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 (*U. l. santarosae*) on Santa Rosa Island (hereafter Santa Rosa), 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 2022 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 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 (NCI), which are composed of San Miguel Island, Santa Rosa, 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 (SCI), 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 conduct any activities on San Miguel, San Nicolas, or Santa Barbara islands in 2020.

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).

Santa Cruz is the largest of the 8 Channel Islands and is owned by the NPS (eastern 24% of the island) and 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 is located 34 km south of Long Beach, California and is owned primarily by the Catalina Island Conservancy (~88%). The island is 34 km long, 0.8 to 13.0 km wide, and has an area of 194 km^2 and a maximum elevation of 648 m (Junak et al. 1995; Fig. 1).

San Clemente Island (hereafter San Clemente), owned by the United States Navy (USN), 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 with the California Department of Fish and Wildlife to conduct bald eagle and golden eagle research on the California Channel Islands, a U.S. Fish and Wildlife Service Migratory Bird permit (MB100806-1) allowing us to capture and transport golden eagles, a U. S. Geological Survey Bird Banding Laboratory permit (# 21564) allowing us to band bald and golden eagles, and a U.S. Park Service permit (CHIS-2019-SCI-0028) allowing us to conduct our studies in the Channel Islands National Park.

Surveying and Nest Monitoring

Bald Eagles

We began surveying for bald eagles in January or February at each of the territories known from previous monitoring efforts. Additionally, monitoring was conducted via live web cams at 2 active nests on Catalina (West End and Two Harbors) and 2 nests on Santa Cruz (Sauces Canyon and Fraser Point) that enabled close, remote observations of nesting and were available for public viewing through iws.org or Explore.org. Additionally, we had placed trail cams at many other eagle nests on Santa Rosa, Santa Cruz, and Catalina during fall 2021 that allowed us to determine chronology of breeding attempts when the images were collected at banding and/or in fall 2022.

Golden Eagles

We surveyed for golden eagles in conjunction with surveys for bald eagles on Santa Cruz, Santa Rosa, and Catalina.

Marking and Sampling

We entered bald eagle nests when the chicks were approximately 5-8 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 made morphological measurements to estimate the sex of nestlings (Bortolotti 1984, Garcelon et al. 1985).

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, which we entered 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 8 previously active territories on Catalina (Pinnacle Rock, Seal Rocks, West End, Two Harbors, Twin Rocks, Rattlesnake, Middle Ranch, Empire; Fig. 2) and we did not locate any new territorial pairs.

Rattlesnake Territory. The Rattlesnake pair (Fig. 2) used the same nest in a eucalyptus tree at White's Landing that they used in 2021. Both the male and the female have lost their wing markers, but are likely still Male K-80, an ACC-produced bird that was fostered into the West End nest in 1998, and Female K-47, an ACC-produced bird that was fostered into the Seal Rocks nest in 2004 (both were confirmed in 2020). One bird was perched on a ridge near the nest on 11 February, and they were incubating by 27 February. They were still incubating on 10 April, which was past an expected hatch date, and no adults were present on 11 April.

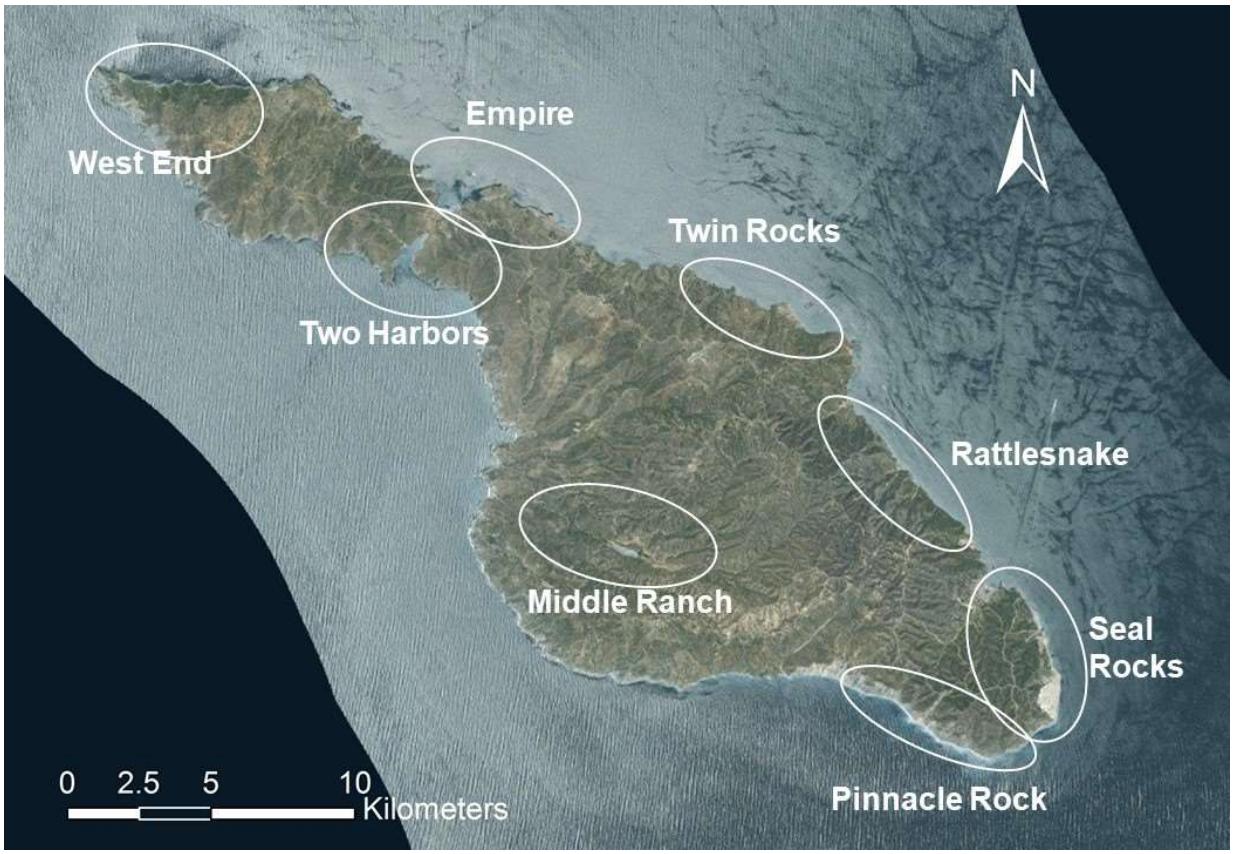

Figure 2. Bald eagle territories on Santa Catalina Island, CA in 2022.

West End Territory. The West End pair (Fig. 2) used the same nest that has been used since 1991. The female was K-91, a 2009 Two Harbors chick, and the male was A-61, a bird that hatched at the Los Pinos nest on Santa Cruz in 2016. We monitored breeding activity via a live web cam. K-91 laid eggs on 29 January, 1 February, and 5 February. Chicks hatched on 8, 10, and 12 March. One of the chicks fell off the nest on 15 April but landed on a small ledge about 1 m below the nest. We recovered the bird on 16 April and placed it back in the nest. We returned to the nest on 24 April to band the chicks (Fig. 3, Table 1). The birds took their first flights on 2 June (Bird 24/D), 10 June (Bird 25/D), and 22 June (Bird 23/D).

Two Harbors Territory. The Two Harbors pair (Fig. 2) used the same nest as in 2021. The male, K-81, was 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 nesting activity was monitored via a live web camera. The first egg was laid between 2000 hrs and 2200 hrs on 23 February and a second was laid around 2200 hrs on 1

March. One egg broke overnight on 5 March, but a chick hatched from the second egg on the morning of 6 April. The chick was accidentally knocked out of the nest by an adult on 25 April, but it fortunately landed on a ledge about 3 m below the nest. We recovered the chick on 26 April and placed it back in the nest. We returned to the nest on 21 May to band the eaglet (Table 1, Fig. 4) The eaglet took its first flight on 25 June.

Table 1. Biographical data for bald eagle chicks hatched at nests on the southern Channel Islands, California during 2022.

Federal Band	Acraft Band	Sex	Territory	Status[c]
829-00466[a]	23/D	M	West End	Unknown
829-00469[a]	24/D	M	West End	Unknown
829-00470[a]	25/D	F	West End	Unknown
829-00477[a]	73/D	M	Twin Rocks	Unknown
829-00478[a]	04/D	M	Twin Rocks	Unknown
829-00479[a]	29/D	M	Seal Rocks	Unknown
829-00480[a]	63/D	M	Seal Rocks	Unknown
829-00481[a]	11/D	F	Two Harbors	Unknown
NA[a]	NA	Unk	Pinnacle Rock	Unknown
NA[a]	NA	Unk	Pinnacle Rock	Unknown
NA[a]	NA	Unk	Middle Ranch	Unknown
829-00486[a]	32/D	M	Empire	Unknown
829-00487[a]	55/D	M	Empire	Unknown
829-00482[b]	05/D	F	Bald Canyon	Unknown
829-00483[b]	31/D	M	Bald Canyon	Unknown

[a] Catalina
[b] San Clemente
[c] As of 12/1/22 or date specified

Pinnacle Rock Territory. The Pinnacle Rock pair (Fig. 2) used the same nest as in 2021. We were unable to identify either adult. We observed an adult incubating on 27 February and confirmed the presence of 2 eggs on 13 March. There were 2 chicks present on 11 April (Table 1). We did not attempt to band because of the difficult and dangerous nest entry. Both fledglings were perched on a slope below the nest on 27 June.

Seal Rocks Territory. The Seal Rocks pair (Fig. 2) used the same nest as in 2021. The female was K-32, who hatched at the Seal Rocks nest in 2013. The male was unbanded. The female was incubating by 27 February, and we confirmed the presence of 2 eggs on 13 March. There were 2 chicks present on 27 March, and we entered the nest on 8 May to band the eaglets (Fig. 5, Table 1). Based upon trail cam images, Bird 29/D took its first flight on 7 June and Bird 63/D took its first flight on 9 June.

Figure 3. The West End eaglets at banding on Santa Catalina Island, California 2022.

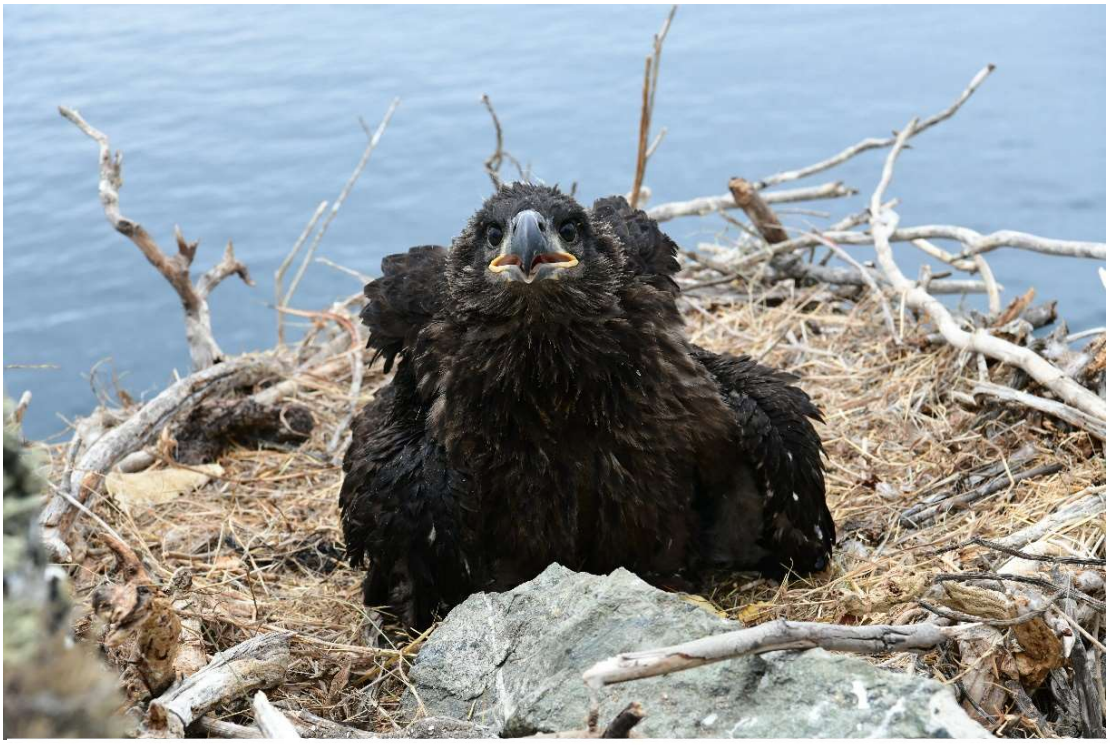

Figure 4. The Two Harbors chick at banding on Santa Catalina Island, California 2022.

Figure 5. The Seal Rocks chicks at banding on Santa Catalina Island, California 2022.

Middle Ranch Territory. The Middle Ranch pair (Fig. 2) used the same nest as in 2021. The female previously lost both her wing markers, but we believe she is A-37, a female 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 10 February, but there was only 1 egg on 2 March. There was an approximately 2-day-old chick present on 17 March. We did not attempt to band because of the nest's precarious location in a eucalyptus tree. The fledgling had taken its first flight by 15 June (Fig. 6, Table 1).

Twin Rocks Territory. The Twin Rocks pair (Fig. 2) used the same nest as in 2021. 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. Most of our chronology data came from a trail cam on the nest. The first egg was laid on 8 February and a second egg was laid on 11 February. The first chick hatched on 18 March and the second hatched before sunrise on 20 March. We banded the chicks on 7 May (Fig. 7, Table 1). The nest was empty on 10 June and we

believe that both birds fledged (we were unable to collect the trail cam footage in the fall).

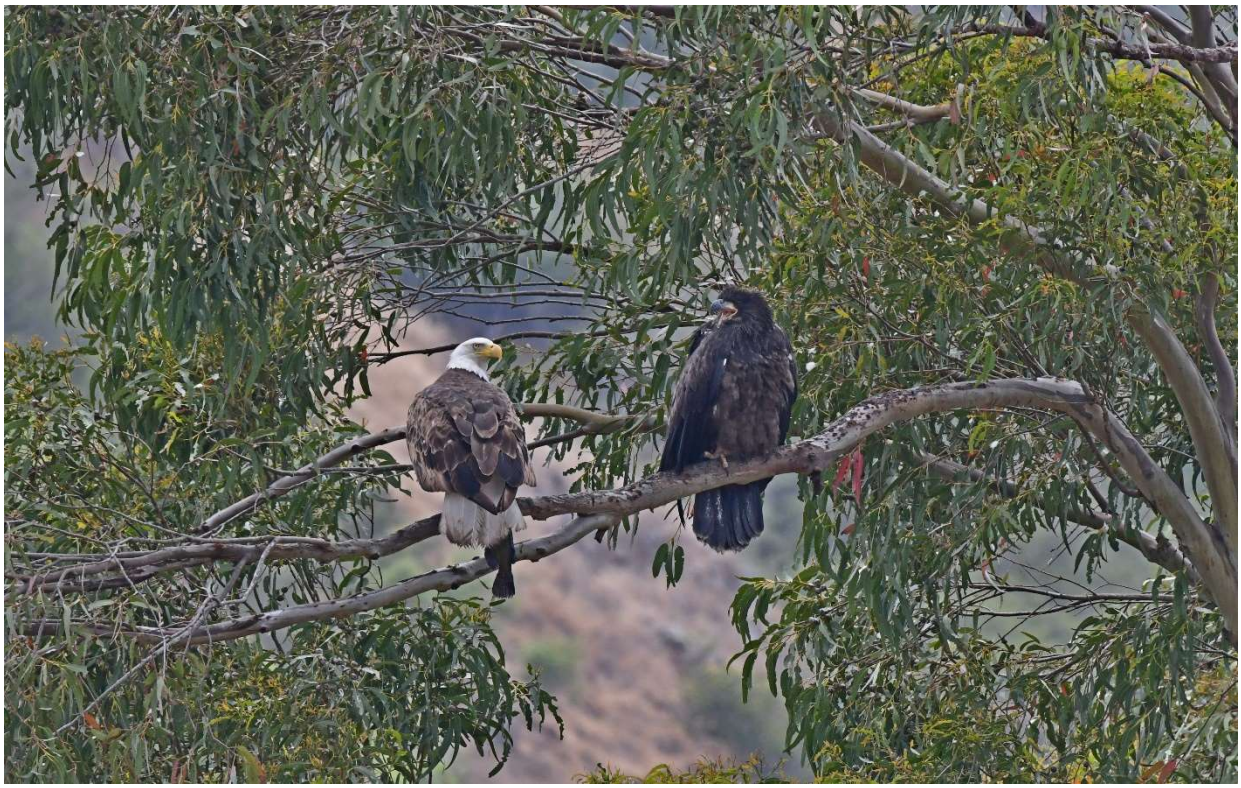

Figure 6. The Middle Ranch chick with an adult on Santa Catalina Island, California in 2022.

Figure 7. The Twin Rocks chicks at banding on Santa Catalina Island, California 2022.

*Empire Territory***.** The Empire pair (Fig. 2) used the same nest as in 2021. The male was K-51, a bird that hatched at the ACC and was fostered into the Pinnacle Rock nest in 2005. Female K-64, a 2016 bird from the Seal Rocks nest, started the season at Empire, but was replaced by K-55, a 2015 female from the Seal Rocks nest, between 28 and 29 January. K-64 was found dead about 5 km northwest of the Empire territory on 19 February. The first egg was laid between 2 and 7 March. We confirmed 2 eggs present on 11 April and there were 2 chicks present on 16 April. We entered the nest on 1 June to band the eaglets (Fig. 8, Table 1). Both fledglings took their first flight on 1 July and continued to visit the nest through at least 8 September.

Figure 8. The Empire eaglets at banding on Santa Catalina Island, California 2022.

San Clemente Island

We surveyed for and monitored eagles on San Clemente in conjunction with other research on the island and located one active nest in the historical Bald Canyon territory (Fig. 9).

Bald Canyon Territory. The Bald Canyon pair returned to the nest last used in 2019. The birds were incubating 2 eggs on 21 March. There was at least 1 chick present on 9 April and 2 chicks on 21 April. We entered the nest on 25 May to band the eaglets (Fig. 10, Table 1). Both fledglings were still in the nest on 2 July.

Figure 9. Bald Canyon eagle territory on San Clemente Island, CA in 2022.

Figure 10. The Bald Canyon chicks at banding on San Clemente Island, California 2022.

Santa Cruz Island

We surveyed the 9 known breeding territories on Santa Cruz and located active nests in 6 territories (Fraser Point, Fry's Harbor, Pelican Harbor, Sauces Canyon, Smuggler's, and Malva Real) and a likely nest in the Los Pinos territory (Fig. 11). We surveyed most of the island but did not locate any additional nesting territories.

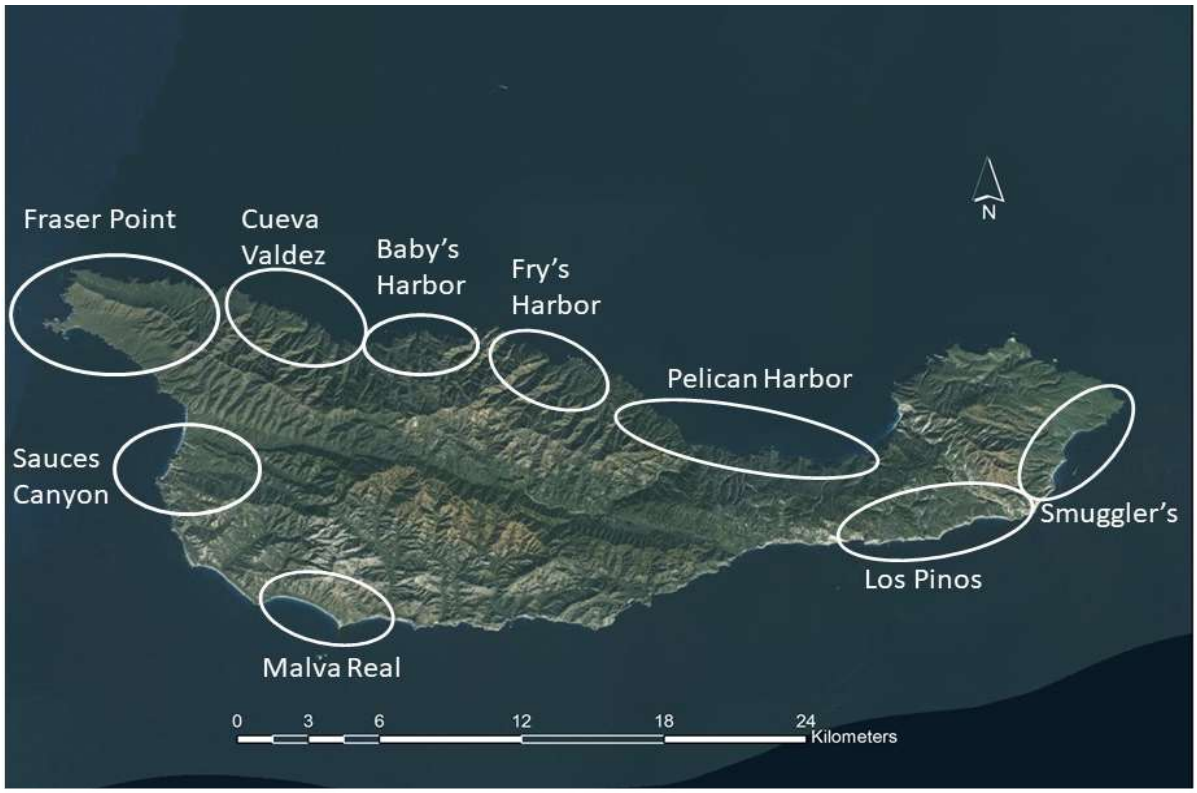

Figure 11. Bald eagle territories surveyed on Santa Cruz Island, California in 2022.

Fraser Point Territory. The Fraser Point pair (Fig. 11) returned to their 2019 nest along the northwestern coast of the island. There was a new male this season, A-14, who hatched at the Baby's Harbor nest in 2017. 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. The first egg was laid around 1830 hrs on 2 March and a second egg was laid around 1530 hrs on 5 March. The first chick hatched on the afternoon of 8 April and the second chick hatched on the morning of 10 April. We entered the nest on 28 May to equip the chicks with leg bands (Fig. 12, Table 2). Eagle 57/D took its first flight on 29 June and Eagle 53/D took its first flight on 30 June. Eagle 57/D returned to the nest around 8 July and appeared to be having difficulties standing. We went

to the nest area on 11 July and found 57/D in the creek bed under the nest. We transported him to the Ojai Raptor Center where he was diagnosed and treated for acute zinc poisoning. He was released at Hollister Ranch, Santa Barbara County, California on 19 September (Fig. 13).

Figure 12. The Fraser Point eaglets at banding on Santa Cruz Island, CA in 2022.

Table 2. Biographical data for bald eagle chicks hatched at nests on the northern Channel Islands, California during 2022.

Federal Band	Acraft Band	Sex	Territory	Status[d]
829-00471[b]	22/D	M	Lopez Canyon	Unknown
829-00475[b]	48/D	M	Trap Canyon	Unknown
829-00476[a]	28/D	M	Fry's Harbor	Unknown
829-00484[a]	57/D	M	Fraser Point	Unknown
829-00485[a]	53/D	F	Fraser Point	Unknown
NA[c]	NA	Unk	Oak Canyon	Unknown

[a] Santa Cruz Island
[b] Santa Rosa Island
[c] Anacapa Island
[d] As of 12/1/22 or date specified

Figure 13. Eagle 57/D following his release in Santa Barbara County, California following rehabilitation at the Ojai Raptor Center.

Los Pinos Territory. We did not confirm a pair in the Los Pinos territory (Fig. 11) until 3 April. We did not locate a nest in lower Cardiac Canyon until 11 June, at which time the adults were defensive, but there was no activity at the nest, and we observed no fledglings. We entered the nest on 4 November to install a trail cam. Based upon the amount of whitewash around the nest, it is likely they produced at least 1 chick in 2022.

Fry's Harbor Territory. The Fry's Harbor pair (Fig. 11) used the same nest as in 2021. We were unable to identify either adult. The birds were found incubating on 21 February and there was 1 nestling approximately 3 weeks old present on 31 March. We entered the nest on 4 May and banded a single male (Fig. 14, Table 2). The eaglet was still in the nest on 25 May, but the nest was empty on 24 June. We believe the eaglet flew successfully.

Figure 14. The Fry's Harbor eaglet at banding on Santa Cruz Island, California in 2022.

Pelican Harbor Territory. The Pelican Harbor pair (Fig. 11) used the same nest as in 2021. The birds were incubating on 20 February and 6 March, but the adult left the nest near the end of the 6 March survey period and did not return. The nest was empty on 17 March, and we could not locate the adults throughout the remainder of the season.

Smuggler's Territory. The Smuggler's pair (Fig. 11) used a new nest in 2022, and we did not confirm the identity of either adult. We observed the pair exhibiting courtship behavior on 19 February and they were incubating on 31 March. They continued to incubate until at least 11 May, past the time of expected hatch. The nest was empty on 30 May.

Baby's Harbor Territory. We confirmed a pair in the historical Baby's Harbor territory (Fig. 11) on 21 February. 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, Alaska in 2004 and released from the South Hacktower on Santa Cruz. Both adults were present in the vicinity of their 2020 nest

during our 8 visits between 21 February and 25 May, but there was no indication that they nested this season.

Sauces Canyon Territory. The Sauces Canyon pair (Fig. 11) used the same nest as in 2021. The male was A-40, a bird from the ACC that was hacked on Santa Cruz in 2005. The female was A-48, an ACC-produced bird that was hacked on Santa Cruz in 2006. This nest was monitored via a live-streaming web camera that was offline until 17 February. There was 1 egg present in the nest when the camera came online, but the egg failed to hatch.

Cueva Valdez Territory. We made only 1 survey of the historical Cueva Valdez territory (Fig. 11) on 7 March and did not confirm a pair. We did observe a golden eagle flying and perching within the territory.

Malva Real Territory. The Malva Real pair (Fig. 11) used the same nest as in 2021. The male was K-11, a bird produced by the ACC and fostered into the West End nest in 2001. The female was A-99, hatched at the Baby's Harbor nest in 2016. The first egg was laid on 7 February and the second egg was laid on 11 February. A young chick and 1 egg was present on 4 April, but there was no activity at the nest on 28 April. We saw no further breeding attempts.

Santa Rosa Island

We located active nests in 3 known territories on Santa Rosa (Lopez Canyon, East Point, and Trap Canyon) and a pair present in the Mud Tank territory (Fig. 15).

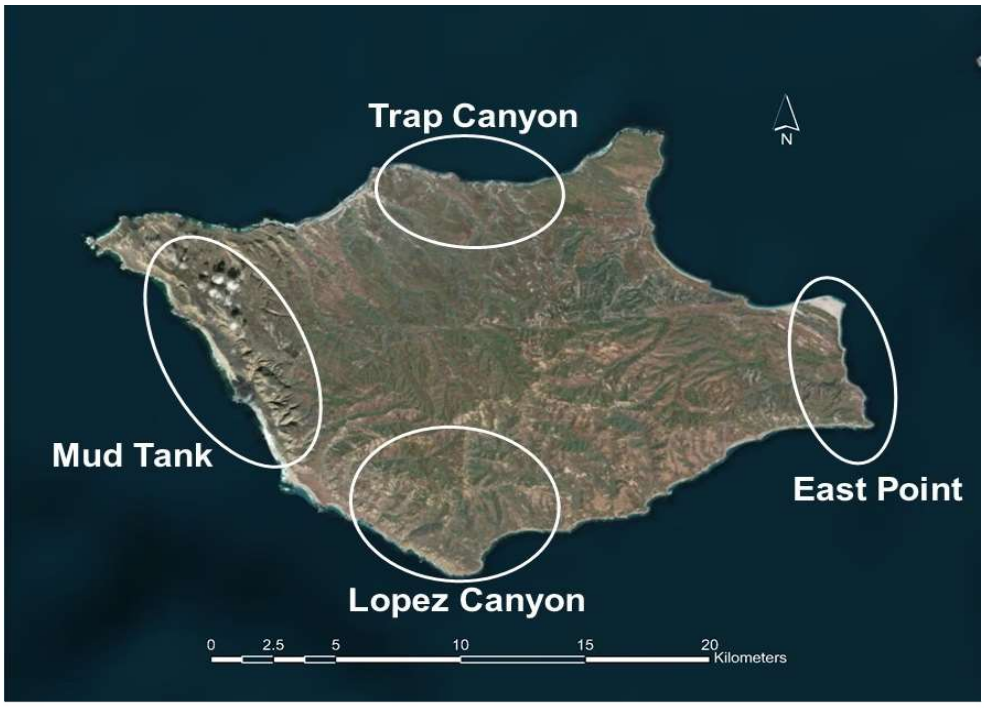

Figure 15. Bald eagle territories on Santa Rosa Island, California in 2022.

Lopez Canyon Territory. The Lopez Canyon pair (Fig. 15) used the same nest as in 2021. The male was A-69, a 2010 Pelican Harbor chick. The female was A-43, a bird produced by the ACC and hacked on Santa Cruz in 2005. Based upon trail cam images, eggs were laid on 4 and 7 February. The first chick hatched on 13 March and a second chick hatched on 15 March. The youngest chick died of unknown causes on 27 March, at which time it was significantly smaller than the older chick. The nest tree fell over late on 18 April or early 19 April (trail cam data) and we observed the chick moving around on the ground about 20 m upslope from the nest tree on 27 April. We recovered and banded the chick on 2 May (Fig. 16, Table 2) and built a new nest in a lemonade berry tree (*Rhus integrifolia*) about 30 m upslope from the former nest (Fig. 17). The fledgling left the nest on 3 June and was seen flying on 9 June.

Figure 16. The Lopez Canyon bald eagle chick on the ground 13 days after its nest tree fell over.

Figure 17. The Lopez Canyon chick after banding in a new nest we built after its nest tree fell over on Santa Rosa Island, California in 2022.

Trap Canyon Territory. The Trap Canyon pair (Fig. 15) used a new nest in 2022. The pair was present on 5 February, but we did not locate their

new nest site until 3 April, at which time they were incubating. There was 1 nestling about 3 weeks old on 30 April. We entered the nest on 14 May and banded the eaglet (Fig. 18, Table 2). The eaglet was still in the nest during our last visit on 25 June.

Figure 18. The Trap Canyon chick at banding on Santa Rosa Island, California in 2022.

Mud Tank Territory. There was a mate switch in the Mud Tank territory (Fig. 15) around 17 February. The male was A-60 who hatched at the Malva Real nest (also a ground nest) in 2006. The new female was A-07, a bird from the 2017 Lopez Canyon nest. We observed adults in the territory throughout the season, but there was no known nesting attempt.

East Point Territory. We observed the first known breeding in the East Point territory (Fig. 15) this season. The male was A-02, a bird that hatched in the Fraser Point territory (Fig. 11) in 2017. We could not identify the female, although she is banded. The first egg was laid on 4 February and the second egg was laid on 8 February. A portion of the nest had collapsed on 1 January and additional portions collapsed throughout incubation until the eggs fell out of the nest on 13 March. We did not observe another breeding attempt.

Anacapa Island

Oak Canyon Territory. Our trail cams captured images of the Oak Canyon pair (Fig. 19) at both of their historical nests throughout the nesting season. The female was A-11, a bird removed from a nest near Juneau, AK and released from the South Hacktower on Santa Cruz in 2002. The male was A-21, which was collected from Alaska in 2003 and released from the North Hacktower on Santa Cruz. The first egg was laid on 13 March and a second egg was laid on 16 March. One egg broke on 29 March, but a chick hatched from the remaining egg on 22 April. The fledgling took its first flight by 8 July.

Figure 19. The Oak Canyon bald eagle territory on Anacapa Island, California in 2022.

Nesting Summary

We confirmed 21 pairs of bald eagles across all the Channel Islands this season. In addition, there were 2 adults in the Mud Tank territory on Santa Rosa (new female), and 2 adults at Scorpion Harbor on Santa Cruz that have not nested yet. There were 19 known nesting attempts with a minimum of 34 eggs laid, 23 chicks produced (68% hatching success), and 21 fledglings (91% fledging success, Table 3). Overall nesting success was 68% and there were 1.1 fledglings per nesting attempt. Nesting success and productivity were higher on the SCI than on the NCI this season. Eighty-nine percent of nesting attempts on the SCI produced at least 1 fledgling and

productivity was 1.7 fledglings/nesting attempt, compared to 50% nesting success and 0.6 fledglings/nesting attempt on the NCI.

Table 3. Summary of nesting attempts by bald eagles on the California Channel Islands in 2022.

	Min #	Min # Chicks	
Island/Nest	Eggs Laid	Hatched	Fledged
Santa Catalina Island			
West End	3	3	3
Pinnacle Rock	2	2	2
Seal Rocks	2	2	2
Two Harbors	2	1	1
Twin Rocks	2	2	2
Middle Ranch	2	1	1
Rattlesnake	1	0	0
Empire	2	2	2
TOTAL	16	13	13
San Clemente Island			
Bald Canyon	2	2	2
TOTAL	2	2	2
Santa Cruz Island			
Sauces	1	0	0
Fry's Harbor	1	1	1
Fraser Point	2	2	2
Smuggler's	2	0	0
Pelican Harbor	1	0	0
Malva Real	2	1	0
TOTAL	9	4	3
Santa Rosa Island			
Trap Canyon	1	1	1
Lopez Canyon	2	2	1
East Point	2	0	0
TOTAL	5	3	2
Anacapa Island			
Oak Canyon	2	1	1
TOTAL	2	1	1
All Islands Combined	34	23	21

Monitoring of Previously Released/Hatched Bald Eagles

During 2022, we identified 40 bald eagles that had hatched in previous years on the Channel Islands through our nest observations, trail cam or live cam images, and reports directly to IWS

or via the Bird Banding Lab (Table 4). Eleven of these birds were on Catalina, 12 were on Santa Cruz, 3 were on Anacapa, 5 were on Santa Rosa, 1 was on San Miguel, and 8 were on the mainland (3 of which were breeding). One eagle was found dead on Catalina (Table 4).

Golden Eagle Surveying

We confirmed a single golden eagle on the islands in 2022. We observed the bird within the Cueva Valdez bald eagle territory (Fig. 11) on Santa Cruz.

DISCUSSION

Bald Eagles

Since 2009, the first year with no manipulations of eggs and chicks on the Channel Islands, the mean success and productivity across all the islands has been 64% and 0.97 fledglings/nesting attempt, respectively. This productivity is only slightly lower than 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). In 2022, the number of breeding pairs on the Channel Islands was similar to 2021 (20 pairs each season if the Los Pinos pair nested this season) and was slightly lower in the number of known chicks produced (23, versus 25 in 2021) and the number of recorded fledglings (21, compared to 23 in 2021).

On the NCI, bald eagle nesting success has been lower than on the SCI in 9 of the past 14 years, and productivity has been lower in 10 of 14 years. However, this year's differences were higher than any year since 2009, when there were only 3 known nesting attempts on the NCI, and they all failed (Sharpe 2010). Four of the 5 nesting failures on the NCI in 2022 occurred during incubation, with the eggs either breaking before expected hatch dates or remaining intact past expected hatch dates. The Malva Real nest on Santa Cruz failed when their chick disappeared. On Santa Rosa, 1 of 2 chicks at Lopez Canyon died of unknown causes this season, as also occurred in 2021 (Sharpe 2021). Both chicks died of unknown causes at Lopez Canyon in 2020 (Sharpe 2020). In 2021 and 2022, the chicks that died were smaller than the surviving chick, so it is possible that the chicks died of starvation.

Table 4. Status of bald eagles released from hacking towers or fledged from nests on the California Channel Islands prior to 2022 that had confirmed sightings in 2022.

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. 2022
629-39817	F	K-82	Pinnacle Rock	1998	Alive, Two Harbors pair, Catalina Is. 2022
629-02782	M	K-11	Zoo	2001	Alive, Malva Real pair, Santa Cruz Is. 2022
629-14048	F	A-11	Alaska	2002	Alive, Oak Canyon pair, Anacapa Is. 2022
629-47356	M	A-21	Alaska	2003	Alive, Oak Canyon pair, Anacapa Is. 2022
629-47375	F	A-27	Alaska	2004	Alive, Baby's Harbor pair, Santa Cruz Is. 2022
629-47391	M	A-40	Zoo	2005	Alive, Sauces pair, Santa Cruz Is. 2022
629-47395	M	K-51	Zoo	2005	Alive, Empire pair, Catalina Is. 2022
629-47399	F	A-43	Zoo	2005	Alive, Lopez Canyon pair, Santa Rosa Is. 2022
629-52406	F	A-48	Zoo	2006	Alive, Sauces pair, Santa Cruz Is. 2022
629-52407	F	A-49	Pelican Harbor	2006	Alive, Fraser Point pair, Santa Cruz Is. 2022
629-52422	M	A-60	Malva Real	2006	Alive, Mud Tank pair, Santa Rosa Is. 2022
629-52425	M	K-00	Pinnacle Rock	2007	Alive, Twin Rocks pair, Catalina Is. 2022
679-52433	F	K-79	Two Harbors	2007	Alive, Lake Piru, CA 4/10/22
629-52450	F	K-91	Two Harbors	2009	Alive, West End pair, Catalina Is. 2022
679-03432	M	A-67	Trap Canyon	2010	Alive, Baja California, Mexico 5/22/22
679-03435	M	A-68	Pelican Harbor	2010	Alive, Baby's Harbor pair, Santa Cruz Is. 2022
679-03436	M	A-69	Pelican Harbor	2010	Alive, Lopez Canyon pair, Santa Rosa Is. 2022
679-03439	F	K-95	Pinnacle Rock	2010	Alive, Twin Rocks pair, Catalina Is. 2022
679-04103	M	K-08	Seal Rocks	2011	Alive, Middle Ranch pair, Catalina Is. 2022
679-04105	M	K-19	Rattlesnake	2011	Alive, Lake Sutherland, CA 4/3/22
679-04128	F	A-85	Lopez Canyon	2013	Alive, Breeding in Anaheim Hills, CA 2022
679-04133	F	K-32	Seal Rocks	2013	Alive, Seal Rocks pair, Catalina Is. 2022
709-03076	F	K-55	Seal Rocks	2015	Alive, Empire pair, Catalina Is. 2022
709-03077	F	K-57	Seal Rocks	2015	Alive, Breeding in San Diego Co., CA 2022
709-03085	M	A-61	Los Pinos	2016	Alive, West End pair, Catalina Is. 2022
709-03087	M	A-63	Sauces Canyon	2016	Alive, Santa Cruz Is., CA 5/24/22
709-03093	F	K-64	Seal Rocks	2016	Dead, Catalina Is. 2/19/22
709-03096	M	K-69	Rattlesnake	2016	Alive, Catalina Is. 9/8/22
709-03097	F	A-99	Baby's Harbor	2016	Alive, Malva Real pair, Santa Cruz Is. 2022
709-03098	M	A-66	Baby's Harbor	2016	Alive, Santa Cruz Is., CA 1/25/22
709-03099	M	A-02	Fraser Point	2017	Alive, East Point pair, Santa Rosa Is. 2022
709-03100	M	A-03	Fraser Point	2017	Alive, Scorpion,Harbor, Santa Cruz Is. 2022
709-07351	M	K-73	West End	2017	Alive, Breeding in Riverside Co., CA 2022
709-07046	M	A-04	Fraser Point	2017	Alive, San Miguel Is. 10/24/22
709-07048	F	A-07	Lopez Canyon	2017	Alive, Mud Tank pair, Santa Rosa Is. 2022
709-07357	F	A-09	Pelican Harbor	2017	Alive, Skamania Co., WA 11/15/22
709-07359	M	A-14	Baby's Harbor	2017	Alive, Fraser Point pair, Santa Cruz Is. 2022
709-07368	F	NA	Sauces Canyon	2018	Alive, Point Mugu, CA 3/15/22
829-00017	F	NA	Fraser Point	2019	Alive, Santa Cruz Is., CA 8/16/22
829-00614	M	NA	Fraser Point	2021	Alive, Anacapa Is. 2/13/22

[a] Determined by karyotyping and/or morphometrics.
[b] As of 12/1/22 unless otherwise noted.

This fall we replaced the batteries and SD cards in the Reconyx trail cameras that we have placed on many of the bald eagle nests on Catalina, Santa Cruz, Anacapa, and Santa Rosa. The cameras have allowed us to collect better information on nesting chronology and outcome without frequent monitoring by personnel. Additionally, the trail cams have allowed us to identify breeding adults by either their leg bands or wing markers in situations where we have not been able to visually confirm identities using spotting scopes.

In 2023, we expect to have additional breeding pairs of bald eagles on the Channel Islands based upon our observations this season. Male A-03 has been seen with a banded, but unidentified, female in the Scorpion Anchorage area on Santa Cruz throughout most of 2021 and 2022, so we are hopeful that they will breed in 2023. The pair in the Mud Tank territory will likely breed in 2023 after the mate change in early 2022. We observed a potential new pair of eagles in the vicinity of the 2021 Fraser Point nest throughout the 2022 season, so the historical Fraser Point territory may be divided into 2 territories in 2023. We observed adults in the Willows area on Santa Cruz several times in 2022, so there may be a new territory there as well. We will conduct widespread surveying and monitoring of bald eagles on Santa Cruz, Santa Rosa, San Clemente, and Catalina islands in 2023 to determine nesting outcomes in known and potential new territories.

Golden Eagles

There was only one known golden eagle on the Channel Islands in 2022, located on northwestern Santa Cruz. This eagle apparently disrupted the breeding of the Fraser Point pair in 2016 because we observed and heard it at the nest site via a live web cam (Sharpe 2017). We believe this eagle also disrupted the breeding activity of the Cueva Valdez pair in 2018 and 2019 (nesting status unknown in 2020) and we have not confirmed a male bald eagle in the territory in the past 3-4 years. The Baby's Harbor pair of bald eagles, which occupy the territory adjacent to the Cueva Valdez territory, have not bred in 2 years and it is possible that the golden eagle is disrupting their breeding behavior. We will continue to monitor this area in 2023. If the golden eagle 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 and/or continues to disrupt bald eagle breeding.

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