Bald Eagle and Golden Eagle Research on the California Channel Islands
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INTRODUCTION

Bald Eagles

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 (hereafter Catalina; Fig. 1) by releasing 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 (Kiff 1994) 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 (hereafter 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.

Golden Eagles

The island fox (*Urocyon littoralis*) is the smallest North American canid and one of the most geographically restricted canid species, being found on only 6 of the 8 California Channel Islands (Coonan 2001). During the 1990s, fox populations declined precipitously on 4 of the 6 islands. On Catalina, one of the southern Channel Islands, a 90-95% decline in the fox population (*U. l. catalinae*) was attributed to an outbreak of canine distemper virus (Timm et al. 2000). Fox densities on Santa Cruz (*U. l. santacruzae*) and San Miguel islands (*U. l. littoralis*) declined from an estimated mean of 7.1 foxes/km^2 (~1300 and 350 adults, respectively) in 1993 to 0.8 foxes/km^2 (~130 and 15 adults, respectively) in 1998 (Roemer et al. 2001). Although regular surveys were not conducted for the foxes on Santa Rosa (*U. l. santarosae*), trapping data from 1998 and 2000, as well as anecdotal evidence, indicated that the fox densities had declined on that island as well (Suckling and Garcelon 2000).

Evidence from fox carcasses recovered on Santa Cruz indicated that golden eagles (*Aquila chrysaetos*) were the primary cause of fox mortality on the northern Channel Islands (Roemer et

al. 2001). The decline in island fox populations occurred concurrently with an increase in golden eagle sightings on the northern Channel Islands. Breeding by golden eagles on the northern Channel Islands, which represented the first breeding record of this species on the islands, was confirmed in 1999 (Roemer et al. 2001).

Because of the threat posed by golden eagles to island fox populations, The Nature Conservancy (TNC) and the National Park Service (NPS), the two land management organizations responsible for the island fox on the northern Channel Islands, desired immediate and intensive actions to ensure that fox survival in the wild was brought to a level sufficient for population recovery. Starting in 1999, a sustained effort to live-capture golden eagles and remove them from Santa Cruz and Santa Rosa resulted in a substantial reduction of the golden eagle population (Latta et al. 2005). Between 1999 and 2006 a total of 32 free-flying and 11 nestling eagles were trapped and removed from the island by the University of California Santa Cruz Predatory Bird Research Group (SCPBRG) and IWS (Latta 2005, Institute for Wildlife Studies 2006).

Despite the removal of the last known breeding golden eagles on the Channel Islands in 2006, there have been sightings of golden eagles on the islands and continued golden eagle-related island fox mortalities, although the mortalities are infrequent in the past few years. IWS continues to monitor for the presence of golden eagles and remains available to trap and remove the eagles if TNC and the NPS decide that golden eagles are having a significant impact on island fox populations.

This report summarizes the results of the 2018 bald eagle and golden eagle season.

STUDY AREA

The California Channel Islands are composed of eight islands located off the coast of southern California (Fig. 1). All of the Channel Islands are subject to a Mediterranean climate regime characterized by cool, wet winters and warm, dry summers (Coonan and Schwemm 2009). The northern Channel Islands, which are composed of San Miguel Island, Santa Rosa Island, Santa Cruz, and Anacapa Island are located approximately 20 to 44 km off the coast of Ventura and Santa Barbara counties (Junak et al. 1995) and are a tightly clustered group with no more than 9.6 km separating adjacent islands (Moody 2000; Fig. 1). The southern Channel

Islands, which are composed of San Nicolas Island, Santa Barbara Island, Catalina, and San Clemente Island, are located 32-79 km from the mainland (Junak et al. 1995) and are more remote and scattered than the northern islands, with the closest islands (Santa Catalina and San Clemente Islands) separated by 34 km (Moody 2000; Fig. 1). We did not survey San Miguel, Santa Barbara, or San Nicolas islands in 2018.

Santa Rosa Island (hereafter Santa Rosa) is the second largest of the Channel Islands and is owned by the National Park Service (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).

Santa Cruz is the largest of the 8 Channel Islands and is owned by the NPS (eastern 24% of the island) and The Nature Conservancy (TNC; western 76% of the island). The island measures about 38 km long by 12 km wide at its widest point (Fig. 1), encompassing approximately 249 km^2 with a maximum elevation of 753 m (Junak et al. 1995).

Anacapa Island (hereafter Anacapa), which is composed of 3 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).

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).

San Clemente Island (hereafter San Clemente), owned by the U.S. Navy, is the southernmost of the 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 and golden eagle research on the California Channel Islands and a banding permit from the United States Geological Survey's Bird Banding Laboratory (# 21564) allowing us to band bald eagles.

Surveying and Nest Monitoring

Bald Eagles

Observations of adult eagles began in January or February at each of the territories known from previous monitoring efforts. In conjunction with surveys for peregrine falcons (*Falco peregrinus*), we conducted monthly or bi-monthly ground surveys of Catalina, Santa Cruz, and Santa Rosa to locate any new bald eagle nesting pairs. Other islands were surveyed opportunistically. 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 unobtrusive observation points from which to monitor the chronology and outcome of nesting attempts. We had established video cameras prior to the nesting season at 3 active nests on Catalina (West End, Middle Ranch, and Two Harbors), 2 nests on Santa Cruz (Sauces, Fraser Point), and 1 nest on San Clemente (Bald Canyon) that enabled close, remote observations of nesting activity. All but the Middle Ranch nest were available for live viewing on our website (http://www.iws.org/livecams.html). The Sauces, Fraser, Two Harbors and West End cams also were streamed via Explore.org.

Golden Eagles

We surveyed for golden eagles in conjunction with surveys for bald eagles and peregrine

falcons on Anacapa, Santa Cruz, Santa Rosa, San Miguel, and Catalina.

Marking and Sampling

We entered each bald eagle nest when the chicks were approximately 3.5-7 weeks old to equip them with federal leg bands and orange Acraft leg bands with alphanumeric codes (Acraft Sign & Nameplate Co., Edmonton, Alberta, Canada). We did not attach patagial wing markers as we have in previous years because the birds were too young. 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 were inconclusive, sex was confirmed later with a blood sample sent for DNA analyses (Avian Biotech International, Tallahassee, FL).

Monitoring of Previously Released/Hatched Bald Eagles

During monitoring and other field work we searched for non-territorial eagles on the islands. In addition, we received sighting information from the public, either directly or through the Bird Banding Lab. We entered sighting information in a Microsoft Access database (Microsoft Corporation, Redmond, WA).

RESULTS

Bald Eagle Surveying and Nest Monitoring

Santa Catalina Island

We located nests in February and March in 7 previously active territories on Catalina (Pinnacle Rock, Seal Rocks, West End, Two Harbors, Twin Rocks, Rattlesnake, Middle Ranch; Fig. 2) and we did not locate any new territorial pairs.

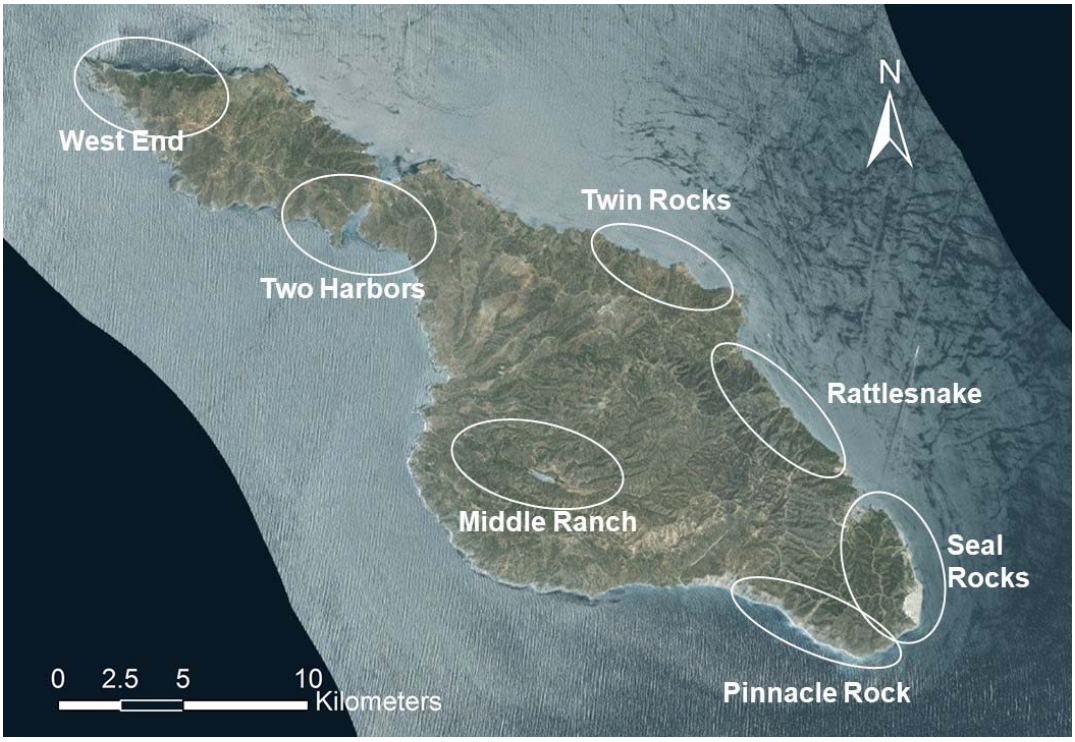

Figure 2. Bald eagle territories on Santa Catalina Island, CA in 2018.

Rattlesnake Territory. The Rattlesnake pair (Fig. 2) used a nest in Gallagher's Canyon that they last used in 2013. The male has lost his wing markers, but is likely K-80, an ACC-produced bird that was fostered into the West End nest in 1998. The female had lost both wing markers, but a photo of her leg band confirmed she was K-47, an ACC-produced bird that was fostered into the Seal Rocks nest in 2004. We confirmed the birds were incubating on 3 March and that there was at least 1 chick present on 10 April. We confirmed there were 2 chicks present on 19 April and entered the nest on 9 May to equip them with leg bands and to collect a blood sample for contaminant analyses (Table 1, Fig. 3). We monitored the nest through 13 June, at which time the eaglets were close to fledging.

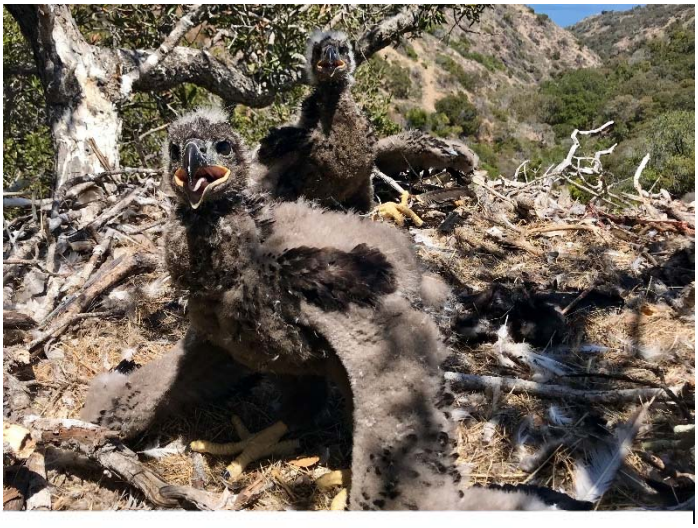

Figure 3. Rattlesnake chicks before banding on Santa Catalina Island, CA in 2018.

Two Harbors Territory. The Two Harbors pair (Fig. 2) returned to their 2017 nest located about 150 m south of their previous nest along the same ridgeline. 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. Before the 2018 breeding season, we installed a camera at this nest location to monitor activity. K-82 laid an egg on 2 April but the egg failed to hatch and eventually broke on 18 May.

West End Territory. The West End pair (Fig. 2) used the same nest that has been in use since 1991. The female was K-91, a 2009 Two Harbors chick, and the male was K-01, a bird produced at the ACC and fostered into the Pinnacle Rock nest in 2000. We were able to monitor this nest via a new camera system installed before the breeding season. K-91 laid eggs on 8 and 11 February. One chick hatched on 20 March, but the other failed to hatch. We entered the nest on 8 May to equip the bird with leg bands and to collect blood samples for contaminant analyses (Fig. 4, Table 1). The eagle fledged on 14 June.

Figure 4. West End chicks before banding on Santa Catalina Island, CA in 2017.

Table 1. Biographical data for bald eagle chicks hatched at nests on the southern Channel Islands, CA during 2018.

Federal Band	Acraft Band	Sex	Date Fledged	Territory	Status[c]
709-07371	27/A	M	~6/13/18	Rattlesnake[a]	Unknown
709-07372	59/A	M	~6/13/18	Rattlesnake[a]	Unknown
709-07373	30/A	M	~6/18/18	Pinnacle Rock[a]	Unknown
709-07375	40/A	F	6/14/18	West End[a]	Unknown
829-00011	49/A	M	NA	Bald Canyon[b]	Died in nest
829-00012	22/A	M	7/17/18	Bald Canyon[b]	Unknown
829-00013	23/A	M	~7/30/18	Seal Rocks[a]	Lewiston, CA 11/11/18

[a] Catalina
[b] San Clemente
[c] As of 12/31/18 or date specified

Pinnacle Rock Territory. The Pinnacle Rock pair (Fig. 2) used the same nest as in 2017. The female had no wing markers. The male was K-88, who hatched at the Twin Rocks nest in 2008 and was the breeding male in the Middle Ranch nest in 2014 and at Pinnacle Rock in 2017. We observed 2 eggs on 25 February. There was 1 egg and 1 chick in the nest on 2 April. The remaining egg had disappeared by 10 April. We entered the nest on 10 May and equipped the chick with leg bands and collected a blood sample for contaminant analyses (Table 1, Fig. 5). The chick fledged between 12 and 18 June.

Figure 5. The Pinnacle Rock chick on Santa Catalina Island, CA in 2018.

Seal Rocks Territory. The Seal Rocks pair (Fig. 2) used the same nest as in 2017. The female was K-32, who hatched at the Seal Rocks nest in 2013. We believe the male was K-25, who hatched from an egg from the West End territory and was fostered into the Pinnacle Rock nest in 1992 (oldest known eagle on the Channel Islands). The birds were found incubating 1 egg on 16 February but had lost the egg by 19 February. By 10 April they had laid a second clutch of 2 eggs. On 14 May they had a day-old nestling and 1 egg, which failed to hatch. We entered the nest on 15 June and equipped the eaglet with leg bands and collected a blood sample for contaminants analysis. (Table 1, Fig. 6). The eaglet had fledged by 30 July and was seen on 11 November in Lewiston, CA.

Figure 6. The Seal Rocks chick on Santa Catalina Island, CA in 2018.

Middle Ranch Territory. The Middle Ranch pair (Fig. 2) used the same nest as in 2016. The female previously lost both her wing markers, but we believe she was A-37, who was produced by eagles at the ACC and hacked on Santa Cruz in 2005. The male was K-08, who hatched at the West End nest in 2010. The birds had 2 eggs by 19 February. However, both eggs were lost within days of their expected hatch. On 20 April, the pair were found building a new nest located on the west end of Thompson Reservoir, but there was no additional breeding attempt.

*Twin Rocks Territory***.** The Twin Rocks pair (Fig. 2) used the same nest as in 2017. We were unable to confirm the identity of either adult this season, but both had orange wing markers. In 2017, the male was K-00, who hatched at the Pinnacle Rock nest in 2007, and the female was K-95, who hatched at the Pinnacle Rock nest in 2010. These birds are half-siblings because there were different females breeding at the Pinnacle Rock nest in 2007 and 2010. The birds were first observed incubating on 19 February and were seen incubating multiple times up to 19 April with no indication of nestlings. By 14 May the nest had failed.

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 historic Bald Canyon territory (Fig. 7).

Figure 7. Bald eagle territory on San Clemente Island, CA in 2018.

Bald Canyon Territory. We placed a camera on the Bald Canyon nest (Fig. 7) in the fall of 2015 for remote monitoring because the Navy restricts access to the nesting area throughout most of

the year. We were unable to verify the identity of the male this season, but we believe he was K-76, hatched at the Twin Rocks nest in 2007. The female was A-32, who was collected from a nest near Juneau, AK in 2004 and released from the North hacking tower on Santa Cruz. The birds laid their first egg on 7 March and a second egg on 10 March. The first chick hatched on 12 April and a second chick hatched on 14 April. We entered the nest on 31 May to equip the birds with leg bands and to collect blood samples for contaminant analyses (Table 1, Fig. 8). On 4 June, the camera showed one of the nestlings had fallen out of the nest and was on the ground nearby. The next day IWS crew on the island returned the uninjured eaglet to the nest. On 9 June, the other chick died in the nest of unknown causes and we did not return to collect the carcass. The remaining eagle fledged on 17 July.

Figure 8. The Bald Canyon chicks after banding on San Clemente Island, CA 2018.

Santa Cruz Island

We surveyed the 9 known breeding territories on Santa Cruz and located active nests in 8 territories (Baby's Harbor, Fraser Point, Fry's Harbor, Los Pinos, Pelican Harbor, Sauces Canyon, Smuggler's, and Malva Real; Fig. 9). We surveyed most of the island for new territories in conjunction with peregrine falcon surveys but located no additional territories.

Fraser Point Territory. The Fraser Point pair (Fig. 9) returned to their 2017 nest along the northwestern coast of the island. The male was A-64, who hatched at the Pelican Harbor nest in 2008. The female was A-49, who hatched at the Pelican Harbor nest in 2006 and was the first known chick to naturally hatch on the islands since 1950. These birds are full siblings. In the fall of 2017, we installed a camera system on the nest to monitor future nesting at this location. A-49 laid her first egg on 9 February, followed by a second on 12 February, and a third egg on 15 February.

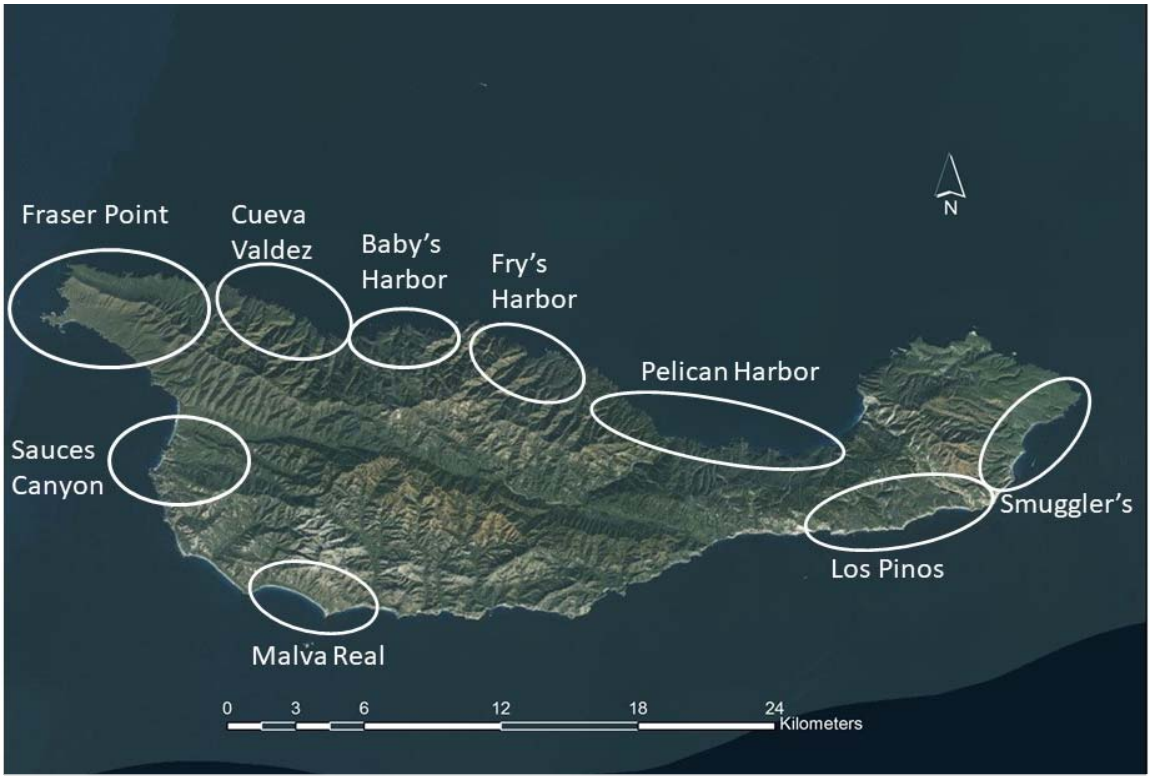

Figure 9. Bald eagle territories on Santa Cruz Island, CA in 2018.

The first chick hatched on 18 March, the second on 20 March, and the third on 22 March. We entered the nest on 1 May to equip the chicks with leg bands and to obtain blood samples for contaminants analyses (Fig. 10, Table 2). All 3 eagles fledged between 8 and 13 June.

After the breeding season we upgraded the camera system to improve the image quality for the 2019 season.

Figure 10. The Fraser Point eaglets before banding on Santa Cruz Island, CA in 2018.

Table 2. Biographical data for bald eagle chicks hatched at nests on the northern Channel Islands, CA during 2018.

Federal Band	Acraft Band	Sex	Wing Tag	Date Fledged	Territory	Status[c]
709-07360	29/A	M	NA	5/9-6/6	Lopez Canyon [b]	Unknown
709-07361	05/A	M	NA	5/9-6/6	Lopez Canyon [b]	Unknown
709-07362	21/A	F	NA	5/27-6/24	Los Pinos [a]	Unknown
709-07363	54/A	M	NA	5/27-6/24	Los Pinos [a]	Unknown
709-07364	31/A	M	NA	5/26-6/21	Pelican Harbor [a]	Seen near Saturna, BC on 8/15
709-07365	52/A	F	NA	6/13	Fraser Point[a]	Unknown
709-07366	44/A	M	NA	6/8	Fraser Point[a]	Unknown
709-07367	35/A	F	NA	6/11	Fraser Point[a]	Unknown
709-07368	08/A	F	NA	6/9	Sauces Canyon [a]	Unknown
709-07369	19/A	F	NA	5/31	Sauces Canyon [a]	Unknown
709-07370	51/A	M	NA	5/30	Sauces Canyon [a]	Unknown
709-07374	58/A	F	NA	6/23-7/9	Baby's Harbor [a]	Unknown
NA	NA	-	NA	5/22-6/23	Fry's Harbor [a]	Unknown

[a] Santa Cruz Island
[b] Santa Rosa Island
[c] As of 12/31/18 or date specified

Los Pinos Territory. The Los Pinos pair (Fig. 9) used the same nest as in 2017. The female was A-51, an ACC-produced bird that was released from the South hacking tower on Santa Cruz. The male has lost his wing markers, but could still be A-45, a 2005 ACC-produced male released from the North hacking tower. The birds were found incubating on 28 February. There were 2 nestlings estimated to be about 3-weeks-old on 6 April. We entered the nest on 29 April to equip the chicks with leg bands and to obtain blood samples for contaminants analyses (Table 2, Fig. 11). The eagles fledged between 27 May and 24 June.

Figure 11. The Los Pinos eaglets after banding on Santa Cruz Island, 2018.

Fry's Harbor Territory. The Fry's Harbor pair (Fig. 9) used a new nest located in a canyon near Platt's Harbor. We were unable to identify either adult, though it is likely the male was A-46, a 2006 ACC-produced male released from the North hacking tower. The birds were observed with at least 1 nestling likely less than 2 weeks old on 2 April. We attempted to enter the nest on 22 May but found the eaglet too old to safely band. (Table 2, Fig. 12). The nestling fledged between 22 May and 23 June.

Figure 12. The Fry's Harbor eaglet on Santa Cruz Island, CA in 2018.

Pelican Harbor Territory. The Pelican Harbor pair (Fig. 9) returned to their 2017 nest. The male had no wing tags, but was identified from a leg band photo as K-10, who was produced by the ACC and fostered into the Twin Rocks nest on Catalina in 2001. The female was K-26, produced by the ACC and fostered into the West End nest on Catalina in 2002. We observed incubation on 3 March. On 4 April the pair had one nestling less than 1 week old. We entered the nest on 30 April to equip the chick with leg bands and to obtain a blood sample for contaminant analyses (Fig. 13, Table 2). The eagle had fledged by 21 June and was seen on 15 August in Saturna, British Colombia.

Figure 13. The Pelican Harbor chick at banding on Santa Cruz Island, CA in 2018.

Baby's Harbor Territory. The Baby's Harbor pair (Fig. 9) moved to a new nest location east of their 2017 nest in a canyon near Punta Diablo. The male was A-68, a bird hatched at the Pelican Harbor nest in 2010. The female was A-27, a bird removed from a nest near Juneau, AK in 2004 and released from the South hacking tower on Santa Cruz. We found the birds incubating on 5 April. We entered the nest on 23 May to equip the chick with leg bands and to obtain blood samples for contaminant analyses (Fig. 14, Table 2). The eagle had fledged by 9 July.

Figure 14. The Baby's Harbor chick after banding on Santa Cruz Island, CA in 2018.

Smuggler's Territory. We located the Smuggler's nest early in the season in a canyon near Yellowbanks Anchorage. The male was A-58, an ACC bird hacked on Santa Cruz in 2006. The female had no wing tags. We observed the pair incubating 1 egg on 28 February. Two subsequent visits on 27 April and 27 May confirmed that the nest had failed.

Sauces Canyon Territory. The Sauces Canyon pair (Fig. 9) returned to their 2017 nest. The male was A-40, a bird from the ACC that was hacked on Santa Cruz in 2005. The female, A-48, an ACC-produced bird, was hacked on Santa Cruz in 2006. This nest was monitored by a live-streaming web camera. The first egg was laid on 2 February. A second egg was laid on 5 February and a third egg was laid on 8 February. The three eggs hatched on 13, 14, and 16 March. We entered the nest on 1 May to equip the chicks with leg bands and to obtain blood samples for contaminant analyses (Fig. 15, Table 2). The three eagles fledged between 30 May and 9 June.

Figure 15. The Sauces Canyon chicks at banding on Santa Cruz Island, CA 2018.

Cueva Valdez Territory. The Cueva Valdez territory had no known nesting attempts in 2018. The male from 2017 was not seen for the duration of the season. The female, A-98, is a 2014 bird that hatched at either the Pelican Harbor or Fraser Point nest (2 females received same wing marker number). From 5 March to 23 June, an adult golden eagle was observed in the territory, often interacting with A-98. The golden eagle may be the same individual that was documented in the Fraser Point territory since 2016.

Malva Real Territory. The Malva Real pair (Fig. 9) made a nesting attempt at an alternate nest site in upper Pozo Canyon, west of Ragged Mountain. The male was A-71, hatched at the Sauces Canyon nest in 2010. Due to lack of wing tags, we were unable to confirm the identity of the other adult. The pair were confirmed incubating on 4 April, but the nest had failed by 28 April.

Santa Rosa Island

We located active nests in the 2 known territories on the island, Lopez Canyon and Trap Canyon (Fig. 16), and surveyed much of the coastline for new territories. We found a third pair

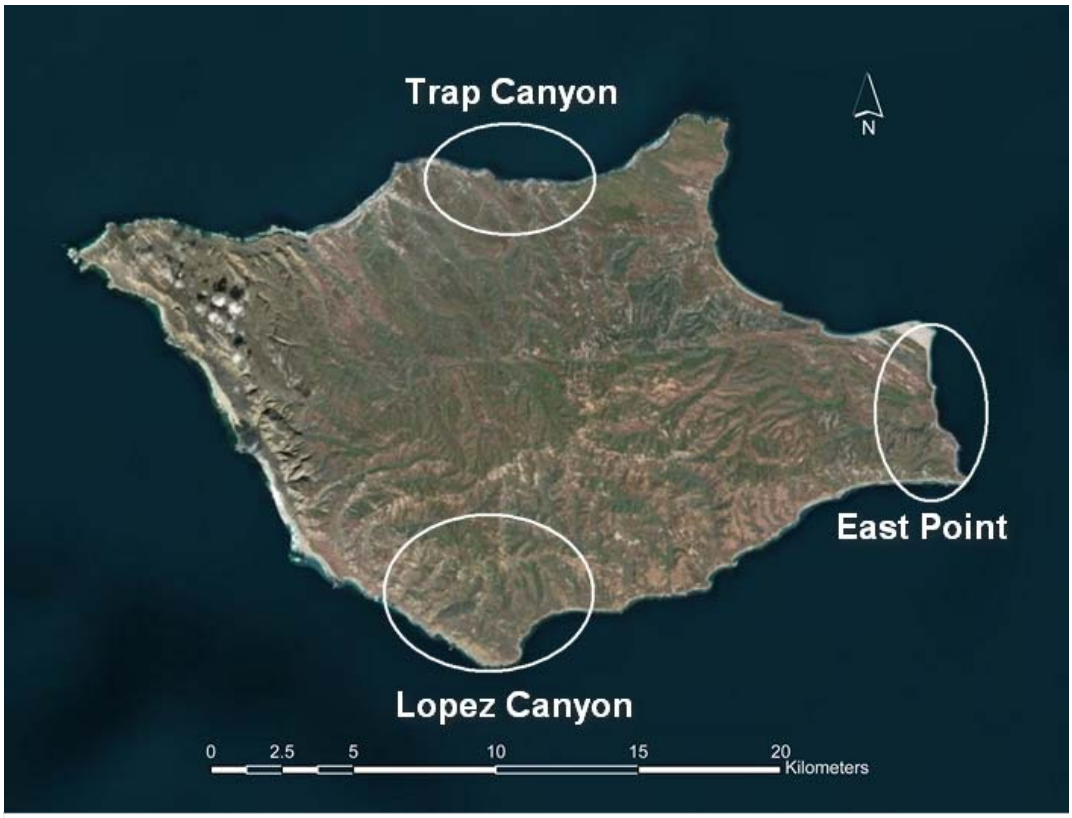

Figure 16. Bald eagle territories on Santa Rosa Island, CA in 2018.

of territorial eagles near East Point. Access to the southeastern quarter of the island was limited due to the decommissioning of roads by the NPS that made the area inaccessible by vehicle.

Lopez Canyon Territory. The Lopez Canyon pair (Fig. 16) returned to their 2017 nest in upper Trancion Canyon. The male was A-69, a 2010 Pelican Harbor chick. We were not able to verify the female's identity, but we believe she was A-43, a bird produced by the ACC and hacked on Santa Cruz in 2005. The birds were observed incubating on 14 February and two approximately 2-week-old chicks were observed on 17 March. We entered the nest on 16 April to attach leg bands and to draw blood for contaminant analyses (Fig. 17, Table 2). We continued monitoring until the chicks fledged between 9 May and 6 June.

Figure 17. The Lopez Canyon chicks after banding on Santa Rosa Island, CA in 2018.

Trap Canyon Territory. The Trap Canyon pair (Fig. 16) used a new nest in Verde Canyon. We could not confirm the identity of either adult due to a lack of wing tags. The birds were found incubating on 16 February and were either still incubating or brooding very young nestlings on 14 March. A survey on 13 April found the limb holding the nest had broken from the tree and the nest had fallen to the ground and failed. There were no further breeding attempts.

East Point Territory. On 15 March we located a new pair of territorial eagles defending the area around a likely nest near East Point (Fig. 16). The male, A-72, fledged from the Cueva Valdez territory on Santa Cruz in 2010. The female, A-89, fledged from the Fraser Point territory on Santa Cruz in 2013. Subsequent checks of the area and the nest suggested that the pair likely did not nest this year.

Anacapa Island

We surveyed Anacapa three times during the breeding season from either our skiff, the

"*Retriever*", or the NPS boat. We located the pair in the historic Oak Canyon territory (Fig. 18).

Figure 18. The Oak Canyon bald eagle territory on Anacapa Island, CA in 2018.

Oak Canyon Territory. We surveyed for the pair on West Anacapa (Fig. 18) on all 3 of our boat surveys during the breeding season. We were unable to confirm an active nest during these surveys. Both birds have wing tags, but we only were able to confirm the identity of the female as A-11, a bird that was removed from a nest near Juneau, AK in 2002 and release from a hacking tower on Santa Cruz. On 5 September we were able to survey the nest area by foot and confirmed a second nest had been built 5-8m from the historic nest. Both nests were in good condition and showed signs that they had been worked on this season. A lack of prey remains, mutes, and natal down at either of the nests indicated the pair did not nest successfully this year.

Nesting Summary

Based upon our observations, there were 20 pairs of bald eagles across all the Channel Islands this season, of which 18 pairs laid a minimum of 31 eggs. A minimum of 20 chicks hatched (65% hatching success) and all but 1 of the known chicks fledged (Table 3). Nesting success was 67% and productivity was 1.06 fledglings/breeding attempt.

Monitoring of Previously Released/Hatched Bald Eagles

During 2018, we had confirmed sightings of 51 identified bald eagles that were released or hatched on the Channel Islands in previous years (Table 4). Twenty-two were identified on the mainland, 12 on Santa Cruz, 10 on Catalina, 3 on Santa Rosa, 3 on San Clemente, and 1 on Anacapa. Two identified females successfully bred on the mainland. Eagle 679-03429, a 2009 bird from the West End nest, raised 2 chicks at Lake Casitas, CA. Eagle 679-04128, a 2013 bird from the Lopez Canyon nest, raised 2 chicks in Anaheim Hills, CA.

Additional Eagle Release

IWS was contacted by the U.S. Fish and Wildlife Service in early August 2018 requesting the release of a juvenile bald eagle on one of the islands. The bird had been recovered from Lancaster, CA and was being held at the Ojai Raptor Center. We arranged for the transport of the eagle to Catalina on 20 August, where we held it in a large aviary with our captive adult bald eagle until 25 August. On 25 August we banded the bird (Federal band 829-0014, orange Acraft band 39/A) and a backpack-mounted transmitter before releasing the bird at Thompson Reservoir. She remained on Catalina until at least 5 September and was last reported in Tipton, CA on 18 September.

Golden Eagle Surveying

We confirmed a single golden eagle on the islands in 2018. It was seen repeatedly throughout the year on the northwestern portion of Santa Cruz, mostly within the Fraser Point and Cueva Valdez bald eagle territories (Fig. 9). TNC (property owners) decided not to attempt to trap and translocate the bird to the mainland.

Table 3. Summary of nesting attempts by bald eagles on the California Channel Islands in 2018.

Island/Nest	Min # Eggs Laid	Min # Chicks Hatched	Min # Chicks Fledged	Number Surviving Until End of Year
Santa Catalina Island				
West End	2	1	1	0-1
Pinnacle Rock	2	1	1	0-1
Seal Rocks	3	1	1	1
Two Harbors	1	0	.	.
Twin Rocks	1	0	.	.
Middle Ranch	2	0	.	.
Rattlesnake	2	2	2	0-2
TOTAL	13	5	5	1-5
San Clemente Island				
Bald Canyon	2	2	1	0-1
TOTAL	2	2	1	0-1
Santa Cruz Island				
Baby's Harbor	1	1	1	0-1
Sauces	3	3	3	0-3
Fry's Harbor	1	1	1	0-1
Fraser Point	3	3	3	0-3
Los Pinos	2	2	2	0-2
Smuggler's	1	0	.	.
Pelican Harbor	1	1	1	0-1
Malva Real	1	0	.	.
TOTAL	13	11	11	0-11
Santa Rosa Island				
Trap Canyon	1	0	.	.
Lopez Canyon	2	2	2	0-2
TOTAL	3	2	2	0-2
Anacapa Island				
Oak Canyon	0	.	.	.
TOTAL	0	.	.	.
All Islands Combined	31	20	19	1-19

Table 4. Status of bald eagles released from hacking towers or fledged from nests on the California Channel Islands prior to 2018 that had confirmed sightings in 2018.

FWS Leg Band	Sex[a]	Patagial Marker	Nest/Origin	Fledge Year	Status, Latest Location[b]
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, San Jacinto, CA 2/5/18
629-02780	M	K-10	Zoo	2001	Alive, Pelican Harbor pair, Santa Cruz Is.
629-02793	F	K-26	West End	2002	Alive, Pelican Harbor pair, Santa Cruz Is.
629-14048	F	A-11	Alaska	2002	Alive, Oak Canyon pair, Anacapa Is.
629-47371	F	K-47	Zoo	2004	Alive, Rattlesnake pair, Catalina Is.
629-47375	F	A-27	Alaska	2004	Alive, Baby's Harbor pair, Santa Cruz Is.
629-47380	F	A-32	Alaska	2004	Alive, Bald Canyon pair, San Clemente Is.
629-47391	M	A-40	Zoo	2005	Alive, Sauces 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.
629-52410	F	A-51	Zoo	2006	Alive, Los Pinos pair, Santa Cruz Is.
629-52420	M	A-58	Zoo	2006	Alive, Smugglers pair, Santa Cruz Is.
629-52433	F	K-79	Two Harbors	2007	Alive, Lake Piru, CA 10/1/18
629-52438	M	A-64	Pelican Harbor	2008	Alive, Fraser Point pair, Santa Cruz Is.
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, Breeding at Lake Casitas, CA
679-03432	M	A-67	Trap Canyon	2010	Alive, Point Mugu, CA 11/13/18
679-03435	M	A-68	Pelican Harbor	2010	Alive, Baby's Harbor pair, Santa Cruz Is.
679-03436	M	A-69	Pelican Harbor	2010	Alive, Lopez Canyon pair, Santa Rosa Is.
679-03443	M	A-71	Sauces	2010	Alive, Malva Real pair, Santa Cruz Is.
679-03444	M	A-72	Cueva Valdez	2010	Alive, East Point pair, Santa Rosa Is.
679-04103	M	K-08	Seal Rocks	2011	Alive, Middle Ranch pair, Catalina Is.
679-04105	M	K-19	Rattlesnake	2011	Alive, Ballena, CA 2/26/18
679-04128	F	A-85	Lopez Canyon	2013	Alive, Breeding in Anaheim Hills, CA
679-04133	F	K-32	Seal Rocks	2013	Alive, Seal Rocks pair, Catalina Is.
679-04134	F	K-38	Two Harbors	2013	Alive, Catalina Is. 9/21/18
679-04137	F	K-28	West End	2013	Alive, Maricopa, CA 11/12/18
679-04142	F	A-89	Fraser Point	2013	Alive, East Point pair, Santa Rosa Is.
709-03052	M	A-94	Lopez Canyon	2014	Alive, San Diego, CA 4/11/18
709-03053	F	A-95	Trap Canyon	2014	Alive, Riverside, CA 3/29/18
709-03054	M	A-96	Trap Canyon	2014	Alive, San Diego Co., CA 4/28/18
709-03058	M	K-41	Seal Rocks	2014	Alive, San Diego Co., CA 2/17/18

Table 4. Continued

FWS Leg Band	Sex[a]	Patagial Marker	Nest/Release Tower	Fledge Year	Status, Latest Location[b]
709-03075	F	A-53	Los Pinos	2015	Alive, Tres Pinos, CA 1/8/18
709-03076	F	K-55	Seal Rocks	2015	Alive, Catalina Is. 11/25/18.
709-03080	M	A-50	Lopez Canyon	2015	Alive, Petersberg, OR 1/26/18
709-03082	M	N/A	Bald Canyon	2015	Alive, San Clemente Is. 7/29/18
709-03085	M	A-61	Los Pinos	2016	Alive, Chino, CA 11/26/18
709-03092	F	K-62	West End	2016	Alive, Sanders County, MT 7/30/18
709-03093	F	K-64	Seal Rocks	2016	Alive, Bella Coola, BC 1/14/18
709-03097	F	A-99	Baby's Harbor	2016	Alive, Cachuma Lake, CA 1/6/18
709-07046	M	A-04	Fraser Point	2017	Alive, Lockwood, CA 3/8/18
709-07048	F	A-07	Lopez Canyon	2017	Alive, Dorris, CA 2/17/18
709-07050	F	K-72	Two Harbors	2017	Alive, Pine, ID 7/31/18
709-07359	M	A-14	Baby's Harbor	2017	Alive, Bella Coola, BC 8/12/18
709-03099	M	A-02	Fraser Point	2017	Alive, Klamath Falls, OR 1/1/18
709-03100	M	A-03	Fraser Point	2017	Alive, Christy Ranch, Santa Cruz Is. 4/15/18

[a] Determined by karyotyping and/or morphometrics.
[b] As of 12/31/18 unless otherwise noted.

DISCUSSION

Bald Eagles

The Channel Island bald eagle population had the highest number of confirmed territories (20) and productivity (19 fledglings) in the history of the restoration project. Productivity has varied greatly since 2009 when we discontinued manipulating Catalina nests, ranging from a high of 85% nest success and 1.15 fledglings per breeding attempt in 2010 to a low of 47% nest success and 0.71 fledglings/attempt in 2015. This season's nest success (67%) and productivity (1.06 fledglings/attempt) was similar to that in 2017 (71% and 1.0 fledglings/attempt), which meets 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). Since 2009, the mean success and productivity across all the islands has been 64% and 0.97 fledglings/attempt, respectively.

In 2019, we expect a slight increase in the number of breeding attempts because the young pair at East Point on Santa Rosa and the young female at Cueva Valdez are likely to begin

breeding. Also, there is the potential for new pairs along the southern coast of Santa Cruz and the southwest coast of Santa Rosa where we occasionally see adult eagles. Due to the 2017 funding cuts we will continue to have a reduced survey effort, but we should be able to collect general information on nesting success and productivity.

Golden Eagles

There was only 1 known golden eagle on the Channel Islands in 2018, located on northwestern Santa Cruz. We will continue to monitor this area in 2019. If the bird remains on the island, we will revisit the possibility of translocating the bird to the mainland if it appears to be having an impact on the island fox population.

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