May to equip the birds with leg bands and wing markers and to collect blood samples for contaminant analyses (Fig. 3, Table 1). We continued to monitor the birds until they fledged around 24 June.

Figure 4. The Two Harbors chick at banding on Santa Catalina Island, CA, in 2015.

Two Harbors Territory. The Two Harbors pair (Fig. 2) 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 27 February and the second egg on 2 March and chicks hatched on 6 and 7 April. One of the chicks fell out of the nest and off a cliff on 1 May and we made no recovery attempt.

We entered the nest on 27 May to equip the remaining bird with leg bands and wing markers and to collect blood samples for contaminant analyses (Fig. 4, Table 1). We continued to monitor the bird until it fledged on 4 July.

Figure 5. The Rattlesnake chicks after banding on Santa Catalina Island, CA, 2015.

Rattlesnake Territory. The Rattlesnake pair (Fig. 2) used the 2014 nest in a eucalyptus tree above the Catalina Island Marine Institute. 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 24 February and confirmed 2 eggs on 3 May. We saw one chick in the nest on 2 April and there was

a second chick present on 3 April.

Because of a full banding schedule for eagles and peregrines, we entered the nest on 13 May when the chicks were about 6 weeks old to install leg bands and obtain blood samples (Fig. 5, Table 1). The birds were too small to apply wing markers. We monitored the nest until the chicks fledged around 24 June.

Middle Ranch Territory. The Middle Ranch female (Fig. 2), A-37, was produced by eagles at the ACC in 2005 and hacked from the South Tower on Santa Cruz. There was no male present during the breeding season, thus no breeding attempts were made in this territory.

Twin Rocks Territory. The Twin Rocks pair (Fig. 2) used the same nest that was used in 2014. The male, K-00, hatched at the Pinnacle Rock nest in 2007. The female, K-17, was a bird released at the Bulrush hacking tower in 1984. The birds were found incubating on 4 March and continued incubating through 28 April. The nest was abandoned by 6 May and no further breeding attempts were observed.

We received a report that K-17 was on the ground at the Catalina Island Marine Institute on 11 October. She was less than 100 m from the Rattlesnake nest and one of the Rattlesnake adults was perched in a nearby tree. K-17 had a hole in her beak (Fig. 6) and several maggot-infested injuries to her left leg that were most likely a result of an altercation with another eagle. We took her to our local veterinarian, Dr. Richard Denney, to clean up the wounds and then transported her to Dr. Scott Weldy at the Orange County Birds of Prey Center on 12 October. She was put under anesthesia to clean the leg wounds, but died a few minutes into the procedure. K-17 was the oldest eagle on the Channel Islands, at 31 years of age.

Figure 6. Eagle K-17 when she was found near the Rattlesnake nest. Note the injury to her beak near her cere.

Empire Territory. The Empire pair (Fig. 2) used the same nest as in 2014. The male, K-51, was produced by eagles at the ACC in 2005 and fostered at the Pinnacle Rock nest. The female,

K-03, hatched at the Seal Rocks nest in 2007. The birds were incubating one egg on 5 March and a second egg was not confirmed until 6 April. The pair incubated until at least 11 May, but the nest was abandoned by 19 May. Throughout the season, the female appeared to have a leg injury that made it difficult to lie down or stand up from incubating, which may have resulted in improper incubation of the eggs. There were no further nesting attempts.

San Clemente Island

We surveyed for and monitored eagles on San Clemente Island in conjunction with other research on the island and located 1 active nest in the Bald Canyon territory (Fig. 7).

Figure 7. Bald Canyon territory on San Clemente Island, CA, 2015.

Bald Canyon Territory. A nest was discovered on the southeastern portion of the island in 2014 (Fig. 7) and was likely present in 2013, based upon behavioral observations (N. Desnoyers, personal communication). The male, K-76, hatched at the Twin Rocks nest in 2007 and is the first naturally hatched Catalina bird to begin breeding. The female, A-32, was collected from a

nest near Juneau, AK in 2004 and released from the North hacktower on Santa Cruz. The birds were found incubating 2 eggs on 18 March and there were 2 chicks present (~1 week old) on 16 April.

We entered the nest on 29 May to install leg bands and obtain blood samples (Table 1, Fig. 8). We had not received clearance from the Navy to attach wing markers, so the birds were banded with orange leg bands in addition to the USGS bands. The nest is located in an area with restricted access, so we monitored the birds monthly. The birds had fledged by 2 July and one may have been seen on San Nicolas Island later in the year.

Figure 8. Bald Canyon chicks at the time of banding, 2015.

In December 2015, we installed a camera system that should allow us to remotely monitor the nest during the 2016 breeding season.

Santa Cruz Island

We surveyed the 7 known breeding territories on Santa Cruz and located active nests in 5 territories (Sauces Canyon, Fraser Point, Cueva Valdez, Fry's Harbor, Malva Real; Fig. 9). We surveyed much of the island for new territories in conjunction with peregrine falcon surveys and located 2 new breeding territories: Baby's Harbor and Smuggler's (Fig. 9).

Sauces Canyon Territory. The Sauces Canyon pair (Fig. 9) used the same nest as in 2014. Male A-40, a bird from the ACC, was hacked on Santa Cruz in 2005. The female, A-48, an ACC-produced bird, was hacked on Santa Cruz in 2006. An egg was laid on 7 February and we were not able to confirm whether more eggs were laid. The nest failed during incubation on 15 March and there were no further nesting attempts.

We replaced the camera with a different camera in November 2015 and raised it about 1.5m higher so that we should have a better view into the nest, as well as night vision, in 2016.

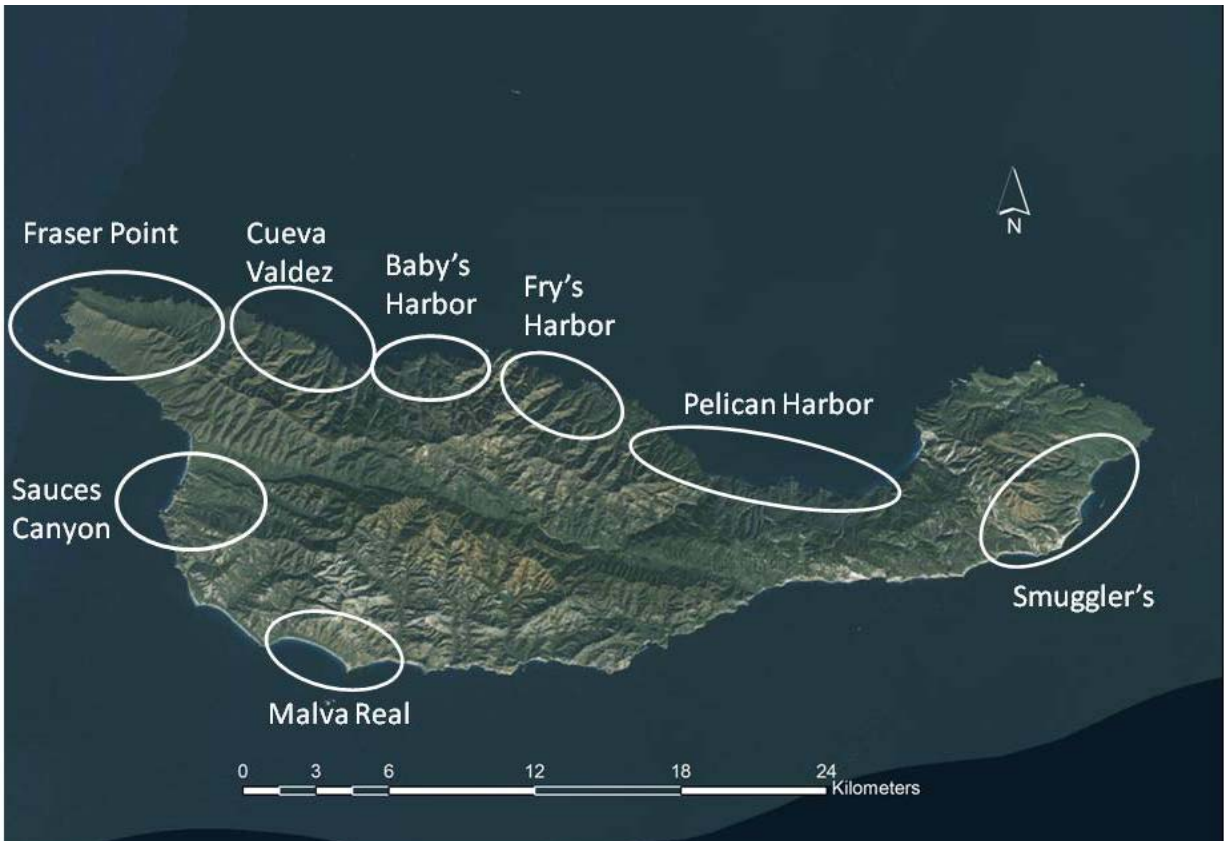

Figure 9. Bald eagle territories on Santa Cruz Island, CA, in 2015.

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. We were unable to locate a nest for this pair in 2015 and repeated sightings of both birds throughout the season indicate that they likely did not attempt breeding this season.

Cueva Valdez Territory. The Cueva Valdez pair (Fig. 9) used the same nest as in 2013. The male, A-00, was produced by the ACC and hacked on Santa Cruz in 2002. The female, A-16, was removed from a nest in Alaska and hacked on Santa Cruz in 2003. We found the adults incubating eggs on 6 March, but the nest had failed by 2 April. There were no further breeding attempts.

Malva Real Territory. The Malva Real pair (Fig. 9) used the same nest in Malva Real Canyon that they used in 2014. The male has no wing markers, but the placement of the leg bands

suggests it may still be K-11, produced at the ACC and fostered into the West End nest on Catalina in 2001. The female is still A-35, an ACC-produced bird that was released on Santa Cruz in 2005. We found the birds in incubation posture on 21 January and a chick was present on 4 March. The nest was empty on 18 March and there were no further breeding attempts.

Fry's Harbor Territory. The Fry's Harbor pair (Fig. 9) used the nest that was constructed in 2013. The male is A-46, a 2006 ACC-produced male, but we were unable to identify the new female that replaced the deceased A-24. The birds were observed incubating on 21 February. They incubated until at least 4 April, but the nest had failed by 17 April. There were no further breeding attempts.

Fraser Point Territory. The Fraser Point pair (Fig. 9) used the same nest as in 2014. 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, A-64, is a brother of A-49 that hatched at the Pelican Harbor nest in 2008. We found the adults incubating on 18 February and observed one chick on 1 April. A second chick was not confirmed until 29 April.

We entered the nest on 11 May to install leg bands and wing markers on the eaglets, and to obtain a blood sample (Fig. 10, Table 2). One of the chicks was too underdeveloped to fit with wing tags, so she only received a USGS leg band. The older chick fledged around 24 June and the younger bird had fledged by 8 July.

Figure 10. The Fraser Point chicks on Santa Cruz Island, CA, in 2015.

Baby's Harbor Territory. A new breeding pair was located along the northern coast in what we named the Baby's Harbor territory (Fig. 9). The male is A-68, a bird hatched at the Pelican Harbor nest in 2010. The female is A-27, a bird removed from a nest near Juneau, AK in 2004 and released from the South hacktower on Santa Cruz. We found the birds incubating on 18

Table 2. Biographical data for bald eagle chicks hatched at nests on the northern Channel Islands, CA, during 2015.

Federal Band	Sex	Wing Tag	Date Fledged	Territory	Status[c]	Comments
709-03067	F	A-54		Fraser Point[a]	Unknown	Seen in Nisqually, WA on 8/2/15
709-03074	F	.		Fraser Point[a]	Unknown	Found dead 8/16/15 in Ventura, CA
709-03075	F	A-53		Smuggler's[a]	Unknown	
709-03080	M	A-50		Lopez Canyon[b]	Alive	Seen in Washington State, 1/7/16
709-03084	M	A-56		Baby's Harbor[a]	Unknown	

[a] Santa Cruz Island
[b] Santa Rosa Island
[c] As of 12/31/15

March at the nest used by the Cueva Valdez pair in 2010. There was a nestling present on 19 April.

We entered the nest on 7 June, at which time the eaglet was about 9 weeks old, to install a leg band and wing markers and obtain a blood sample (Table 2, Fig. 11). We continued to monitor the chick until it fledged around 12 July.

Figure 11. The Baby's Harbor chick following banding on Santa Cruz Island, CA, 2015.

Santa Rosa Island

We located active nests in the two known active territories on the island, Trap Canyon and Lopez Canyon (Fig. 12), and surveyed most of the coastline for new territories.

Trap Canyon Territory. The Trap Canyon pair (Fig. 12) used a new nest in a small tree about 50 m west of their 2014 nest. The male, A-08, was an Alaskan bird hacked on Santa Cruz in 2002. The female, A-22, was produced by the ACC and hacked on Santa Cruz in 2004. The birds incubated through 17 March, but the nest had failed by 25 March. There were no further nesting attempts.

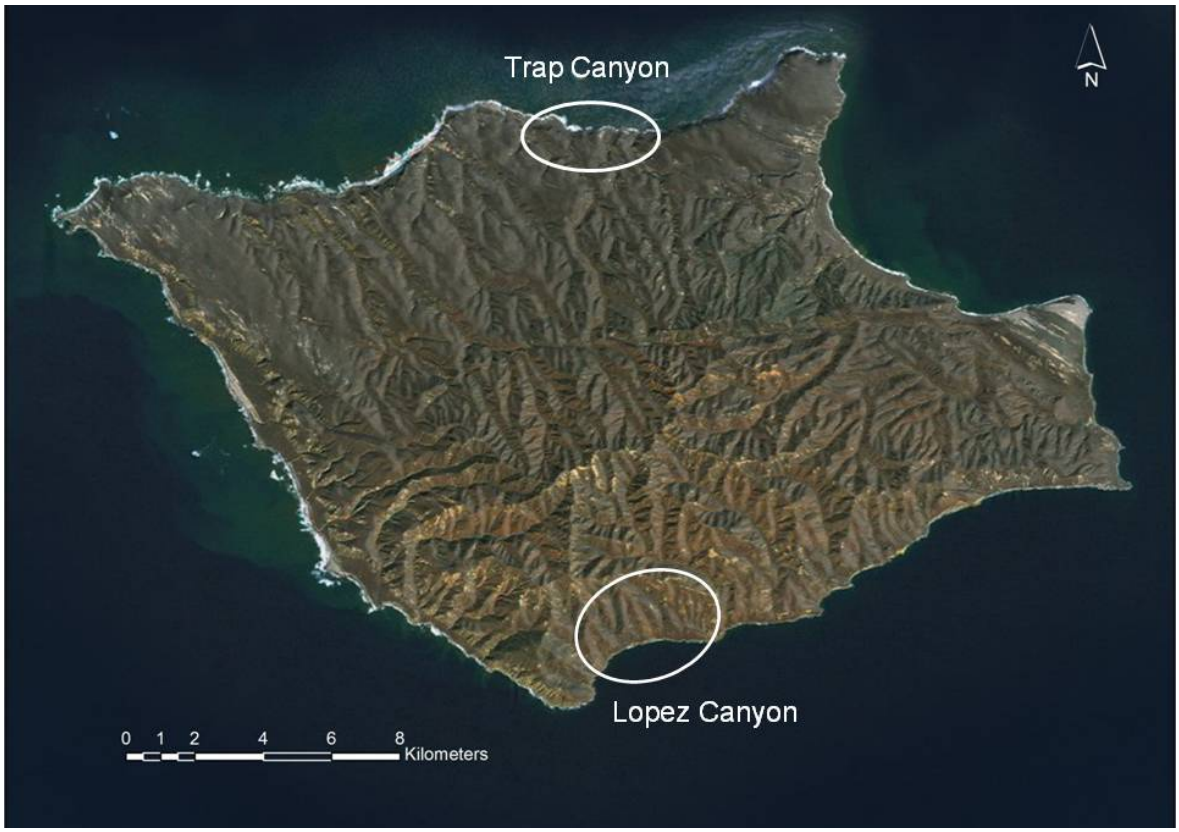

Figure 12. Bald eagle territories on Santa Rosa Island, CA, in 2015.

Lopez Canyon Territory. The Lopez Canyon pair (Fig. 12) used the same nest in a large toyon (*Heteromeles arbutifolia*) as in previous years. The previous male, A-39, was replaced by A-69, a 2010 Pelican Harbor chick. The female, A-43, was produced by the ACC and hacked on Santa Cruz in 2005. The birds were observed incubating on 24 February and two chicks were observed on 8 April. Two chicks were present through 6 May.

We entered the nest on 20 May to attach leg bands and, wing markers, and to draw blood for contaminant analyses (Fig. 13, Table 2). We found only one chick in the nest and saw no sign of a second chick in or around the nest and nest tree. We continued to monitor the nest through 8 June, at which time the

Figure 13. The Lopez Canyon bald eagle chick at the time of banding on Santa Rosa Island, CA, in 2015.

chick was about 9.5 weeks old and perching on branches outside the nest. Personnel were unavailable to confirm fledging, but it was reported in Washington State in January, 2016.

Anacapa Island

We surveyed Anacapa during peregrine falcon surveys aboard the vessel *Retriever*. We found a nesting pair in the previously known Oak Canyon territory (Fig. 14).

Figure 14. The Oak Canyon bald eagle territory on Anacapa Island, CA, in 2015.

Oak Canyon Territory. The pair on West Anacapa Island used the same nest as in 2014 (Fig. 14). The female is A-11, which was removed from a nest near Juneau, AK in 2002 and released from a hack tower on Santa Cruz. The male is A-21, which was collected from Alaska in 2003 and released from a hack tower on Santa Cruz. There was an adult in the nest on 28 March that appeared to be in incubation posture and an adult seemed to be in a brooding posture on 30 April. At least one chick (< 6 weeks old) was confirmed in the nest on 1 June. Access to the island was restricted because of seabird nesting, so we were unable to access the island for banding and did not confirm fledging.

Nesting Summary

Based upon our observations, we estimate that across all the Channel Islands there were 18 pairs of eagles that laid a total of 28-36 eggs this season, of which 18-19 (50-68%) hatched (Table 3). Twelve to 14 chicks (63-78%) fledged from nests.

Table 3. Summary of nesting attempts by bald eagles on the California Channel Islands in 2015.

Island/Nest	Eggs Incubated	Chicks Hatched	Chicks Fledged	Number Surviving Until End of Year
Santa Catalina Island				
West End	2	1	0	.
Pinnacle Rock	2	1	0	.
Seal Rocks	2	2	2	0-2
Two Harbors	2	2	1	0-1
Twin Rocks	1-2	0	.	.
Rattlesnake	2	2	2	0-2
Empire	2	0	.	.
TOTAL	13-14	8	5	0-5
San Clemente Island				
Bald Canyon	2	2	2	0-2
TOTAL	2	2	2	0-2
Santa Cruz Island				
Baby's Harbor	2	1	1	0-1
Sauces	1-2	0	.	.
Cueva Valdez	1-2	0	.	.
Malva Real	1-2	1	0	.
Fraser Point	2	2	2	0-1
Smuggler's	1-2	1	1	0-1
Fry's Harbor	1-2	0	.	.
TOTAL	9-14	5	4	0-3
Santa Rosa Island				
Trap Canyon	1-2	0	.	.
Lopez Canyon	2	2	1	1
TOTAL	3-4	2	1	1
Anacapa Island				
Oak Canyon	1-2	1-2	0-2	0-2
TOTAL	1-2	1-2	0-2	0-2
All Islands Combined	28-36	18-19	12-14	1-13

Monitoring of Previously Released/Hatched Bald Eagles

We continued to monitor eagles that had been released or hatched naturally on the Channel Islands prior to 2015. Thirty-one bald eagles that were released or hatched on Catalina in previous years were seen during 2015 (Table 4). Sixteen of the birds were on Catalina, 3 on Santa Cruz, 1 on San Clemente, and 11 on the mainland. One of the mainland reports was of a dead adult (Table 4).

Table 4. Status of bald eagles released or fledged from nests on Santa Catalina Island, CA, prior to 2015 and seen in 2015.

FWS Leg Band	Sex[1]	Patagial Marker	Nest/Release Tower	Fledge Year	Status, Latest Location[2]
629-16077	F	K-17	Bulrush Tower	1984	Dead, Twin Rocks pair, Catalina Is.
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.
629-29498	M	K-01	Pinnacle Rock	2000	Alive, West End pair, Catalina Is.
629-29499	F	K-02	West End	2000	Alive, Lake Palmdale, CA 4/16/15
629-02780	M	K-10	Twin Rocks	2001	Alive, Pelican Harbor pair, Santa Cruz Is.
629-02782	M	K-11	West End	2001	Alive, Malva Real 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, Empire 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	Dead, Glenwood, WA 10/16/15
629-52430	M	K-76	Twin Rocks	2007	Alive, Bald Canyon pair, San Clemente Is.
629-52433	F	K-79	Two Harbors	2007	Alive, Lake Piru, CA 5/13/15
629-52434	F	K-03	Seal Rocks	2007	Alive, Empire pair, Catalina Is.
629-52442	F	K-83	Two Harbors	2008	Alive, Palomar Mountain, CA 2/22/15
629-52443	M	K-88	Twin Rocks	2008	Alive, Pinnacle Rock pair, Catalina Is.
629-52450	F	K-91	Two Harbors	2009	Alive, West End pair, Catalina Is.
679-03429	F	K-97	West End	2009	Alive, Lake Casitas, CA 4/2-12/30/15
679-04102	F	K-07	Seal Rocks	2011	Alive, Tulare County, CA 1/28/15
679-04103	M	K-08	Seal Rocks	2011	Alive, Atascadero, CA 9/21/15
679-04105	M	K-19	Rattlesnake	2011	Alive, Palomar Mountain, CA 2/15/15
679-04133	F	K-32	Seal Rocks	2013	Alive, Laguna Beach, CA 4/17/15

Table 4. Continued.

679-04136	M	K-27	West End	2013	Alive, Catalina Is. 5/7/15
679-04137	F	K-28	West End	2013	Alive, Catalina Is. 2/10/15
709-03058	M	K-41	Seal Rocks	2014	Alive, Sequim, WA 2/8/15
709-03063	M	K-44	Pinnacle Rock	2014	Alive, Vancouver Is., BC 1/7/15
709-03066	F	K-46	Rattlesnake	2014	Alive, Catalina Is. throughout year

[1] Determined by karyotyping and/or morphometrics.
[2] As of 12/31/15 unless otherwise noted.

Twenty-five eagles that were released on Santa Cruz, or hatched naturally on the northern Channel Islands in previous years, were seen in 2015 (Table 5). Eleven of the birds were on Santa Cruz, 6 on Santa Rosa, 2 on Anacapa, 1 on Catalina, 1 on San Clemente, and 4 on the mainland. Although 3 eagles were carrying functioning GPS-PTTs at the beginning of the year, there are only 2 birds with functional GPS-PTTs as of 31 December.

A-17 Movements

GPS data for Eagle A-17 were sporadic in 2015, which is expected given that her current GPS unit has been functioning since 8 October 2007 when she was recaptured and fit with a new transmitter. An addition, we lost some data in the crash of a computer hard drive (May-June). She is known to have spent time on Santa Rosa, Santa Cruz, and the mainland (Fig. 15) in 2015. She began the year on Santa Rosa and flew to Santa Cruz on 9 February. She returned to Santa Rosa sometime between 10 and 19 February, but returned to Santa Cruz between 15 and 21 March, before returning to Santa Rosa on 22 March. She spent on 31 March – 7 April on Santa Cruz, 7 – 17 April on Santa Rosa, 17 - 20 April on Santa Cruz, 20-25 April on Santa Rosa, 25-28 April on Santa Cruz, and 28-29

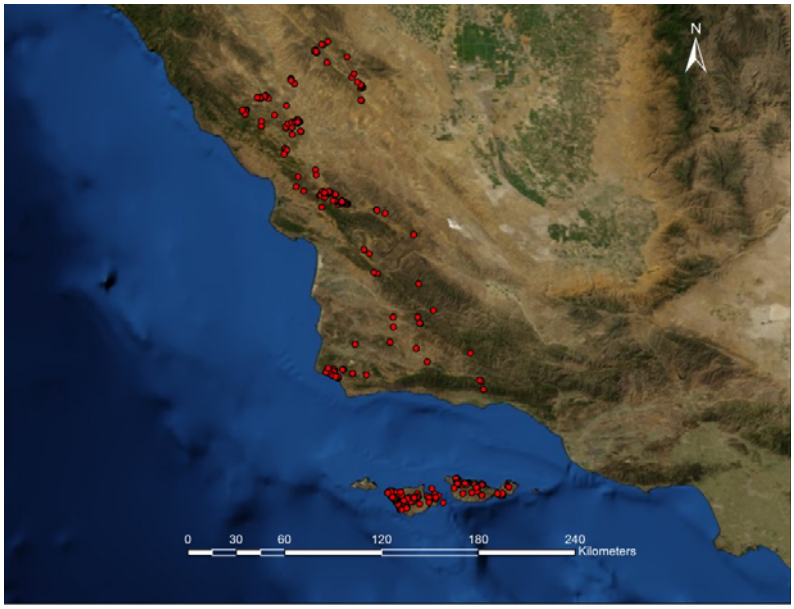

Figure 15. Movements of Eagle A-17 in 2015.

April on Santa Rosa. The next data we have is from 4 July, at which time she was in central California. She remained on the mainland until 19 October, at which time she flew to Santa Cruz. She flew to Santa Rosa on 20 October and remained there through the end of the year.

Table 5. Status of bald eagles released or fledged from nests on Santa Cruz and Santa Rosa Islands, CA in 2002-2014 and known to have been alive in 2015.

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.
629-47365	F	A-22	Zoo	2004	Alive, Trap Canyon pair, Santa Rosa Is.
629-47375	F	A-27	Alaska	2004	Alive, Baby's Harbor, Santa Cruz Is.
629-47380	F	A-32	Alaska	2004	Alive, Bald Canyon pair, San Clemente Is.
629-47385	F	A-34	Zoo	2005	Dead?, Wing marker found near Anacapa
629-47386	F	A-35	Zoo	2005	Alive, Malva Real pair, Santa Cruz Is.
629-47388	F	A-37	Zoo	2005	Alive, Middle Ranch pair, Catalina Is.
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 Is.
629-52404†	M	A-46	Zoo	2006	Alive, Fry's Harbor pair, Santa Cruz Is.
629-52406	F	A-48	Zoo	2006	Alive, Sauces pair, Santa Cruz Is.
629-52407	F	A-49	Pelican Harbor	2006	Alive, Fraser Point pair, Santa Cruz Is.
629-52422	M	A-60	Malva Real	2006	Alive, Santa Rosa 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, Cayucos, CA 5/15/15
679-03435	M	A-68	Pelican Harbor	2010	Alive, Baby's Harbor, Santa Cruz Is.
679-03436†	M	A-69	Pelican Harbor	2010	Alive, Lopez Canyon pair, Santa Rosa Is.
679-03444	M	A-72	Cueva Valdez	2010	Alive, San Simeon, CA 1/19/15
679-04116	F	A-79	Lopez Canyon	2012	Alive, Santa Cruz Is. 2/27/15
679-04127	M	A-84	Pelican Harbor	2012	Alive, Santa Rosa Is 8/26/15
679-04142	F	A-89	Fraser Point	2013	Alive, Irvine Lake, CA 2/10/15
709-03052	M	A-94	Lopez Canyon	2014	Alive, Big Bear Lake, CA 4/4/15

[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, Fraser Point, Cueva Valdez, Malva Real) or Santa Rosa (Lopez Canyon, Trap Canyon).
[3] As of 12/31/15, unless otherwise noted. † Carrying a GPS transmitter.

A-46 Movements

We are still receiving data from the Fry's Harbor male's (A-46) GPS transmitter. Although the data is often sporadic, he appears to have remained on Santa Cruz throughout the year (Fig. 16).

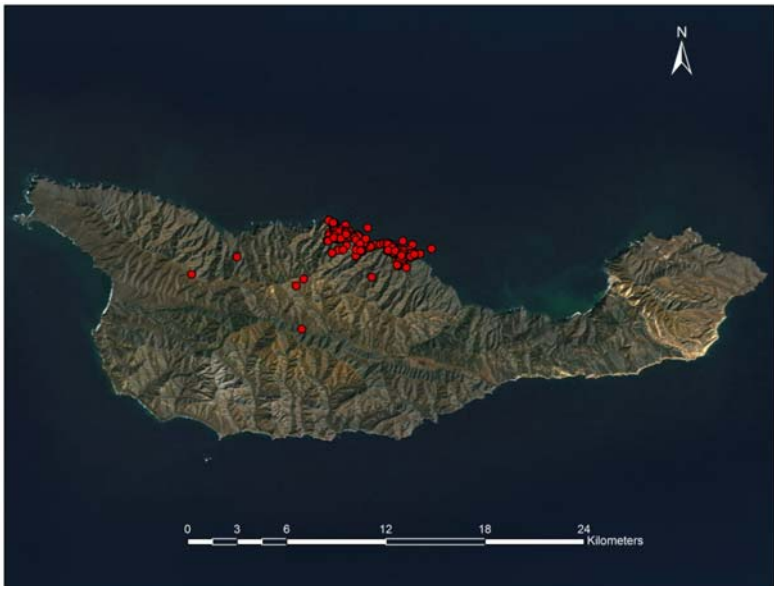

Figure 16. Movements of Eagle A-46 on Santa Cruz Island, CA, during 2015.

A-60 Movements

We received intermittent data (35 data points) from Eagle A-60, the 2006 Malva Real chick, before we stopped receiving data on 16 August (Fig. 17). His first data point on 28 February placed him on Santa Rosa, where he remained throughout the season, except for a visit to Santa Cruz on 28 – 29 March.

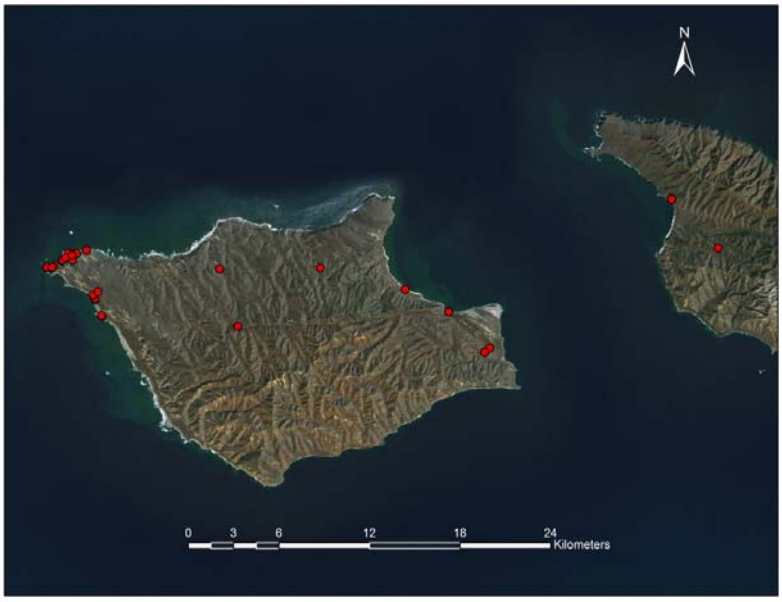

Figure 17. Movements of Eagle A-60 on the northern Channel Islands, CA, in 2015.

DISCUSSION

We had a few milestones this season. The number of breeding pairs increased from 15 in 2014 to 18 in 2015, which is higher than in any previous season. On San Clemente, there was the first confirmed successful breeding by bald eagles in over 65 years. Finally, this season we surpassed 100 successful fledglings from natural reproduction on the islands since 2006, which

includes 61 fledglings on Catalina, 30 on Santa Cruz, 11 on Santa Rosa, 2 on San Clemente, and 2 on Anacapa.

Productivity has varied greatly on the Channel Islands since 2009 when we discontinued manipulating Catalina nests, ranging from a high of 85% nest success and 1.15 fledglings/ attempt in 2010 to this season's low of 47% nest success (44% on northern Channel Islands, 50% on southern Channel Islands) and 0.71 fledglings/attempt (includes all nests, except Oak Canyon on Anacapa). This season's nest success and productivity was about 35% lower than the mean of 72% nest success and 1.07 fledglings/attempt in 2013 and 2014. Although overall productivity was lower in large part because of the loss of at least 5 chicks (3 on Catalina, 1 on Santa Cruz, 1 on Santa Rosa), there were 6 nests that failed during incubation, which is concerning because of the history of DDE-induced eggshell thinning. We have evidence that the DDE load of bald eagles increases as they age and it is possible that birds on the Channel Islands may be reaching a threshold of DDE contamination that is reducing hatching success. We were unable to collect eggshells from failed nests this year because we have yet to receive a Migratory Bird Treaty Act permit allowing for the collection of eggshells (on-going application since 2012) and were not added to the Region 8 permit until 14 April, after the majority of failures. For the 2016 season, we will attempt to get permission to collect failed eggs for analyses earlier in the season.

Despite this season's low productivity, the mean of 64% nest success and productivity of 0.95 fledglings/attempt over the past 7 seasons is similar to the Pacific Region Bald Eagle Recovery Plan's target of 65% nesting success and productivity of 1.0 fledgling/attempt (U.S. Fish and Wildlife Service 1986). Therefore, as long as this season's low productivity was an anomaly and mean reproductive effort continues at the 2009-2015 rate, the eagle population should be able to maintain itself without human intervention.

In 2016, we expect the number of active bald eagle nests to remain stable on Anacapa, Catalina, and San Clemente, with a possible increase of 1-2 nests on each of Santa Rosa and Santa Cruz. On Santa Cruz, we expect the Pelican Harbor birds to resume nesting and continued nesting by all the pairs that nested in 2015. On Santa Rosa, there is the potential for male A-60 to begin breeding with A-17, who have spent recent winters and springs in the vicinity of each other before A-17 makes an annual trip to central California. We will continue our annual bald eagle and peregrine falcon surveys on all 8 Channel Islands in 2016, so we should be able to locate all the breeding bald eagles on islands.

RECOMMENDATIONS

We saw several near adult or adult eagles in 2015 that did not appear to be part of mated pairs. In addition to monitoring known pairs in 2016, we suggest continued surveys for new pairs in 2016, especially on the western and eastern quarters of Santa Rosa, the south-central coast of Santa Cruz, and the northeastern coast of San Clemente. If possible, we recommend placing a camera on the Oak Canyon nest in the fall of 2016 to allow us to determine the outcome of future nesting. If seabird breeding activity does not allow access to West Anacapa for banding in 2016, we would like to visit the island as soon as it is accessible to try to determine whether older chicks or young fledgings are present.

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