

**Bald Eagle Restoration on the Northern
Channel Islands, California
January—December 2008
7th Annual Report**



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Restoring Natural Resources
harmed by DDTs and PCBs

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EXECUTIVE SUMMARY

Bald eagles (*Haliaeetus leucocephalus*) once nested on all the California Channel Islands off the coast of southern California, but disappeared by the early 1960's. 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 DDT residue continued to impact the birds. In 2002, IWS initiated a 5-year bald eagle restoration feasibility study on Santa Cruz Island, under contract with the National Park Service, to determine whether the eagles could reproduce successfully further from the primary DDT source off the Palos Verdes Peninsula. IWS released 61 eagles on Santa Cruz Island from 2002-2006. In 2006, we had the first known nesting attempts on the northern Channel Islands. Two pair of eagles successfully fledged one chick each from nests at Pelican Harbor and Malva Real on Santa Cruz Island. Both pair attempted nesting again in 2007, but only the Pelican Harbor pair was successful at fledging a single chick.

In 2008, we combined the Santa Catalina Island and northern Channel Islands projects into a single project because of the regular movement of eagles among all the islands. There were six known nesting attempts on Santa Catalina Island, three on Santa Cruz Island, and one on Santa Rosa Island in 2008. A total of 10 chicks hatched in nests (6 on Catalina, 4 on Santa Cruz) and two chicks were hatched by artificial incubation and fostered into nests on Santa Catalina Island. Eight chicks fledged on their own, all on Santa Catalina Island.

On Santa Catalina Island, we left eggs in four nests, but one nest failed within a couple weeks of laying eggs. We removed four eggs from two other nests (West End and Two Harbors) for artificial incubation, although an additional egg was laid at the West End nest following the egg switch. Two of four eggs hatched under artificial incubation and six chicks hatched in five wild nests, including the third egg at the West End nest.

On Santa Cruz Island, one nest failed after about a month of incubation (Sauces) and two nests had two chicks each. The chicks at the Malva Real nest died at a couple weeks of age, as did the resident female, after a likely intrusion by another unpaired female. The Pelican Harbor

nest had two chicks that were attacked by a subadult eagle at about seven weeks of age. Both were injured, rehabilitated and released back on the island via hacking. The Trap Canyon nest on Santa Rosa Island had two eggs that were incubated past their hatch date. Both eggs were recovered and showed no signs of development.

As of the end of December 2008, there are 45 known bald eagles on the California Channel Islands. There are 30 known eagles remaining on the northern Channel Islands, including four originally released on Santa Catalina Island. Fifteen known eagles are on Santa Catalina Island, including one bird originally released on Santa Cruz Island. These are minimum numbers, as it is likely that there are others that were not documented in 2008. Three other eagles released from Santa Cruz Island are being tracked on the mainland via their GPS units.

Bald eagles have continued to use Santa Rosa Island, especially from the fall through spring, where they have been seen feeding on carcasses and gut piles of mule deer (*Odocoileus hemionus*) and Roosevelt elk (*Cervus canadensis*) left from the guided hunts and culling activities, and on marine mammal carcasses on the beaches. Many of the birds then move to West Anacapa during the spring and summer, which corresponds with the marine bird breeding season. However, as the birds are maturing, forming pairs, and establishing territories, fewer birds are making the seasonal movements between the islands.

The successful hatching of bald eagles on Santa Cruz and Santa Catalina Islands in 2008, coupled with the high survival and retention rates of bald eagles on the Channel Islands, are reason for optimism regarding the success of the bald eagle restoration program. The eagles are moving freely among the islands, so as the population grows there is a good possibility that bald eagles will eventually be found on all the California Channel Islands, as they were historically. Although there were no successful nests on the northern Channel Islands in 2008, more birds are forming pairs, so the number of breeding birds should increase steadily over the next few years, adding more young birds to the population.

ACKNOWLEDGMENTS

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INTRODUCTION

Bald eagles (*Haliaeetus leucocephalus*) were extirpated from the Channel Islands by the early 1960s as a result of human persecution and the introduction of the organochlorine pesticide DDT into the Southern California Bight (Fig. 1). DDE (a metabolite of DDT) levels have been found to be inversely correlated with eggshell thickness and productivity in bald eagles (Hickey and Anderson 1968, Wiemeyer et al. 1984). The decline in bald eagle populations in southern California was concurrent with declines in seabird breeding success in the Southern California Bight and with continent-wide declines in bald eagle populations, much of which was also attributed to the impacts of DDT (Risebrough et al. 1971, Anderson et al. 1975, Grier 1982, Wiemeyer et al. 1984).



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

The Institute for Wildlife Studies (IWS), in cooperation with the United States Fish and Wildlife Service (FWS) and California Department of Fish and Game (CDF&G), initiated a program to reintroduce bald eagles to Santa Catalina Island, California (Catalina; Fig. 1) in 1980. Between 1980 and 1986, 33 eagles were released on the island from hacking platforms (Garcelon 1988). Many of these birds matured and formed breeding pairs on the island, but all the eggs produced broke in the nest. Concentrations of DDE in the remains of eggs removed from failed nests implicated this contaminant as the causal agent of the lack of productivity (Garcelon et al. 1989). Eggs removed from nests on Catalina 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). Mean levels of DDE in egg remains removed from nests in 1987 and 1988 were twice as high as that which has been shown to cause complete reproductive failure (Wiemeyer et al. 1984), indicating that there was still a large amount of DDE in the food chain.

Since 1989, the reintroduced population has been maintained through manipulations of eggs and chicks at each nest site and through additional hacking of birds. In the egg manipulation process, artificial eggs are substituted for the structurally deficient eggs laid by the birds affected by DDE. The adult eagles continue to incubate the artificial eggs while the removed eggs are relocated and artificially incubated. Chicks that hatch from these removed eggs, or those produced by captive adults at the Avian Conservation Center (ACC) at the San Francisco Zoo, are then fostered into the nests.

From 1989 through 2008, adult bald eagles successfully reared 67 of 78 chicks that were either fostered into nests (66 chicks), hatched from two of three healthy eggs that were placed into nests, or hatched from eggs left in the nest (10 chicks). Four of these 78 birds were removed from the nest prior to fledging because of injuries and seven died due to accidents, predation, or unknown causes. An additional 21 eagles have been released through continued hacking activities since 1991 (20 chicks and a 1-year-old bird).

IWS began a similar reintroduction program on the northern Channel Islands in 2002, releasing 61 eagles from hacking towers from 2002-2006. In 2006, two separate pairs on Santa Cruz Island successfully hatched and fledged one chick (Sharpe 2007). These were the first known bald eagle chicks to hatch naturally in the wild on the California Channel Islands since 1950. In 2007, only one of the two nests was successful at hatching and fledging an eaglet.

Because of the recent successes on the northern Channel Islands and Catalina, and the movement between the islands by the eagles, the Montrose Settlements Restoration Program combined the two bald eagle restoration projects into a single program at the end of 2007. In 2008, we monitored all known bald eagle nests on the Channel Islands and left the eggs in all but two of the nests. Below we summarize the results of the 2008 bald eagle nesting season.

STUDY AREA

Our 2008 monitoring was conducted primarily on Catalina, Santa Cruz Island (Santa Cruz), and Santa Rosa Island (Santa Rosa). Catalina is located 34 km south of Long Beach, California. The island is 34 km long, 0.8 to 13.0 km wide, and covers 194 km² (Fig. 2). Elevations range from sea level to 648 m. Mean annual temperatures range from 12 to 20° C near the coast, and yearly precipitation averages 31 cm (NOAA 1985).

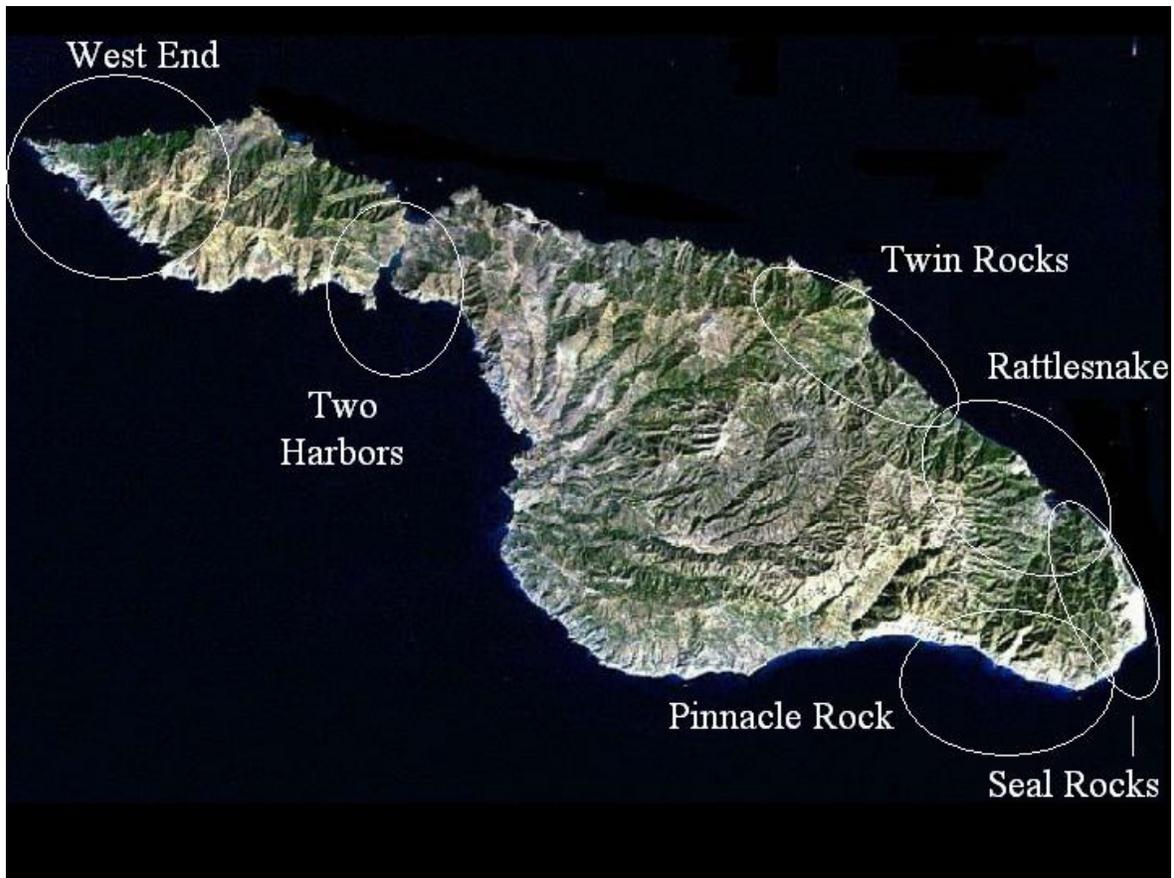


Figure 2. Santa Catalina Island, California and the active bald eagle breeding territories in 2008.

The northern Channel Islands, which are composed of San Miguel Island (San Miguel), Santa Rosa, Santa Cruz, and Anacapa Island (Anacapa; west to east), are located approximately 19 to 44 km off the coast of Ventura and Santa Barbara counties (Fig. 1). Santa Cruz is the largest of the eight California Channel Islands, measuring about 38 km in length and 12 km wide at its widest point (Fig. 3). The land area is approximately 249 km² 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 - 20.9° C and a mean annual rainfall of 50 cm (Junak et al. 1995). The NPS owns and manages the eastern 24% of the island and The Nature Conservancy (TNC) owns and manages the western 76% of the island.

Santa Rosa is the second largest of the Channel Islands and is owned by the NPS. The island encompasses approximately 214 km² and is less topographically diverse than Santa Cruz. A central mountain range reaches an elevation of 484 m and the coastal habitat varies from gentle slopes and sandy beaches to sheer cliffs (Channel Islands National Park website, <http://www.nps.gov/chis>)



Figure 3. Santa Rosa (left) and Santa Cruz (right) Islands and the active breeding territories in 2008.

METHODS

Permitting

IWS has the required Federal Fish and Wildlife Permit (Permit TE744878-8) and a Memorandum of Understanding with the CDF&G to conduct bald eagle research on the northern Channel Islands. IWS has a banding permit from the United States Geological Survey's Bird Banding Laboratory allowing banding and radio-tagging of the eagles.

Surveying and Nest Monitoring

Observations of adult eagles began in January 2008 at each of last year's nest sites. We also conducted weekly ground surveys of Catalina, Santa Cruz, and Santa Rosa to locate new nesting pairs. In addition, we conducted a helicopter survey of the northern Channel Islands in March. Once we confirmed nesting eagles we set up observation blinds or found partially hidden locations from which to observe the nests. We monitored the chronology of nesting through incubation and chick-rearing. We had established video cameras prior to the nesting season at five nests on Catalina (West End, Seal Rocks, Twin Rocks, Rattlesnake and Two Harbors nests) and one nest on Santa Cruz (Pelican Harbor nest), which enabled close, remote observations of nesting activity. Most nests were available for live viewing on our website (<http://www.iws.org>).

We used radio-telemetry (all islands) and GPS transmitters (northern Channel Islands only) to locate and observe fledged eagles every 1-3 days during their first month of flight. We attempted to observe, or at least determine that the birds were moving, at least once per week through December, or until they left the islands.

Nest Manipulations

Because we had successful hatching of eggs in nests on Catalina in 2007, we left eggs in all but the West End and Two Harbors nests in 2008. We replaced eggs laid by these nesting pairs with artificial eggs within 2-7 days of the date that eagles were confirmed incubating. We replaced the artificial eggs with healthy chicks after the adults had incubated approximately 35 days.

No eggs were removed for artificial incubation from nests on Santa Cruz or Santa Rosa.

Bald Eagle Hacking

Eagles were placed in a hacking tower upon arrival on Santa Cruz. One to two birds were placed in each cage and fed fish until their release. Each cage was monitored remotely using a wireless video system to insure that each bird was eating and healthy. We also kept daily records of how much food was placed in and removed from each cage, as well as of the general behavior and appearance of each bird.

Artificial Incubation

In winter 2004/2005 we established an incubation facility at our office in Avalon, California (Fig. 4). The facility has two incubators, candler, hatcher, brooder, and all the other equipment necessary to hatch the eggs. We acquired a Grumbach incubator from the ACC and purchased a Brinsea Contaq X8 incubator. Unlike the Grumbach, which surrounds the eggs with warm, moist air, the X8 uses an air bladder inflated with warm air that rests on top of the eggs. This more closely mimics the conditions in a nest. Eggs were weighed and measured upon arrival in the facility so that we could estimate weight loss trends. Eggs should typically lose about 15% of their weight during the 35-day incubation period. If weight loss was above the

predicted weight loss of a healthy bald eagle egg, then we covered portions of the egg below the aircell with Tegaderm. This reduced water loss through the shell, but allowed gas exchange. The Grumbach incubator, which can be set at higher humidity levels than the Brinsea, was used as a hatching unit.



Figure 4. Incubation facility with Brinsea incubator (left), Brinsea hatcher (center), and Grumbach incubator (right).

Banding

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

Each eagle that was released via hacking on Santa Cruz was equipped with a combination satellite/VHF transmitter (Fig. 5), wing markers (blue), and FWS leg band prior to being placed in the tower. We attached the transmitters so that they would detach after 2-3 years, the approximate lifespan of the transmitters. The satellite transmitters record hourly GPS locations of the bird up to 14 times per day and then upload them to a satellite approximately every three days. We also collected ~10 cc of blood from each bird at the time of banding to allow for baseline contaminant analyses and sexing.



Figure 5. PTT GPS unit with VHF transmitter (gray) attached to the side. The whole unit weighs approximately 100 g.

Monitoring of Previously Released Eagles

We closely monitored the status of all GPS-tagged eagles fledged in previous years. Data were retrieved daily via computer from Argos, Inc. (Largo, Maryland). Any bird that had not moved more than 50 m in a day was located as soon as possible to determine its status. We radio-tracked 1-2 days/week on Catalina to search for previously released eagles that had stayed on or returned to the island. During monitoring we searched for other eagles that were no longer carrying functioning transmitters, as well.

Trapping

We attempted to trap bald eagles on Santa Cruz and Catalina in 2008 to collect blood samples for contaminant analyses and to replace their transmitters. Most trapping efforts were made from a boat using the floating fish noose technique (Cain and Hodges 1989, Jackman et al. 1993). However, we did attempt to trap using a nest launcher set over fish at the Saucers beach on Santa Cruz on two days.

RESULTS

Surveying and Nest Monitoring

Santa Catalina Island

Nests were located in February and March 2008 in all five previously occupied territories on Catalina (Twin Rocks, Pinnacle Rock, Seal Rocks, West End, and Two Harbors), as well as in a new territory (Rattlesnake; Fig. 2).

Twin Rocks Territory. The territory was used by the same pair that used it from 1998-2007. The male (K-33) was a bird that hatched from a Catalina egg in 1992 and the female (K-17) was a bird released at the Bulrush hacktower in 1984. The birds built a new nest on a relatively inaccessible cliff face and were seen at the nest several times during January and February. The first egg was laid around 26 February, based upon observed incubation behavior. At least one more egg was laid, but we were never able to see the eggs in the nest from our nearest

observation point, which was nearly a 1.5 km away. On 26 March, we were able to put in a camera that gave us a slightly better view of the nest.

On 4 April, the adults' behavior changed and it appeared as though they had at least one chick. We climbed to the nest on 28 May and found that they had two eaglets (Fig. 6). The two were removed from the nest temporarily and equipped with leg bands, transmitters, and wingmarkers, and we obtained blood samples (Table 1). We continued to observe the eaglets in the nest until they fledged around 3 July. Eagle K-88 left the



Figure 6. The Twin Rocks chicks at the time of banding.

island around 19 August and was seen on the Palos Verdes Peninsula on the mainland. On 8 October it was reported near Florence, Oregon, and on 18 October it was at the mouth of the Elk River in southwestern Oregon. K-89 was pulled out of the ocean at the western tip of Catalina on

Table 1. Biographical data for bald eagle chicks fostered into or hatched at nests on Santa Catalina Island, California during 2008.

Federal Band	Sex	Wing Tag	Date Fledged	Foster/Hatch Nest	Status ^a	Comments
629-52439	F	K-71	~6/24/08	Pinnacle Rock ^b	Dead	Found dead on the island on 23 July
629-52440	M	K-70	~6/24/08	Pinnacle Rock ^b	Alive	Still on Catalina Island
629-52441	M	K-62	~6/27/08	Seal Rocks ^b	Dead	Found floating in the ocean on 10/24/08
629-52442	F	K-83	~6/21/08	Two Harbors	Unknown	Left the island in late September
629-52443	M	K-88	~7/3/08	Twin Rocks ^b	Unknown	Left the island around 8/19/08
629-52444	M	K-89	~7/3/08	Twin Rocks ^b	Dead	Washed up in Huntington Beach, CA
629-52445	F	K-65	7/11/08	West End	Unknown	Left the island around 8/22/08
629-52446	F	K-67	7/11/08	West End ^b	Unknown	Left the island in late October

^a As of 12/31/08

^b Natural hatch at nest

19 August. The bird was water-logged but uninjured. It was released near its parents' territory after it dried out. On 6 September K-89 washed up dead on Huntington Beach on the mainland.

West End Territory. The West End pair used the same nest that has been used since 1991. The male, K-01, was produced by captive birds at the ACC and fostered into the Pinnacle Rock nest in 2000. The original female (Female 1) was not marked with patagial tags, but is believed to be a 22-year-old bird released at the Sweetwater hacktower in 1986. A second female, which had been breeding at the nest as part of a trio since 1992, was present in the territory until just before egg-laying. She was not seen again in 2008 and is presumed dead. This nest was monitored primarily via our live web cam and birds were regularly seen at the nest throughout February. On 6 March we saw the first egg in the nest. We entered the nest on 13 March and removed two eggs, both of which were fertile. We were able to manually hatch one of the chicks on 15 April.

On 18 April we saw a chick in the nest. The pair had produced at least one more egg after our egg switch and it had hatched

among the artificial eggs. On 19 April, we fostered the chick that had hatched

in to the nest (Fig. 7). We returned to

the nest on 11 June to equip the birds

with leg bands, transmitters, and

wingmarkers, and to obtain blood

samples (Table 1). We continued to

monitor the birds until they fledged on

11 July. One chick (K-65) fledged

around 1415 hrs, but returned to the nest

a short while later. Around 1430 hrs a

small plane flew close to the nest and caused both eaglets to jump off the nest. We traveled to the

nest area to make sure the bird that had not fledged yet was healthy. The bird was found about

100 m from the nest underneath a thick cover of lemonade berry (*Rhus integrifolia*). We were

able to capture the bird and carry it to an open area, where it was released and able to fly back

towards the nest ridge.



Figure 7. The West End chicks at the time of fostering. The chick on the right hatched in the nest and the chick on the left was hatched in the IWS incubation facility.

We continued to monitor the young eagles until K-65 apparently left the island around 22 August and K-67 left in late October. We received no sighting reports of K-65, but K-67's signal was picked up regularly by a remote telemetry station on San Miguel Island. It is likely she spent the fall on Santa Rosa, where many young eagles can be found (see below).

Pinnacle Rock Territory. The Pinnacle Rock pair used the same nest as in 2007. The female, K-92, was produced by captive birds at the ACC and released at the Bulrush hacktower in 1999. The 22-year-old male, K-65, was hacked at the Bulrush tower in 1986. We observed the birds sitting on their first egg on 23 February. They laid a second egg on or around 25 February. The eggs hatched around 31 March and 1 April, respectively.

We climbed to the nest on 26 May and equipped the eaglets with leg bands, wingmarkers, and transmitters, and collected blood for contaminants analyses (Table 1). The eaglets both fledged around 24 June and began moving around the island a few weeks later. K-71 was found dead on the northeastern portion of Catalina on 23 July. There was no evident cause of death. K-70 was reported to be struggling in the water near Empire Landing on 10 August. The bird managed to get ashore and did not appear injured. It remained on the island through the end of the year.

Seal Rocks Territory. The Seal Rocks pair used the same nest as in 2007. The 15-year-old female, K-34, is from the captive ACC eagles and was hacked at the Bulrush tower in 1993. The 16-year-old 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 seen at the nest throughout February and the first egg was laid on the evening of 27 February. A second egg was laid on the evening of 1 March. One of the eggs disappeared on 15 March, but the remaining egg hatched in the nest on 5 April, indicating that it was the second egg laid.

We entered the nest on 27 May to equip the bird with a leg band, transmitter and wingmarkers and to collect blood for contaminants analyses. We continued to monitor the nest until the bird fledged on or around 27 June (Table 1). We relocated the bird via telemetry 2-3 times per week. It remained on the island until at least 18 October, but was found floating about 25 miles off the coast of Point Loma, California on 24 October.

Two Harbors Territory. The Two Harbors pair used the same nest as last season. The 10-year-old male, K-81, is an ACC-produced eagle that was fostered into the West End nest in 1998. The 10-year-old 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. Activity was noted at the nest throughout February and the female laid her first egg around 1700 hrs on 22 February. A second egg was present by 26 February. We entered the nest on 28 February and removed both eggs, replacing them with two artificial eggs. The eggs were both fertile and one hatched on 2 April.

On 8 April, we fostered the chick back into the nest. We returned to the nest on 27 May to install a leg band, transmitter, and wingmarkers on the chick, and to obtain a blood sample (Table 1). The eaglet fledged on 21 June and we continued to radio-track the bird until it left the island in late September. It was seen on San Clemente Island, California on 4 October.

Rattlesnake Territory. In 2007, we located a nest in an oak about 2 km north of Avalon, but were not sure if it was a bald eagle nest. In February 2008, we found the Rattlesnake pair working on the nest. 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, also was produced by eagles at the ACC in 2004 and was fostered into the Seal Rocks nest. On 22 February, the female was observed incubating a single egg, but on 23 February she was off the nest and there was no egg present. On 24 February, the male was observed incubating a single egg. They continued incubating a single egg until 9 March, at which time there were no birds present and no egg in the nest. The pair did not lay again, but were seen in their territory repeatedly throughout the year.

Santa Cruz Island

Pelican Harbor Territory. The Pelican Harbor pair remained together for a third breeding season. The male, K-10, was produced by the ACC and fostered into the Twin Rocks nest on Catalina in 2001. The female, K-26, also was produced by the ACC and fostered into the West End nest on Catalina Island in 2002. Both eagles have been on Santa Cruz since 2005. The Pelican Harbor nest has a live internet feed during daylight hours with a large following of online viewers. This allows IWS biologists to read through daily postings to determine egg-laying times, etc. without needing to physically monitor the nest. The first egg was laid on 24 February

and a second egg was laid on 7 February. The eggs hatched on 1 April and 3 April, respectively (Fig. 8).

Both chicks did well until 19 May, when a subadult bald eagle (2-3 years old), which had blue wingmarkers, but was not identified, attacked the nest. It pulled one of the eaglets out of the nest around 1500 hours. Afterwards, the subadult could be heard vocalizing near the nest. At 1523 hours, the subadult dove at the nest and knocked the second eaglet over the edge. IWS biologists arrived at the nest shortly afterwards and found both eaglets on the ground. One had a puncture in its beak (presumably the first bird pulled out of the nest) and the second had a broken wing. The birds were transported to the Orange County Birds of Prey Center on 20 May, where they were treated for their injuries.



Figure 8. The Pelican Harbor chicks at about four weeks old.

On 8 June, the eaglet with the beak injury was transported back to Santa Cruz, fit with a GPS/VHF transmitter, wingmarkers (A-64), and federal leg bands, and placed in the South Hacking Tower (Table 2). It was kept in the tower until the door was opened on the night of 29 June. The bird fledged on 1 July and remained on Santa Cruz through mid-September. On 19

Table 2. Biographical data for bald eagles hatched and/or hacked on Santa Cruz Island, California during 2008.

Federal Band	Sex	Wing Tag	Source	Hacking Tower	Date Fledged	Status ^a	Comments
629-52438 ^b	M	A-64	Pelican Harbor Nest	South Tower	7/1/08	Alive	Has remained on the northern Channel Islands.
629-52447	M	A-65	Rehab. Center	South Tower	7/17/08	Dead	Found dead in the water on 8 August.
629-52437 ^b	M	A-66	Pelican Harbor Nest	South Tower	6/30/08	Dead	Found dead near tower about 4 days after fledging.
N/A ^b	.	.	Malva Real Nest	.	.	Dead	Died/killed at nest prior to fledging
N/A ^b	.	.	Malva Real Nest	.	.	Dead	Died/killed at nest prior to fledging

^a As of 12/31/08

^b Natural hatch at nest

September, he took his first flight to Anacapa Island and was seen landing in the water off Anacapa Island via a remote camera. He was able to get out of the water, dried off on the rocks, and returned to Santa Cruz the next morning, where he remained through the end of the year (Fig. 9).

On 14 July, the second eaglet was transported to Santa Cruz, fit with a GPS/VHF transmitter, wingmarkers, and federal leg bands and placed in the hacking tower (Table 2). The tower door was opened on the night of 16 July and the bird fledged around 0830 hours on 17 July. The bird moved around the eastern portion of Santa Cruz until 8 August (Fig. 10), when it was found dead floating in a kelp bed on the northern shore of the island.

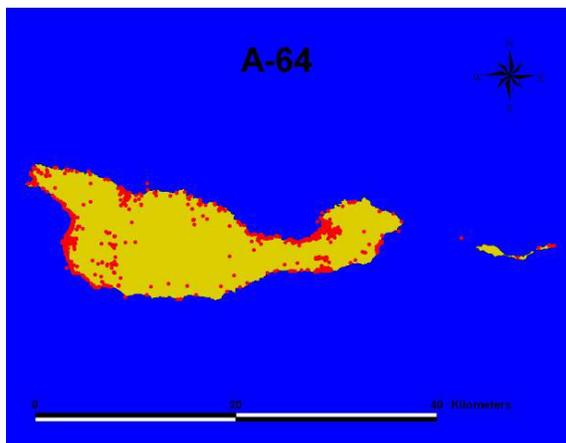


Figure 9. Movements of Bald Eagle A-64 on the California Channel Islands in 2008.

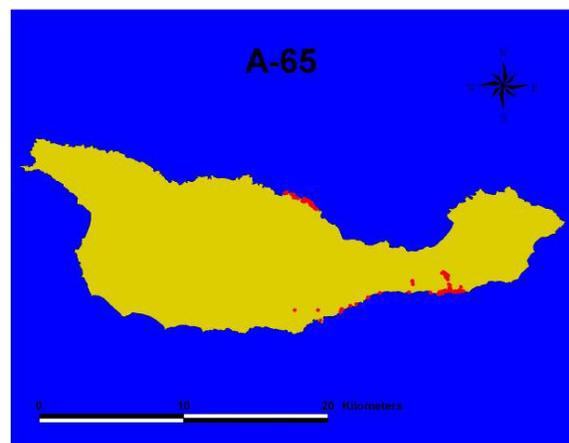


Figure 10. Movements of Bald Eagle A-65 on Santa Cruz Island in 2008.

Malva Real Territory. The Malva Real pair consists of a 6-year-old Alaskan female, A-04, hacked on Santa Cruz in 2002, and a 7-year-old male, K-11, produced at the ACC and fostered into the West End nest on Catalina in 2001.

In 2006 and 2007, this pair had placed their nest in a field on the south side of Santa Cruz. In 2008, they placed their nest in the field again. The first egg was seen on 1 March and they had a second egg by 8 March. Both eggs hatched on 4 April and 6 April, respectively (Fig. 11). Sometime around 14 April the nest was apparently attacked, possibly by another female eagle. One chick was found dead on 17 April. The other chick was not located. The GPS data for the breeding female showed that the transmitter stopped moving on 15 April. Her carcass was found in a creek bed just east of the nest. She may have died from injuries sustained in an encounter with another female, A-17, that was in the area when the nest failed.



Figure 11. The Malva Real chicks being fed by K-11 in April 2008.

Sauces Territory. A new pair built a nest in Sauces Canyon on the western portion of Santa Cruz in 2008. The female, A-02, was produced by birds at the ACC and was hacked on Santa Cruz in 2002. The male, A-28, was collected from an Alaskan nest and hacked on Santa Cruz in 2004. The birds were confirmed to be incubating on 10 March, but A-02's GPS data indicate the first egg was laid around 8 March. We were unable to see into the nest, so we do not know how many eggs were in the clutch. The nest failed around 31 March for unknown reasons.

Santa Rosa Island

Trap Canyon Territory. We had our first known breeding on Santa Rosa in 2008. Female A-22 and Male A-08, released on Santa Cruz in 2004 and 2002, respectively, were found nesting in an old golden eagle nest on 13 March. They had not been seen for a couple of weeks prior to finding their nest, so we do not know when the eggs were laid. The pair continued incubation into late April, but began spending more and more time away from the nest, and eventually abandoned it. We entered the nest on 23 April, nearly six weeks after the nest was located, to remove the eggs. We opened the eggs to process them for chemical analyses and neither egg appeared fertile.

Bald Eagle Hacking

In addition to the two Pelican Harbor eaglets that were treated for injuries and released from the hacking tower, we released an eaglet from a mainland nest. The eaglet's nest tree was blown over and the eaglet was sent to the California Foundation for Birds of Prey. We arranged to have the bird transported to Ventura, California so that it could be placed in a hacking tower with one of the Pelican Harbor chicks that was of similar age. The bird was flown to Ventura on 7 June and was taken to Santa Cruz on 8 June. After being equipped with a GPS/VHF transmitter, wing markers (A-66), and a federal leg band, it was placed in the South Tower with A-64 (Table 2).

The tower door was opened on the night of 29 June and the bird fledged on 30 June. Because its radio signal was coming from the vicinity of the hacking tower, we only approached the tower at night to place food in and around the tower. We got the first GPS data from the bird several days later. According to the data, the bird had not moved since soon after it fledged. We went to locate the bird and found it dead about 50 m from the tower. There was no indication of the cause of death and the carcass was in too poor of a condition for a necropsy.

Artificial Incubation

In 2008, we collected four eggs (all fertile) from two active nests on Catalina. Of these eggs, we successfully hatched two eggs (50%) (Table 3). We had to manually hatch the West End chick, which was malpositioned and had pipped at the wrong end of the egg.

Table 3. Summary of artificial incubation of eggs removed from bald eagle nests on Santa Catalina Island, California in 2008.

Territory/ Egg #	Estimated Lay Date	Estimated Initial Wt.	Days Incubated	End Wt.	Comments
Two Harbors					
08-01	2/22/08	149.52 g	38	124.23 g	Died in shell
08-02	2/26/08	140.28 g	35	.	Hatched and fostered
West End					
08-03	3/6/08	141.86 g	38	.	Hatched and fostered
08-04	3/9/08	133.89 g	20	120.33 g	Died in shell

Nesting Summary

Based upon our observations and the number of chicks that hatched in nests on the Channel Islands, we estimate that the eagles laid 16-18 eggs this season, of which 12 (67-75%) hatched (Table 4). Fifty percent of the eaglets that hatched survived until the end of the year.

Table 4. Summary of nesting attempts by bald eagles on the California Channel Islands in 2008.

Island/Nest	Eggs Incubated		Chicks		# Surviving to End of Year
	Artificial	In Nest	Hatched	Fledged	
Santa Catalina Island					
Twin Rocks	0	2-3	2	2	1
West End	2	1	2	2	2
Pinnacle Rock	0	2	2	2	1
Seal Rocks	0	2	1	1	0
Two Harbors	2	0	1	1	1
Rattlesnake	0	2	0	0	0
TOTAL	4	9	8	8	5
Santa Cruz Island					
Pelican Harbor	0	2	2	2*	1
Malva Real	0	2-3	2	0	0
Sauces	0	1-2	0	0	0
TOTAL	0	5-7	4	2*	1
Santa Rosa Island					
Trap Canyon	0	2	0	0	0
TOTAL	0	2	0	0	0
All Islands Combined	4	16-18	12	10*	6

* Two chicks recovered injured and subsequently released via hacking.

Monitoring of Previously Released Eagles

Besides monitoring this year's fledglings, we continued to monitor the eagles that had been released or hatched naturally on the Channel Islands prior to 2008. We had 32 bald eagles released on Catalina in previous years that were sighted during 2008, two of which were found dead on or near the island (Table 5). In addition, K-69, who disappeared at the beginning of the breeding season, is assumed dead (Table 5). Nine of the birds were sighted on the mainland or Santa Cruz.

Table 5. Status of bald eagles released or fledged from nests on Santa Catalina Island prior to 2008 and known to have been alive in 2008.

FWS Leg Band	Sex ¹	Patagial Marker	Nest/Release Tower	Fledge Year	Status, Latest Location ²
629-16077	F	K-17	Bullrush Tower	1984	Alive, Twin Rocks, Catalina Is.
629-16085	F	NA	Sweetwater Tower	1986	Alive, West End, Catalina Is.
629-16089	M	K-65	Bullrush Tower	1986	Alive, Pinnacle Rock, Catalina Is.
629-16084	F	K-69	Sweetwater Tower	1986	Alive, West End territory, 2/08
629-19925	M	K-25	Pinnacle Rock	1992	Alive, Seal Rocks, Catalina Is.
629-19923	M	K-33	Seal Rocks	1992	Alive, Twin Rocks, Catalina Is.
629-19928	F	K-34	Bullrush Tower	1993	Alive, Seal Rocks, Catalina Is.
629-39815	M	K-80	West End	1998	Alive, Rattlesnake, Catalina Is.
629-39816	M	K-81	West End	1998	Alive, Two Harbors, Catalina Is.
629-39817	F	K-82	Pinnacle Rock	1998	Alive, Two Harbors, Catalina Is.
629-29496	F	K-92	Bullrush Tower	1999	Alive, Pinnacle Rock, Catalina Is.
629-29497	M	K-93	Bullrush Tower	1999	Alive, Middle Ranch, Catalina Is.
629-29498	M	K-01	Pinnacle Rock	2000	Alive, West End, Catalina Is.
629-29499	F	K-02	West End	2000	Alive, Lake Hemet, CA
629-02780	M	K-10	Twin Rocks	2001	Alive, Pelican Harbor, Santa Cruz Is.
629-02782	M	K-11	West End	2001	Alive, Malva Real, Santa Cruz Is.
629-02790	M	K-23	Pinnacle Rock	2002	Alive, British Columbia 4/24/08
629-02793	F	K-26	West End	2002	Alive, Pelican Harbor, Santa Cruz Is.
629-47352	M	K-36	Two Harbors	2003	Alive, East Peak, Catalina Is. 4/5/08
629-47353	M	K-37	Seal Rocks	2003	Alive, San Juan Capistrano, CA 3/9/08
629-47369	F	K-45	West End	2004	Alive, San Diego Co. 1/27/08
629-47371	F	K-47	Seal Rocks	2004	Alive, Rattlesnake, Catalina Is.
629-47395	M	K-51	Pinnacle Rock	2005	Alive, Shark Harbor, Catalina 4/23/08
629-47396	F	K-54	West End	2005	Alive, China Point, Catalina, 3/14/08
629-47398	F	K-56	Seal Rocks	2005	Alive, Salta Verde area, Catalina
629-52401	M	K-61	Seal Rocks	2006	Alive, Oso Lake, Orange Co., CA 2/17/08
629-52408	M	K-64	Pinnacle Rock	2006	Dead, Catalina 8/11/08
629-52430	M	K-76	Twin Rocks	2007	Alive, British Columbia 9/10/08
629-52431	M	K-75	Twin Rocks	2007	Alive, China Pt., Catalina 3/23/08
629-52432	M	K-78	Two Harbors	2007	Alive, Fairfield, CA 2/23/08
629-52433	F	K-79	Two Harbors	2007	Alive, Catalina 3/17/2008
629-52435	M	K-77	Seal Rocks	2007	Dead, off Palos Verdes Peninsula 6/16/08

¹ Determined by karyotyping and/or morphometrics.

² As of 12/31/08. unless otherwise noted.

As of 31 December, 15 of the eagles previously released or naturally hatched on Santa Cruz are being monitored via GPS data and others have been identified during our surveys (Table 6). During 2008, we had two known mortalities of eagles released on the northern Channel Islands in previous years (Table 6).

A-02 Movements

Eagle A-02 spent most of the year on Santa Cruz in her territory on the western portion of the island. She made two trips to Santa Rosa: one from 10 September through 14 October, and the second from 20–27 November (Fig. 12).

A-04 Movements

Eagle A-04 spent all of 2008, up to the time of her death, in or near her territory in the Malva Real area on the south side of Santa Cruz (Fig. 13)

A-17 Movements

Eagle A-17 spent all year on either Santa Rosa or Santa Cruz (Fig. 14). She began the year on Santa Rosa and remained there through at least 2 February. She spent the week of 5-12 February on Santa Cruz, before returning to Santa Rosa. She returned to Santa Cruz around 25 February and was

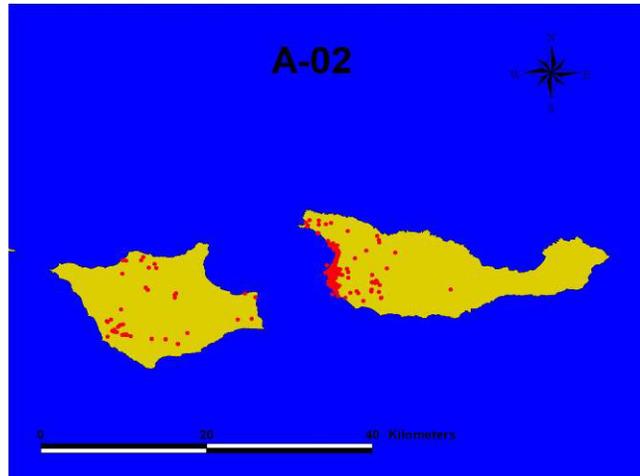


Figure 12. Movements of Bald Eagle A-02 on the California Channel Islands in 2008.

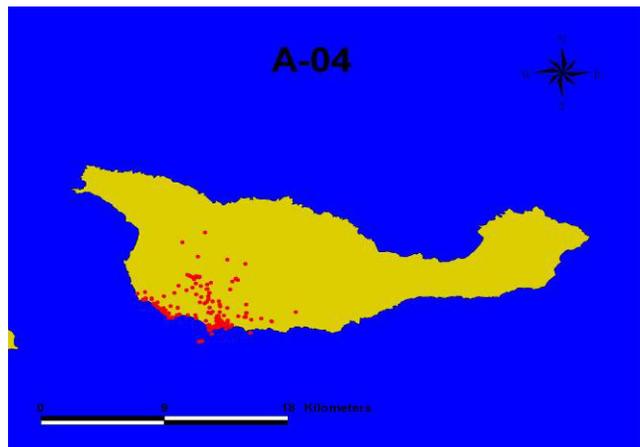


Figure 13. Movements of Bald Eagle A-04 on Santa Cruz Island, California in 2008.

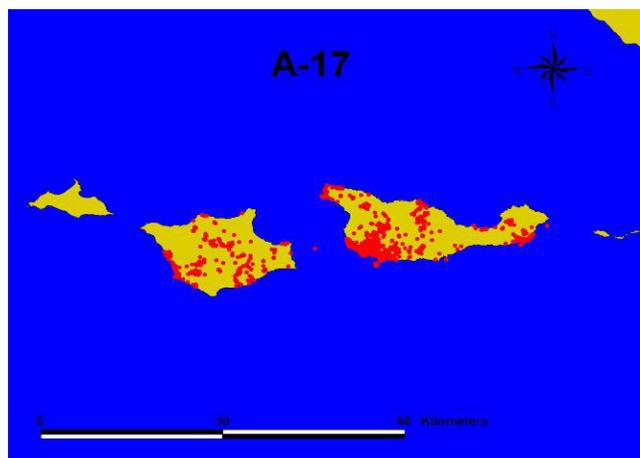


Figure 14. Movements of Bald Eagle A-17 on the California Channel Islands in 2008.

Table 6. Status of bald eagles released or fledged from nests on Santa Cruz Island in 2002-2007 and known to have been alive in 2008.

FWS Leg Band	Sex ¹	Patagial Marker	Source ²	Fledge Year	Status, Latest Location ³
629-02795	M	A-00	Zoo	2002	Alive, Santa Cruz Is.
629-02798†	F	A-02	Zoo	2002	Alive, Santa Cruz Is.
629-14042†	F	A-04	Alaska	2002	Dead on Santa Cruz Is. 4/15/08
629-14045	M	A-08	Alaska	2002	Alive, Santa Rosa Is.
629-14048	F	A-11	Alaska	2002	Alive, Santa Cruz Is.
629-47359	F	A-16	Alaska	2003	Alive, Santa Cruz Is.
629-47360†	F	A-17	Alaska	2003	Alive, Santa Cruz Is.
629-47363	F	A-19	Alaska	2003	Alive, central. California
629-47356	M	A-21	Alaska	2003	Alive, Santa Cruz Is.
629-47365	F	A-22	Zoo	2004	Alive, Santa Rosa Is. 2/20/08
629-47372	F	A-24	Alaska	2004	Alive, Santa Cruz Is.
629-47375	F	A-27	Alaska	2004	Alive, Santa Rosa Is. 12/6/08
629-47376	M	A-28	Alaska	2004	Alive, Santa Cruz Is. 3/1/08
629-47377†	M	A-29	Alaska	2004	Alive, Southern California Mainland
629-47380	F	A-32	Alaska	2004	Alive, Santa Catalina Is.
629-47381†	M	A-33	Alaska	2004	Dead 2/15/08, Ocean off S. Cruz Is.
629-47385†	F	A-34	Zoo	2005	Alive, Santa Rosa Is.
629-47386	F	A-35	Zoo	2005	Alive, Santa Rosa Is. 1/5/08
629-47387†	F	A-36	Zoo	2005	Alive, Santa Rosa Is.
629-47390†	M	A-39	Zoo	2005	Alive, Santa Cruz Is.
629-47391	M	A-40	Zoo	2005	Alive, Santa Cruz Is.
629-47399	F	A-43	Zoo	2005	Alive, Santa Cruz Is. 12/7/08
629-02800	M	A-45	Zoo	2005	Alive, Santa Cruz Is. 12/7/08
629-52404†	M	A-46	Zoo	2006	Alive, Mainland
629-52406†	F	A-48	Zoo	2006	Alive, Santa Rosa Is.
629-52407†	F	A-49	Pelican	2006	Alive, Santa Rosa Is.
629-52410	F	A-51	Zoo	2006	Alive Santa Rosa Is. 9/25/08
629-52411†	F	A-52	Zoo	2006	Alive, Santa Cruz Is.
629-52417†	F	A-55	Zoo	2006	Alive, Santa Rosa Is.
629-52420†	M	A-58	Zoo	2006	Alive, Santa Rosa Is.
629-52421†	F	A-59	Zoo	2006	Alive, Santa Miguel Is.
629-52422†	M	A-60	Malva	2006	Alive, Santa Rosa Is.

¹ Determined by karyotyping for birds from San Francisco Zoo, and morphometrics for Alaskan birds.

² Bald eagles from the San Francisco Zoo (Zoo), wild nests near Juneau, Alaska (Alaska), the Pelican Harbor (Pelican) or Malva Real (Malva) nests on Santa Cruz, or a rehabilitation center in northern California (Rehab).

³ As of 12/31/08, unless otherwise noted.

† Carrying a GPS transmitter.

back on Santa Rosa on 2 March. She returned to Santa Cruz on 12 March and remained until 29 September. During that time she was often within the Malva Real territory and has probably replaced A-04. Between 29 September and 4 December she made four visits to Santa Rosa, each lasting from 6-11 days. She ended the year on Santa Cruz.

A-29 Movements

Eagle A-29 began the year on Santa Rosa, but flew to Santa Cruz around 25 February. He remained on the island until 21 March, at which time he flew to the mainland. He spent the remainder of the year on the mainland, primarily in the Pt. Conception area (Fig. 15).

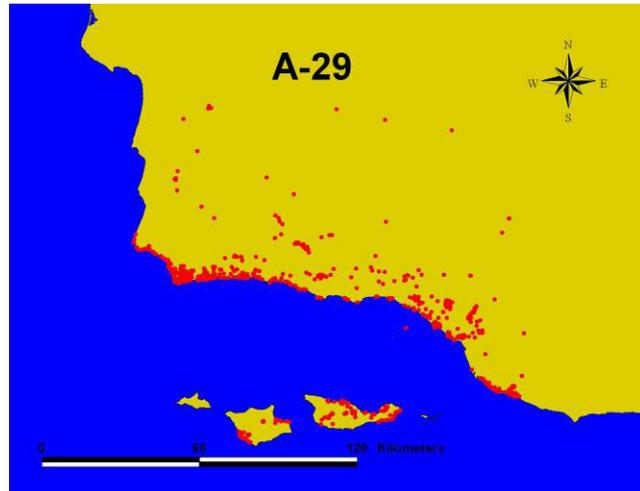


Figure 15. Movements of Bald Eagle A-29 in southern California in 2008.

A-33 Movements

Eagle A-33 spent time on three islands and the mainland before his death in February (Fig. 16). He spent most of January on Santa Rosa, except for a short trip to Santa Cruz on 20-21 January. On 30 January, he flew to Anacapa, before flying to the mainland on 2 February. He returned to Anacapa the same day and stayed there through 4 February. He spent 5-10 February on Santa Cruz, 11-14 February on Santa Rosa, and flew back to Santa Cruz on the afternoon of 14 February. Between 1400 and 1500 hrs on 15 February, he flew approximately 42 km southeast towards Santa Barbara Island. He turned to the northeast and flew another 50 km over a 3-hour period, eventually ending up in the ocean. He likely was flying against a strong headwind for him to cover such a short distance over that period of time. We continued to receive data points floating back towards Anacapa until the morning of 19 February.

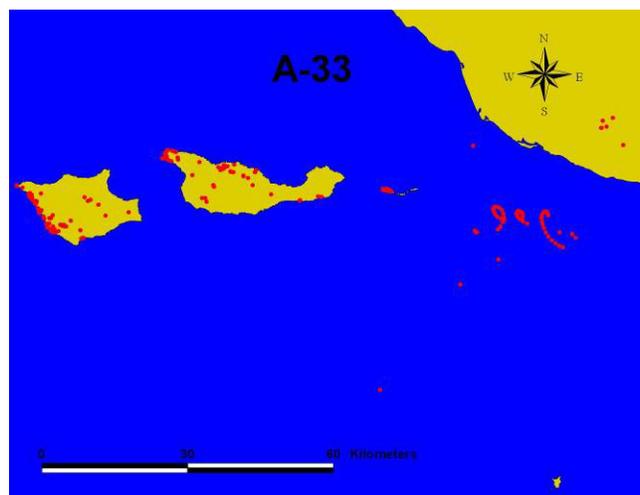


Figure 16. Movements of Bald Eagle A-33 in southern California in 2008.

A-34 Movements

Eagle A-34 flew from Santa Cruz Island to Santa Rosa on 1 January, remaining there until 20 January. She returned to Santa Cruz for four days before flying back to Santa Rosa, where she remained until 5 February. She flew to Santa Cruz on 5 February, then to the mainland, via Anacapa, on 6 February. She returned to Anacapa on 9 February. Between 11 February and 16 April, she visited Santa Cruz four times, Santa Rosa twice, and Anacapa once, never spending more than three weeks on an island. On 16 April, she returned to Santa Rosa and spent most of the remainder of the year there, except for 17 June – 10 July, which was spent on Santa Cruz (Fig. 17).

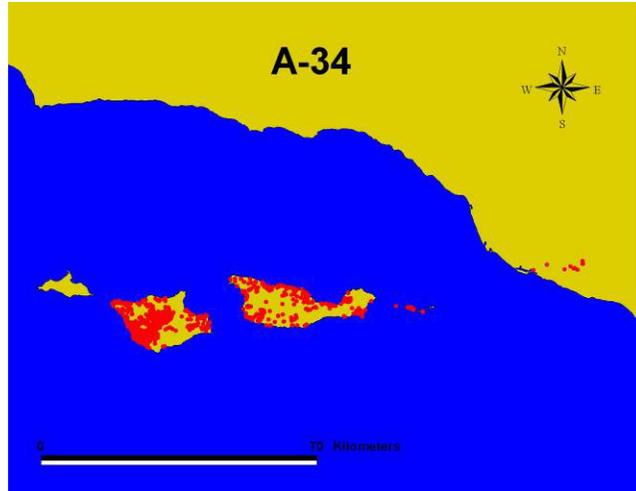


Figure 17. Movements of Bald Eagle A-34 in southern California in 2008.

A-36 Movements

Eagle A-36 remained on the Channel Islands throughout 2008, visiting all four northern Channel Islands at least once (Fig. 18). She began the year on Santa Rosa, but moved back and forth between Santa Rosa and Santa Cruz through mid-February, spending 4-10 days on an island before moving again. On 19 February, she flew to Anacapa, but returned to Santa Cruz two days later. On 26 February, she flew back to Santa Rosa, then made her only 2008 visit to San Miguel Island on 29 February – 1 March. She returned to Santa Rosa on 1 March. Between 11 March and 14 May she regularly visited Santa Cruz, Anacapa, and Santa Rosa, spending 1-14 days on each island. She spent 15 May – 23 December on Santa Rosa, except for three visits to Santa Cruz (1-3 days each) and an 11-day visit to Anacapa in late

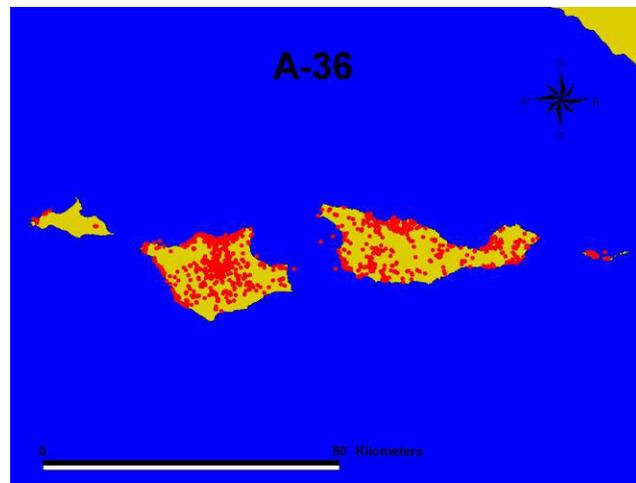


Figure 18. Movements of Bald Eagle A-36 on the California Channel Islands in 2008.

June/early July. She returned to Santa Cruz on 23 December and remained on the island through the end of the year.

A-39 Movements

Eagle A-39 began the year in Washington. He began moving south on 21 February, crossing into Oregon on 24 February (Fig. 19). He stopped in southern Oregon from 1-12 March before crossing into California on 13 March. He arrived on Anacapa on 23 March and spent 24 March – 15 April on Santa Cruz. He moved between Santa Cruz and Santa Rosa regularly between 15 April and 13 June. He spent most of the remainder of the year on Santa Rosa, except for two 1-4 day visits to Santa Cruz in July and November.



Figure 19. Movements of Bald Eagle A-39 in 2008.

A-40 Movements

We received a few GPS points for Eagle A-40 on Anacapa on 17 January, but apparently he dropped his transmitter. He is known to have survived through the year.

A-43 Movements

Eagle A-43 moved frequently among the northern Channel Islands in 2008 (Fig. 20). During January – July she visited Santa Rosa 13 times, Santa Cruz 16 times, Anacapa five times, and San Miguel Island once, spending a maximum of 20 days in a row on any island. On 30 July, she flew from Santa Cruz to Santa Rosa and remained there until she dropped her transmitter on 1 October. She was seen perched on Black Mountain on Santa Rosa on 3 December and flying over the Navy Site on Santa Cruz on 7 December.

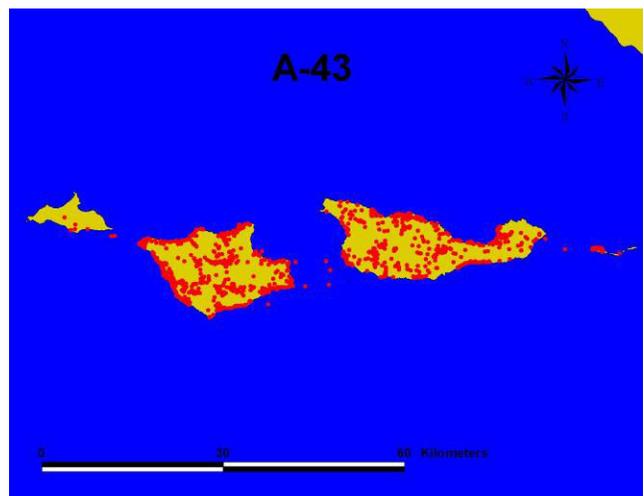


Figure 20. Movements of Bald Eagle A-43 on the California Channel Islands in 2008.

A-46 Movements

Eagle A-46 began the year in Washington. We did not receive any data until 23 January, probably because there was not enough sun to recharge the transmitter. He began moving south soon after we began receiving data. There was another data outage from 1-15 February, at which time he had moved into northern Oregon. He moved into California on 28 February and, after spending two weeks in northeastern California, flew down to the Channel Islands along the western path shown in Figure 21. A-46 arrived on Santa Cruz on 23 March and remained there until 29 April. He flew to Anacapa for five days on 29 April and then returned to Santa Cruz until 23 May. He repeated this Anacapa-Santa Cruz visitation pattern five more times through early September, with the longest stay lasting just over a month (Anacapa, 14 June-16 July). On 10 September, he returned to the mainland, reaching Oregon on 16 September. He remained in central Oregon until 16 December and then began flying south again. He spent the remainder of the year in the Klamath Basin area on the Oregon-California border.

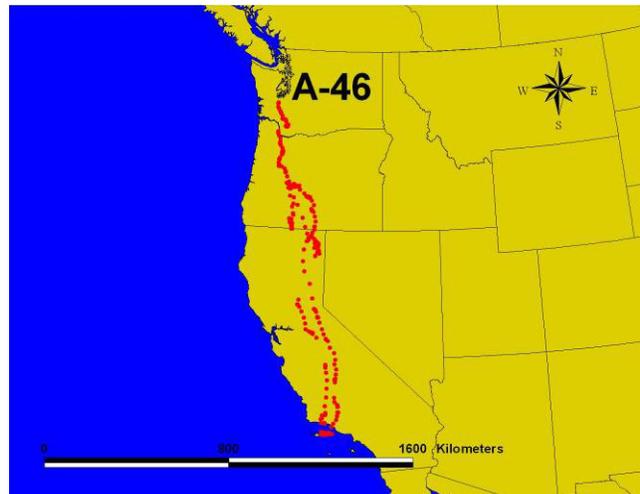


Figure 21. Movements of Bald Eagle A-46 in 2008.

A-48 Movements

Eagle A-48 began the year on Santa Rosa, but by 8 January she had moved to Santa Cruz and was on Anacapa 9-13 January. She returned to Santa Rosa, via Santa Cruz, on 14 January, but returned to Anacapa on 28 January. After returning to Santa Cruz on 31 January she flew to the mainland between 1 and 4 February (no data those days; Fig. 22). She returned to Anacapa late on 4 February, to Santa Cruz on 8

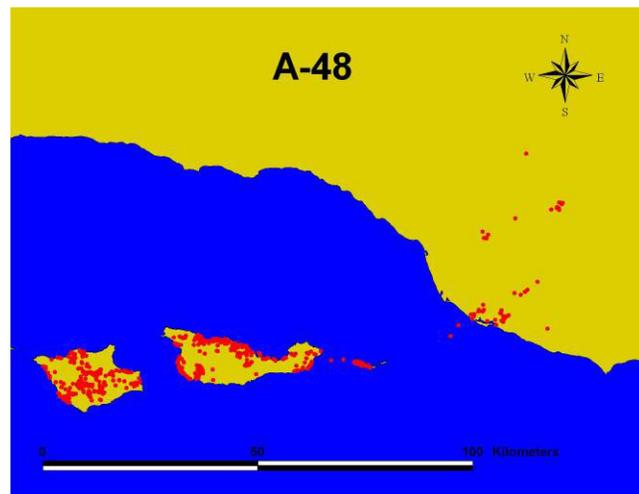


Figure 22. Movements of Bald Eagle A-48 in 2008.

February, and to Santa Rosa on 9 February. On 14 March, she flew along the north shore of Santa Cruz on her way to Anacapa, where she remained until 8 March, except for a visit to Santa Cruz on 23-24 February. Sometime between 9 and 11 March she flew to the mainland, where she stayed until 23 March, before returning to Anacapa. She spent most of her time on Anacapa through early September, except for five visits to Santa Cruz, each lasting up to nearly three weeks. On 11 September, she returned to Santa Rosa, where she remained through the year, except for a 3-day visit to Santa Cruz in mid-December.

A-49 Movements

Eagle A-49 (aka Cruz) was the first known eagle to hatch naturally on the California Channel Islands since 1950 (Pelican Harbor nest, 2006). She spent January on Santa Rosa, except for a 5-day visit to Santa Cruz and Anacapa mid-month. She moved to Santa Cruz on 31 January and to Anacapa on 2 February. She returned to Santa Cruz on 4 February, before visiting the mainland on 5-9 February. Early on the afternoon of 9 February she made a 45 km flight across the ocean back to Santa Cruz, covering the distance in ≤ 1 hr. She spent the rest of the year on the islands. Most of February through May was spent on Santa Cruz, with six visits to Anacapa lasting 1-5 days. From 24 May – 12 July she stayed on Anacapa, except for a 3-day visit to Santa Cruz. The rest of the year was spent traveling back and forth between Santa Cruz and Santa Rosa (six visits to each island), ending the year on Santa Rosa (Fig. 23).

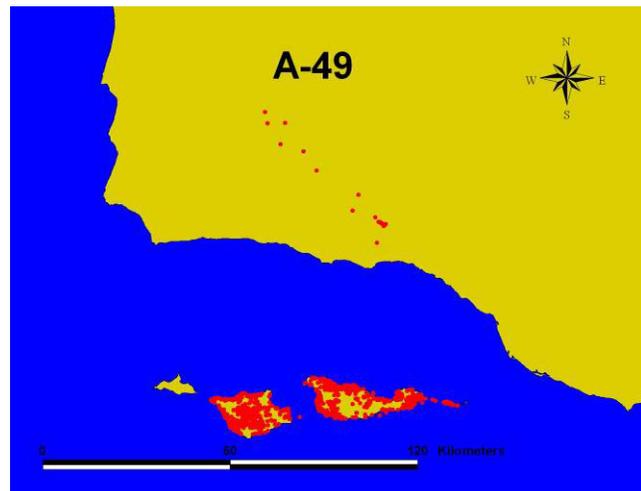


Figure 23. Movements of Bald Eagle A-49 in 2008.

A-52 Movements

Eagle A-52 began the year on Santa Rosa, but moved to Anacapa on 7 January. On 21 January, she made a flight to the mainland, but returned to Anacapa 4-5 hours later. She made a short trip to Santa Cruz on 24-28 January, and to Santa Rosa on 28-29 January. She returned to Anacapa on 30 January and spent most of the next seven months on that island. However, she did make 11 trips to Santa Cruz, lasting from 1-18 days, and a 5-day visit to Santa Rosa in late

August. On 2 September, she moved to Santa Cruz, and then on to Santa Rosa on 5 September. She spent most of the remainder of the year on Santa Rosa, but made four trips to Santa Cruz, lasting 3-13 days, and a 1-hour visit to San Miguel Island on 23 October (Fig. 24).

A-55 Movements

Eagle A-55 spent January on Santa Rosa. She moved to Santa Cruz on 3 February and then spent two days on Anacapa beginning on 6 February (Fig. 25). The rest of the month she moved between Santa Cruz and Santa Rosa. She left Santa Rosa on 8 March and moved back to Santa Cruz for six days. She moved back and forth between Anacapa and Santa Cruz through 18 August, at which time she moved to Santa Rosa. She remained on Santa Rosa through 3 November, before returning to Santa Cruz for the rest of the month. She returned to Santa Rosa on 3 December and remained there through the rest of the year, with the exception of a 5-day visit to Santa Cruz on 22-27 December.

A-58 Movements

Eagle A-58 was one of the eagles that visited some of the southern Channel Islands in 2008 (Fig. 26). He spent most of January

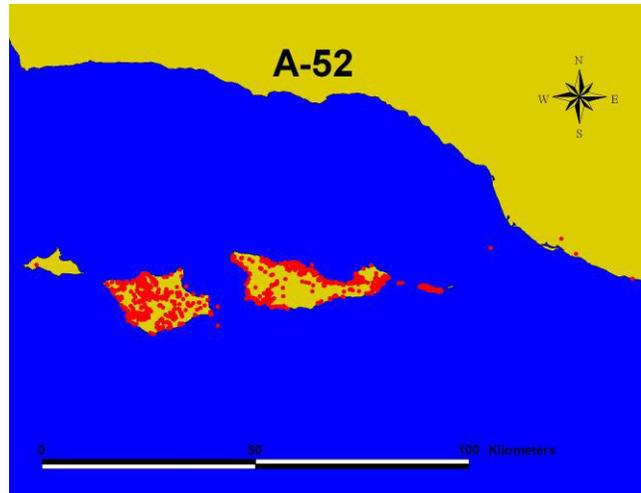


Figure 24. Movements of Bald Eagle A-52 on the California Channel Islands in 2008.

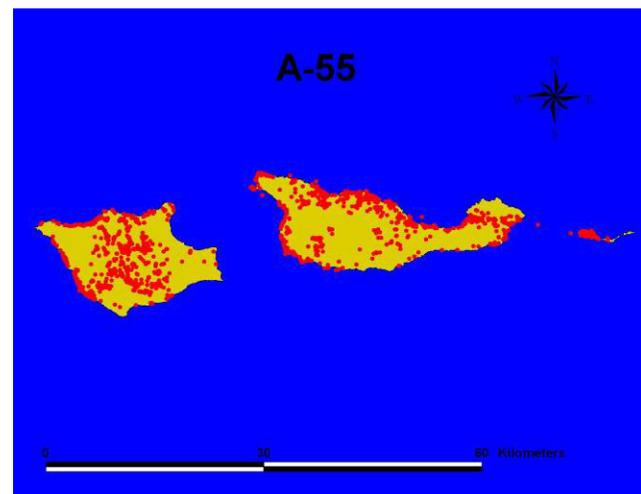


Figure 25. Movements of Bald Eagle A-55 on the California Channel Islands in 2008.

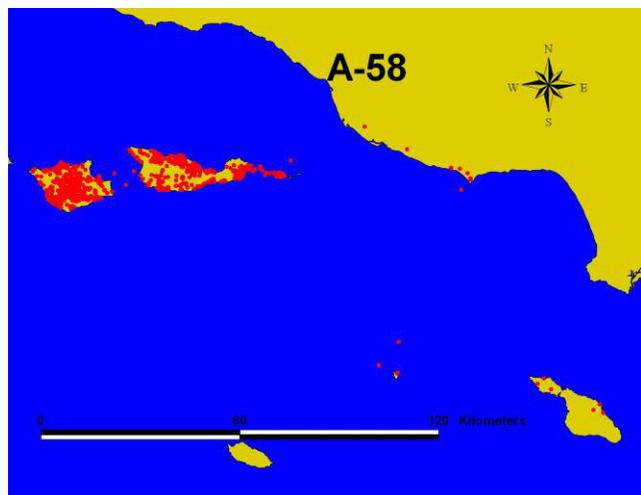


Figure 26. Movements of Bald Eagle A-58 in 2008.

on Santa Rosa, but did make a 5-day visit to Santa Cruz late in the month. On 3 February, he flew to Santa Cruz and Anacapa. The afternoon of 4 February he was on Catalina. On 5 February, he flew to Santa Barbara Island and then to the mainland. He returned to Anacapa on 7 February and remained there through 27 March. He spent most of his time through 3 August on Anacapa, but made regular trips to Santa Cruz, lasting 1-13 days, a week-long visit to Santa Rosa beginning on 24 May, and a 2-day visit to Santa Rosa on 9 June. On 3 August, he moved to Santa Cruz, then flew to Santa Rosa the next day. He returned to Santa Cruz on 6 August and spent 7-16 August on Anacapa, except for a 4-hour trip to Santa Cruz. He returned to Santa Rosa on 17 August and spent most of the remainder of the year there, except for several trips to Santa Cruz, which lasted from several hours to several days each.

A-59 Movements

Eagle A-59 began the year on San Miguel, but moved to Santa Rosa on 7 January (Fig. 27). She remained on Santa Rosa until 23 January, moved to Santa Cruz, then returned to Santa Rosa from 26 January to 13 February. She moved to Santa Cruz on 13 February and then to Anacapa on 14 February. Through 9 September, she spent most of her time on Anacapa, but did make repeated visits to Santa Cruz (8 trips, 2-19 days each). On 9 September, she flew to Santa Cruz, before moving to Santa Rosa on 23 September. She remained on Santa Rosa through 29 December, but ended the year back on San Miguel Island.

A-60 Movements

Eagle A-60, the other eagle to successfully hatch and fledge in 2006, began the month on Santa Rosa (Fig. 28). He flew to

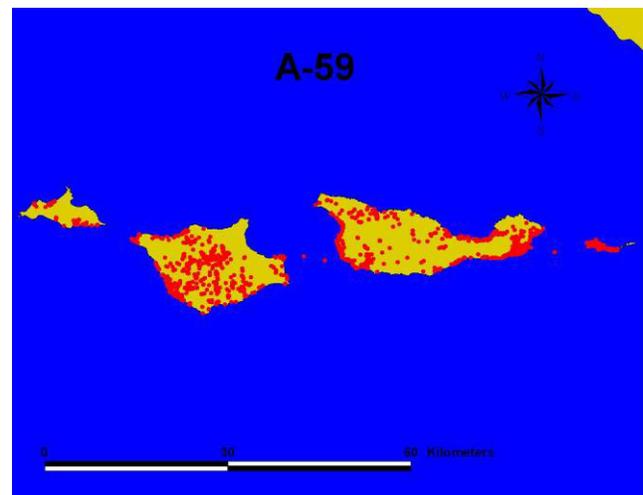


Figure 27. Movements of Bald Eagle A-59 on the California Channel Islands in 2008.

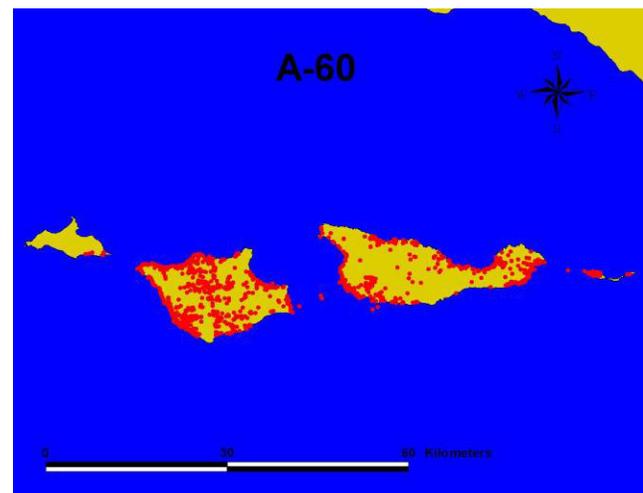


Figure 28. Movements of Bald Eagle A-60 on the California Channel Islands in 2008.

Santa Cruz on 24 January, Anacapa on 29-30 January, back to Santa Cruz on 31 January, and finally returned to Santa Rosa on 4 February. He remained on Santa Rosa through 19 February, then flew to Santa Cruz for two days, before moving to Anacapa. He spent 26-28 February on Santa Cruz, 28-29 February on Anacapa, then returned to Santa Rosa, via Santa Cruz, on 29 February. He returned to Santa Cruz on 12 March, and remained on Santa Cruz until 8 April, except for a 6-7 hour visit to Anacapa on 16 March, and a visit to Santa Rosa on 23-24 March. He then moved to Anacapa through 13 August, making eight 3-8 day visits to Santa Cruz during that period. He returned to Santa Cruz on 13 August, before returning to Santa Rosa on 17 August, where he spent most of the remainder of the year. He did make several short trips to Santa Cruz in October and December.

Overall Island Use

Because the birds move freely among the islands and to the mainland, the GPS units are the most effective way to monitor the released birds. During 2008, we received 63,523 GPS locations on the islands from 22 different eagles that spent at least part of the year on the northern Channel Islands.

The time eagles spent on each of the northern Channel Islands was correlated with the time of the year. They spent more time on Santa Cruz during February through May, and more time on Anacapa in June and July. In January and from August through December eagles spent more of their time on Santa Rosa (Fig. 29).

Trapping

We were unsuccessful at trapping any eagles in 2008. We attempted to trap the Middle Ranch birds on Catalina using a floating-fish noose on three days (5 September, 9-10 October). The birds made several passes at the fish, but were never caught in the nooses. We used the floating fish noose to try to capture the Saucos, Cueva Valdez, and Pelican Harbor adults on Santa Cruz on seven days in September and October. Although there were attempts to grab the fish, many times the adults appeared uninterested. Besides the floating fish noose, we set a net launcher over a pile of fish on Saucos beach to target the Saucos pair on 15-16 September. The adults flew over the set several times, but never landed at the set.

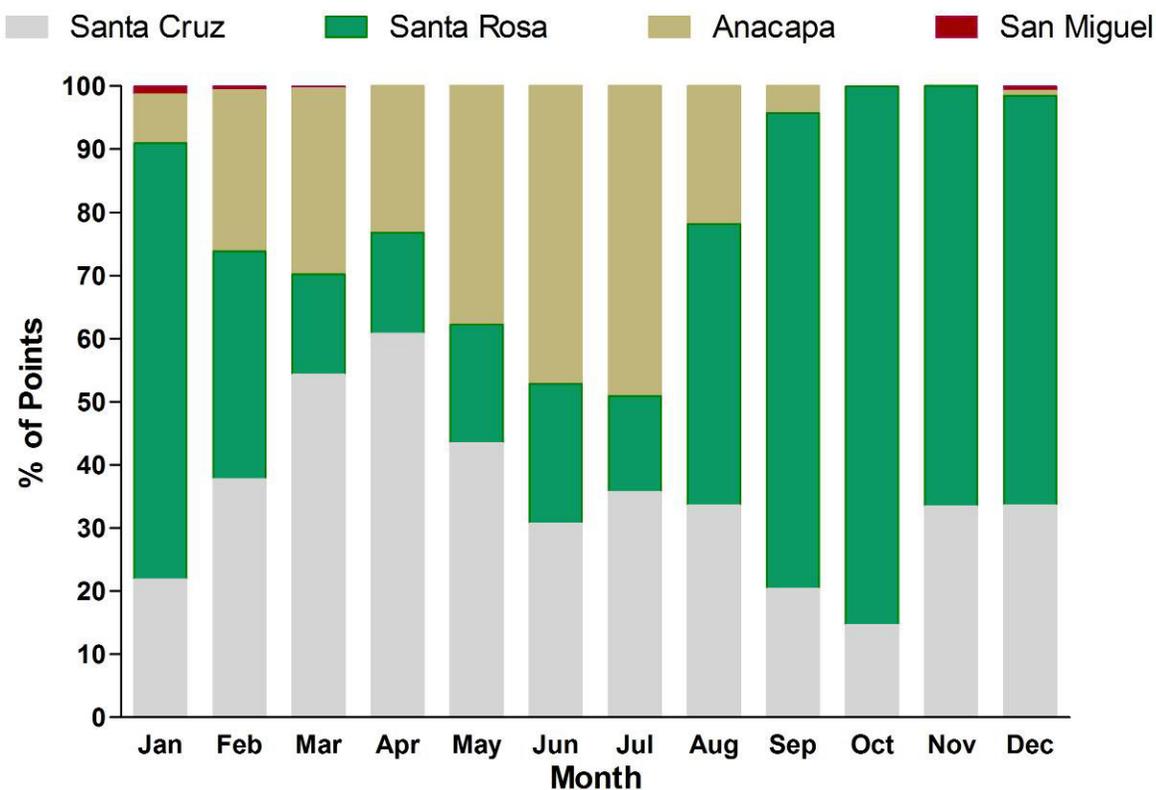


Figure 29. Use of the northern Channel Islands, California by bald eagles during 2008. The bars represent the mean percent of time spent on each island as determined by GPS data.

DISCUSSION

Eagles on Catalina successfully hatched six of an estimated seven eggs left in their nests (85.7%) in 2008. It was surprising that even the nest with the historically highest DDE contamination in their eggs (West End) successfully hatched a chick. Because of the natural hatching success in 2008, we will leave all eggs in the Catalina nests in 2009 to determine whether they can continue to hatch their own eggs without human assistance.

The eagles on Santa Cruz and Santa Rosa did not have much success in 2008. Only 50% of nests hatched chicks, and none of the chicks successfully fledged from the nests. We observed the failure of the Pelican Harbor nest via our webcam, and it is assumed that another female was responsible for the failure of the Malva Real nest. This female, A-17, has remained in the Malva Real area and we believe that she will replace the deceased female. Even though there were no successful fledges from nests on the northern Channel Islands this season, the eagles are continuing to hatch eggs, indicating that DDE contamination is not causing complete hatching

failure. Analyses of the Trap Canyon eggs may help shed light on the cause of their failure.

There was a similar pattern in island use in 2008, as compared to previous years (Sharpe 2008). Many young, non-territorial eagles moved to Anacapa during the late spring and early summer and are believed to have been feeding on the many sea birds that breed on West Anacapa Island. As the breeding season drew to a close in late summer, the eagles once again moved to Santa Rosa at a time that corresponded with the start of fall hunting on that island, where we believe mule deer (*Odocoileus hemionus*) and Roosevelt elk (*Cervus canadensis*) carcasses and/or gut piles become readily available. The higher use of Santa Rosa and Santa Cruz throughout the year, as compared to 2007, is likely because some of the older birds with functioning transmitters are breeding or setting up territories on those islands. As the population continues to age, we expect that there will be less seasonal movement between the islands.

We expect the number of nests to increase on Catalina, Santa Cruz, and Santa Rosa in 2009. There is a pair at Middle Ranch Reservoir on Catalina comprised of a 1999 Catalina male (K-93) and a 2004 Santa Cruz female (A-32) that we expect to breed after being together for nearly two years. Assuming all the other nesting pairs attempt to nest again, this will bring the number of breeding pairs on Catalina to at least seven. There are 2-3 additional pairs that we observed on Santa Cruz in 2008 that did not breed. Therefore, we could have 5-7 pairs on Santa Cruz in 2009. Although no other pairs were observed on Santa Rosa in 2008, we could have younger birds form pairs for the 2009 breeding season. Therefore, in 2009, we could have 15 or more breeding pairs on the California Channel Islands.

RECOMMENDATIONS

We expect additional pairs of eagles to form and begin reproducing in 2009 and recommend that continued efforts be made to search for nesting eagles on the Channel Islands. Personnel should spend February through May surveying Catalina, Santa Cruz and Santa Rosa. A helicopter survey should be made of all four northern Channel Islands in mid-March to search for nests that may not be visible from shore. If feasible, a boat or helicopter survey should be made on Catalina, as much of the western coast is difficult to observe from land.

We recommend making a more targeted trapping effort in 2009 using the floating-fish noose method. Birds that are not actively breeding can be targeted starting in June, when sea

conditions may be better for getting around the island on a small zodiac. If we can get transmitters on at least one adult of most breeding pair, then we could reduce the personnel needed to search for and monitor these pair for the 2010 season.

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