

**Bald Eagle Restoration on the California Channel Islands**  
**January — December 2010**  
**9<sup>th</sup> Annual Report**



Restoring Natural Resources  
harmful by DDTs and PCBs

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**9<sup>th</sup> Annual Report**

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## EXECUTIVE SUMMARY

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

The Institute for Wildlife Studies (IWS) began bald eagle restoration efforts on Santa Catalina Island in 1980, but residual DDT continued to impact the birds and successful reproduction was inhibited. In 2002, IWS initiated a 5-year bald eagle restoration feasibility study on Santa Cruz Island, in cooperation with the National Park Service, to determine whether the eagles could reproduce successfully if located further from the primary DDT source off the Palos Verdes Peninsula. IWS released 61 eagles on Santa Cruz Island from 2002-2006. In 2006, the first known nesting attempts occurred on the northern Channel Islands. Two pair of eagles successfully fledged one chick each from nests at Pelican Harbor and Malva Real on Santa Cruz Island. Since 2006, there have been successful hatchings on Santa Cruz, Santa Rosa, and Santa Catalina Islands and IWS has not manipulated eggs or nestlings at any nest on Santa Catalina Island since 2008.

In 2010, there were seven known nesting attempts on Santa Catalina Island, four on Santa Cruz Island, and two on Santa Rosa Island. A total of 15 chicks hatched (nine on Catalina, four on Santa Cruz, two on Santa Rosa) in 11 nests. On Santa Catalina Island, single chicks were produced at the Pinnacle Rock, Middle Ranch, and Seal Rocks nests. The Two Harbors, Rattlesnake, and West End nests each produced two chicks. The Twin Rocks nest failed after about three weeks of incubation. This year was the first nesting attempt in the Middle Ranch territory and the first successful attempt in the Rattlesnake territory. All Santa Catalina chicks successfully fledged, but five of the fledglings died within a day to a month of their first flight.

On Santa Cruz Island, the Saucos pair hatched and fledged their first chick, the Pelican Harbor pair hatched and fledged two chicks, and the Cueva Valdez pair hatched and fledged a single chick in their first known breeding attempt. The Malva Real pair nested in a pine tree on

Carl Peak, which was located at an elevation of about 350 m and 3 km inland, but the nest failed after about three weeks.

On Santa Rosa Island, the Trap Canyon pair built a new nest in an unnamed canyon east of Verde Canyon and successfully hatched and fledged a single chick in their third nesting attempt. A new pair, the Lopez Canyon pair, successfully hatched and fledged a single chick in their first known nesting attempt.

As of the end of December 2010, there are approximately 52 bald eagles on the California Channel Islands. There are 34 known eagles on the northern Channel Islands, including five originally released on Santa Catalina Island. Eighteen 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 2010. Twelve other eagles (eight from Catalina, four from Santa Cruz) are either being tracked on the mainland via their GPS transmitters (2 birds) or were sighted on the mainland in 2010.

Bald eagles have continued to visit Anacapa Island more frequently in the spring and summer and Santa Rosa Island in the late summer through early winter. These time periods correspond with the sea bird breeding season on Anacapa Island and the guided hunts of mule deer (*Odocoileus hemionus*) and elk (*Cervus canadensis*) on Santa Rosa Island.

The successful hatching of bald eagles on three of the Channel Islands in 2010, coupled with the high survival and retention rates and continued addition of new breeding territories are reason for optimism regarding the success of the bald eagle restoration program. The eagles are moving freely among the islands (they are known to have been on all but San Nicolas Island in 2010), so as the population continues to grow it is likely that bald eagles will eventually be found on all the California Channel Islands, as they were historically. There could be 15 or more active nests on the Channel Islands in 2011, including the possibility of nesting attempts by the first two naturally produced chicks from the 2006 season (A-49 and A-60), as they will be five years old next season.

## **ACKNOWLEDGMENTS**

IWS thanks the National Park Service (NPS), U.S. Fish and Wildlife Service (FWS), California Department of Fish and Game, National Oceanic and Atmospheric Administration (NOAA), The Nature Conservancy, the U.S. Navy, and the Ventura County Office of Education. We also would like to thank this year's field crew: S. Jijon, S. Eyes, D. Jones, H. Johnson, and K. Smith. D. Jones assisted in creating maps of the eagles' movements for this report. Funding for the project was made available by the Montrose Settlements Restoration Program.

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# INTRODUCTION

Bald eagle (*Haliaeetus leucocephalus*) restoration began on the California Channel Islands in 1980 after they were extirpated from the Channel Islands by the early 1960s. Although human persecution likely played a role in their demise, the introduction of the organochlorine pesticide DDT into the Southern California Bight (Fig. 1) is what is believed to have led to the disappearance of bald eagles from the islands. 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), California Department of Fish and Game, and the Santa Catalina Island Conservancy, initiated reintroduction efforts on Santa Catalina Island, California (Catalina; Fig. 1). 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 by the initial breeding pairs 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.

From 1989 through 2006, the reintroduced population on Catalina was maintained entirely through manipulations of eggs and chicks at each nest site and through additional hacking of birds. In the egg manipulation process, artificial eggs were substituted for the structurally deficient eggs laid by the birds affected by DDE. The adult eagles continued to incubate the artificial eggs while the removed eggs were relocated and artificially incubated. Chicks that hatched from these removed eggs, or those produced by captive adults at the Avian Conservation Center (ACC) at the San Francisco Zoo, were then fostered into the nests. As a result of increased hatching success during artificial incubation during 2005 and 2006, and natural breeding on Santa Cruz Island (Santa Cruz) in 2006 (see below), we began leaving eggs in some Catalina nests in 2007. To date, all the breeding pairs have hatched at least one chick naturally and we stopped removing eggs from nests after 2008.

From 1989 through 2010, adult bald eagles on Catalina successfully reared 84 of 95 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 (27 chicks). Four of these 95 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 were released through continued hacking activities between 1991 and 2001 (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 on Santa Cruz from 2002-2006. In 2006, two separate pairs on Santa Cruz 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. In 2008, four chicks hatched in two nests on Santa Cruz, but two chicks died at the nest and two others were knocked out of the nest by a subadult eagle. These last two chicks were rescued and later hacked onto the island. In 2009, only two chicks hatched on the northern Channel Islands (Pelican Harbor nest), but they both died at about 3 days of age.

Although the bald eagle restoration projects were initially considered to be independent programs, the Montrose Settlements Restoration Program combined the two restoration projects into a single program at the end of 2007. In 2010, we monitored all known bald eagle nests on

the Channel Islands and searched for additional breeding eagles. In this report we summarize the results of the 2010 bald eagle season.

## STUDY AREA

Our 2010 monitoring was conducted on Catalina, 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 km<sup>2</sup> (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).

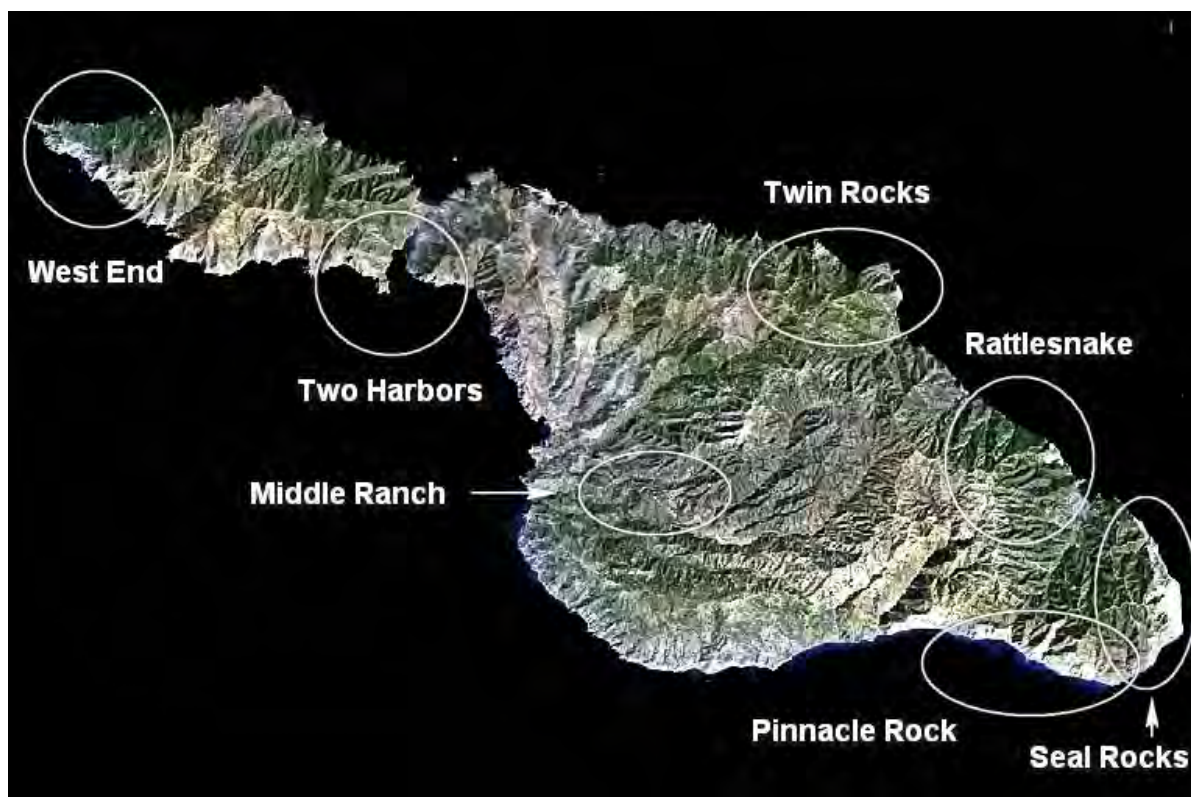


Figure 2. Santa Catalina Island, CA and the active bald eagle breeding territories in 2010.

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 km<sup>2</sup> 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.



**Figure 3. Santa Rosa (left) and Santa Cruz (right) Islands, CA and the active bald eagle territories in 2010.**

Santa Rosa is the second largest of the Channel Islands and is owned by the NPS. The island encompasses approximately 214 km<sup>2</sup> 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>).

## METHODS

### Permitting

IWS has the required Federal Fish and Wildlife Permit (Permit TE744878-8) and a Memorandum of Understanding with the California Department of Fish and Game to conduct bald eagle research on the California Channel Islands. IWS has a banding permit from the United States Geological Survey's Bird Banding Laboratory allowing us to band and radio-tag eagles.

## Surveying and Nest Monitoring

Observations of adult eagles began in January at each of the nest sites. We also conducted weekly ground surveys of Catalina and Santa Cruz to locate new nesting pairs. Because of logistics, we only surveyed Santa Rosa about one week per month. For the northern Channel Islands, we mapped our survey routes in Arcview so that survey crews could more easily identify areas that needed to be searched. 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 three nests on Catalina (West End, Rattlesnake, and Two Harbors nests) and two nests on Santa Cruz (Pelican Harbor and Sauces nests), which enabled close, remote observations of nesting activity. The West End, Two Harbors, and Pelican Harbor nests were available for live viewing on our website (<http://www.iws.org>). In addition, the Pelican Harbor nest was streamed on the Channel Islands Live! site ([http://chil.vcoe.org/eagle\\_cam.htm](http://chil.vcoe.org/eagle_cam.htm)).

We used radio-telemetry (all islands) and GPS-PTT transmitters (Microwave Telemetry Inc., Columbia, MD; 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, a minimum of once per week through December, or until they left the islands. For eagles banded on Catalina, we attached a VHF transmitter (Communications Specialists, Inc., Orange, CA) that transmitted a signal once per second, but also transmitted a unique identifier once per hour that could be received by remote telemetry towers on Catalina and San Nicolas islands. When a tower received a signal, the data were transmitted to Communications Specialists, where they were integrated into a web page that we could access to determine which birds were identified and which tower(s) received the signal. We were able to manually locate the birds for visual monitoring using a VHF telemetry receiver (R-1000; Communications Specialists, Inc., Orange, California). If the transmitter failed to move for 2-6 hours, then it switched to mortality mode (2-3 pulses/second) and indicated a mortality signal in its hourly transmission. The GPS-PTT units record GPS locations of the bird up to 14 times per day and then upload the data to a satellite approximately every three days. The data can then be retrieved via computer from Argos, Inc. (Largo, Maryland). We checked for new data daily and any bird that had not moved more than 50 m in a day was immediately located to determine its status.

## **Marking and Sampling**

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

## **Monitoring of Previously Released Eagles**

We closely monitored the status of all GPS-tagged eagles fledged in previous years. On Catalina, as we went about our other activities, we used vehicle-based telemetry units to scan for previously released eagles that had stayed on or returned to the island. During monitoring and other field work we searched for other eagles that were no longer carrying functioning transmitters. We also kept records of reported sightings from observers around the islands and on the mainland.

# **RESULTS**

## **Surveying and Nest Monitoring**

### ***Santa Catalina Island***

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

*Twin Rocks Territory.* The territory was used by the same pair that used it from 1998-2009 (Fig. 2). 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 used their 2009 nest located on an inaccessible cliff face and were seen at the nest several times during January and February. Based upon observed incubation behavior, the first egg was laid around 19 February. We were never able to see the egg(s) in the nest from our nearest observation point, which was nearly 1.5 km away. On 12 March, the adults were no longer incubating. We monitored them for the next few months, but they did not renest.

Table 1. Biographical data for bald eagle chicks hatched at nests on Santa Catalina Island, CA during 2010.

Federal Band	Sex	Wing Tag	Date Fledged	Territory	Status <sup>a</sup>	Comments
679-03431	F	K-05	~6/23/10	Seal Rocks	Unknown	Left Catalina around 8/10
679-03433	F	K-04	6/23/10	Two Harbors	Alive	Left Catalina around 8/7
679-03434	M	K-06	6/23/10	Two Harbors	Unknown	Left Catalina around 7/26
679-03437	F	K-09	~6/27/10	Rattlesnake	Dead	Found dead on 7/7
679-03438	M	K-96	~7/1/10	Rattlesnake	Dead	Found dead on 7/7
679-03439	F	K-95	~6/27/10	Pinnacle Rock	Unknown	Left Catalina around 8/12
679-03441	M	K-07	7/10/10	West End	Dead	Found dead in ocean 8/8
679-03442	M	K-08	7/7/10	West End	Dead	Mortality signal from ocean on 7/17
679-03445	M	K-98	7/16/10	Middle Ranch	Dead	Found dead near nest on 7/17

<sup>a</sup> As of 12/31/10

*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 female was not marked with patagial tags, but is believed to be a bird released at the Sweetwater hacktower in 1986. This nest was monitored primarily via our live web cam and birds were regularly seen at the nest throughout February. The first egg was laid on 8 March and the second on 12 March. The eggs hatched on 13 and 16 April.

We entered the nest on 10 June to

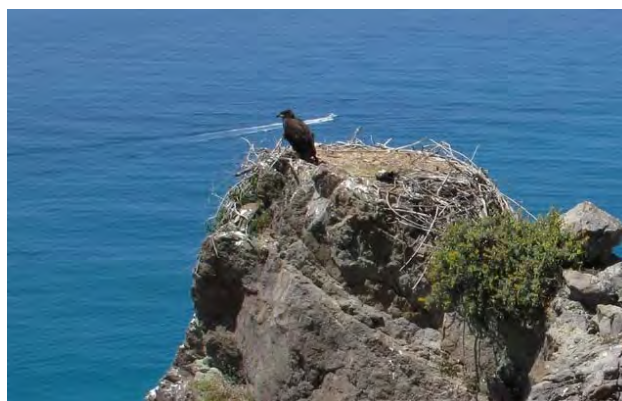


Figure 4. The West End chicks at the time of banding, Santa Catalina Island, CA, 2010.

equip the birds with leg bands, transmitters, and wingmarkers, and to obtain blood samples (Fig. 4, Table 1). We continued to monitor the birds until they fledged between 7 and 10 July. We got a mortality signal from one of the fledglings (K-08) coming from the direction of the mainland on 17 July. On 8 August, a fisherman found the other fledgling (K-07) dead in the ocean off the Palos Verdes Peninsula. The eagle was returned to Catalina and we sent it to the National Eagle Repository in Commerce City, Colorado.

After the breeding season, K-01 disappeared from the territory. Starting on 14 September, male K-51, who had previously been on San Clemente Island, began spending time at the nest. He was seen at the nest with the female almost daily through the end of the year, so it appears that there will be a new male for the 2011 nesting season.

*Pinnacle Rock Territory.* The Pinnacle Rock pair used the same nest as in 2009. The female, K-56, was hatched from a Seal Rocks egg and fostered into the Seal Rocks nest in 2005. The male, K-65, was hatched at the Bulrush tower in 1986. We observed the female in incubation posture on 19 February and confirmed the first and second eggs on 20 and 23 February, respectively. One egg disappeared around 15 March, but the remaining egg hatched between 1930 on 29 March and 1200 on 30 March.



**Figure 5. The Pinnacle Rock chick at the time of banding, Santa Catalina Island, CA, 2010.**

We entered the nest on 29 May and equipped the eaglet with a leg band, wingmarkers, and a transmitter, and collected blood for contaminants analyses (Fig. 5; Table 1). The eaglet fledged around 27 June and was last located on the island on 12 August.

*Seal Rocks Territory.* The Seal Rocks pair used the same nest as in 2009. The female, K-34, is from the captive ACC eagles and was hatched at the Bulrush tower in 1993. The male, K-25, hatched from an egg from the West End territory and was fostered into the Pinnacle Rock nest in 1992. The eagles were seen incubating their first egg on 18 February and laid a second egg around 20 February. One of the eggs disappeared around 15 March, but the remaining egg hatched on 26 March.

We entered the nest on 21 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 18 June (Fig. 6, Table 1). The bird remained on the island until approximately 10 August, at which time we no longer picked up its signal.



**Figure 6. The Seal Rocks chick at the time of banding, Santa Catalina Island, CA, 2010.**

*Two Harbors Territory.* The Two Harbors pair used the same nest as last season. The male, K-81, is an ACC-produced eagle that was fostered into the West End nest in 1998. The female, K-82, hatched from an egg removed from the West End nest in 1998 and was fostered into the Pinnacle Rock nest. The nest was monitored primarily via our live web cam. Activity was noted at the nest throughout February and the female laid her first egg on 17 February. A second egg was laid on 21 February and the eggs hatched on 27 and 28 March.

We entered the nest on 24 May to install a leg band, transmitter, and wingmarkers on each chick, and to obtain blood samples (Fig. 7, Table 1). Both eaglets appear to have fledged on 23 June, which was the first day flight was seen via the web cam. We saw K-04 visiting the nest area through 7 August and the last date it registered on our remote telemetry towers was 30 July (it was found injured in Washington State in February 2011). Eagle K-06 was last seen on the nest on 22 July and the last data point from our remote tower was on 26 July. We assume both birds left the island soon after their last sighting or data point.



**Figure 7. The Two Harbors chicks at time of banding, Santa Catalina Island, CA, 2010.**

*Rattlesnake Territory.* The Rattlesnake pair returned to the nest in Gallagher's Canyon where they attempted breeding in 2008. The male, K-80, was produced by eagles at the ACC in 1998 and was fostered into the West End nest. The female, K-47, was produced by eagles at the ACC

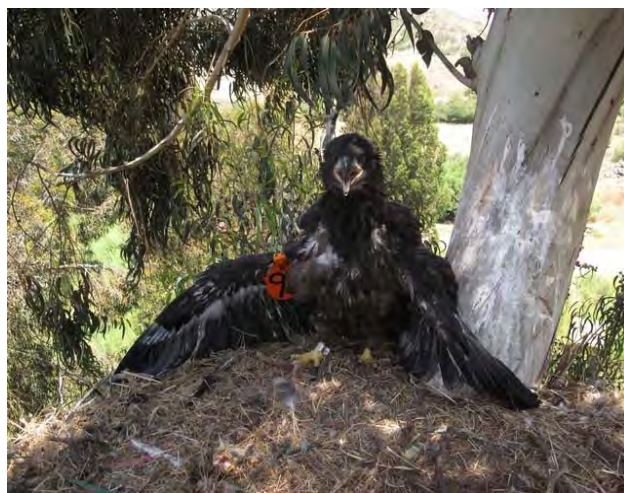
in 2004 and was fostered into the Seal Rocks nest. The first egg was seen in the nest on 20 February and a second egg was seen on 23 February. One of the chicks hatched on 29 March and the second hatched on 1 April.

We entered the nest on 28 May to install a leg band, transmitter, and wingmarkers on each chick, and to obtain blood samples (Fig. 8, Table 1). The first eaglet fledged around 27 June and the second one fledged around 1 July. The adults were observed bringing prey items to the nest area, but on 7 July we received mortality signals from both eaglets. After a couple hours of searching, we located both dead eaglets underneath bushes about 100 m from the nest and 50 m apart. They were sent to the National Wildlife Health Center in Madison, Wisconsin for necropsy, but they were unable to determine a cause of death. However, they did rule out our primary concern, West Nile virus, as the cause of death. No evidence of internal injuries was found.



**Figure 8. The Rattlesnake chicks at the time of banding, Santa Catalina Island, CA, 2010.**

*Middle Ranch Territory.* The Middle Ranch pair used the nest that was started in 2009. The male, K-93, was produced by eagles at the ACC in 1999 and was hacked at the Bulrush hacktower on Catalina. The female, A-37, also was produced by eagles at the ACC in 2005 and hacked from the South Tower on Santa Cruz. A-37 replaced A-32, the 2009 Middle Ranch female, sometime during late 2009 or early 2010. We first saw the eagles in incubation posture on 29 March. We were unable to see into the nest bowl, so we do not know how many eggs were laid. One chick hatched on 3 May.



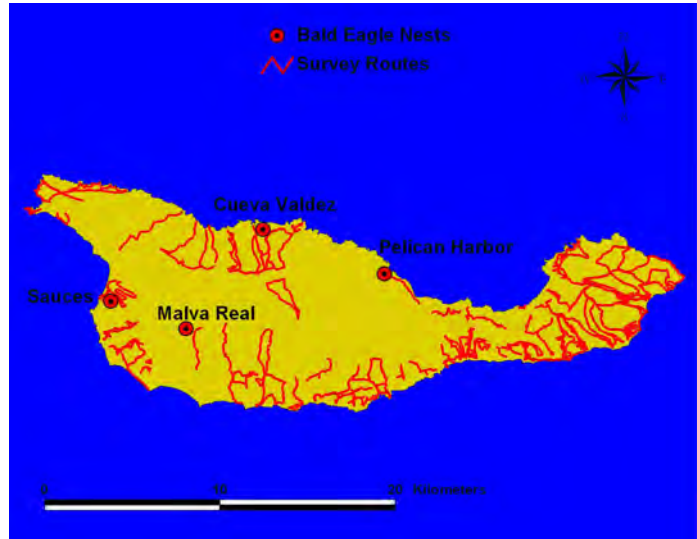
**Figure 9. The Middle Ranch chick at the time of banding, Santa Catalina Island, CA, 2010.**

We entered the nest on 28 June to install a leg band, transmitter, and wingmarkers on the eaglet, and to obtain blood samples (Fig.

9, Table 1). The eaglet fledged around 16 July, but was found dead the evening of 17 July on a hillside near the nest. Because of the similarity to the deaths of the Rattlesnake chicks, this eagle also was sent to Madison for necropsy. Necropsy results indicated the likely cause of death was dehydration. The high temperature on 16 July was 96° F, which set a new record for that date that exceeded the average maximum temperature by 21° F.

### ***Santa Cruz Island***

We surveyed much of Santa Cruz Island by foot in 2010 (Fig. 10). We concentrated surveys in areas outside of known breeding territories in an effort to locate new territories and nests. Areas that were difficult to reach by foot, such as the central north coast, were surveyed by boat. Some areas were surveyed repeatedly because of continued sightings of eagles without known nesting. During surveys, we located two new nests, one in the Malva Real territory and one in the Cueva Valdez territory, and monitored nesting at the previously known nests at Pelican Harbor and Saucos (Figs. 3 and 10).



**Figure 10. Survey routes and active bald eagle nests on Santa Cruz Island, CA, 2010.**

*Pelican Harbor Territory.* The Pelican Harbor pair remained together for a fifth 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. Monitoring via a live web cam established with the cooperation of the



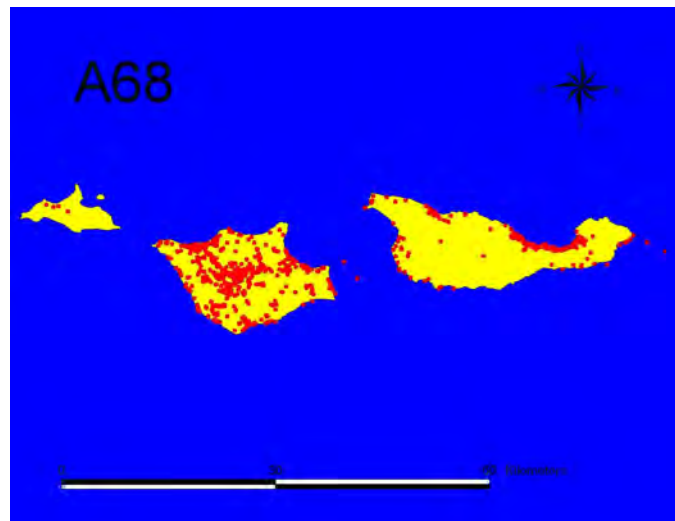
**Figure 11. The Pelican Harbor chicks at the time of banding on Santa Cruz Island, CA, 2010.**

Ventura County Office of Education (VCOE) indicated that the first egg was laid on 25 February and a second egg was laid on 27 February. The first egg hatched on 3 April and the second egg hatched on 5 April.

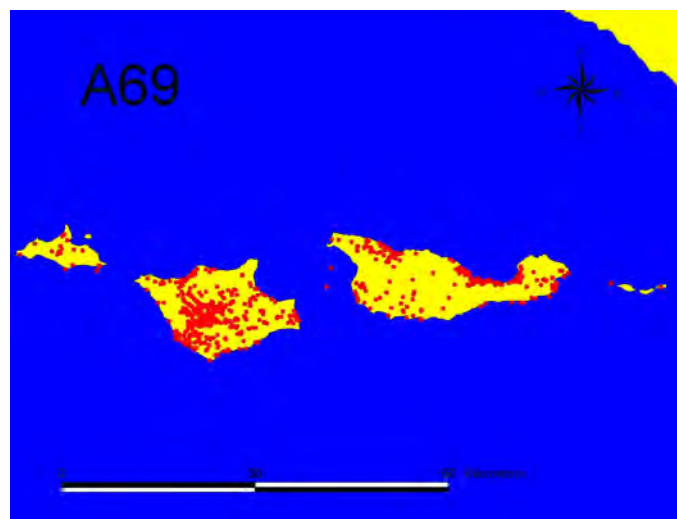
We entered the nest on 27 May to install a leg band, transmitter, and wingmarkers on each eaglet, and to obtain blood samples (Fig. 11, Table 2). The entire banding process was streamed live with the cooperation of the National Park Service and the VCOE. The first eaglet fledged on 22 June and the second eaglet fledged on 28 June. We continued to monitor the birds via ground-tracking and the data provided by their GPS-PTT transmitters.

Both birds remained in the general area of the nest for approximately a month and then began to explore further from the nest. K-68 remained on Santa Cruz until 17 August before making his first trip to Santa Rosa for the period of 17-21 August. He returned to Santa Cruz and remained there until 8 September. He returned to Santa Rosa on 8 September and remained there through December, except for a visit to San Miguel on 6-7 October and to Santa Cruz on 17-20 October. He returned to Santa Cruz at about noon on 31 December (Fig. 12).

Eagle K-69 remained on Santa Cruz until 19 August. He flew to Santa Rosa on 19 August and then returned to Santa Cruz on 21 August. On 6 September he flew to San Miguel via Santa Rosa, but returned to Santa Rosa on 8 September. He remained there until 22 December before flying to Santa Cruz. He returned to Santa Rosa midday on 31 December (Fig. 13).



**Figure 12. Movements of Eagle A-68 on the northern Channel Islands, CA in 2010.**



**Figure 13. Movements of Eagle A-69 on the northern Channel Islands, CA in 2010.**

*Malva Real Territory.* The Malva Real pair built a nest in a Bishop pine (*Pinus muricata*) on Carl Peak. The pair consists of a 2003 Alaskan female, A-17, hacked on Santa Cruz in 2002, and a male, K-11, produced at the ACC and fostered into the West End nest on Catalina in 2001. We located the nest on 22 February and saw both adults near the nest throughout March. The nest was located in an area where it was impossible to see into the nest from most locations. On 4 April, after the birds were seen in incubation posture, we stealthily approached the nest to a location where we could see the nest bowl, which contained two eggs. The birds continued to incubate until about 28 April, at which time the nest failed.

Table 2. Biographical data for bald eagle chicks hatched at nests on the northern Channel Islands, CA during 2010.

Federal Band	Sex	Wing Tag	Date Fledged	Territory	Status <sup>a</sup>	Comments
679-03432	M	A-67	6/15/10	Trap Canyon	Alive	On Santa Rosa
679-03435	M	A-68	6/28/10	Pelican Harbor	Alive	On Santa Cruz
679-03436	M	A-69	6/22/10	Pelican Harbor	Alive	On Santa Rosa
679-03440	F	A-70	7/11/10	Lopez Canyon	Alive	On Santa Rosa
679-03443	F	A-71	7/1/10	Sauces	Alive	GPS transmitter failed.
679-03444	M	A-72	7/8/10	Cueva Valdez	Alive	On Santa Rosa

<sup>a</sup> As of 12/31/10

*Sauces Territory.* The Sauces birds used the same Sauces Canyon nest as in 2009. The female, A-27, and the male, A-28, were both collected from Alaska and hacked on Santa Cruz in 2004. The first egg was laid on 11 March. Even though we had a camera on the nest, we were unable to get a good view of nest cup, so we do not know how many eggs were in the clutch. A single chick hatched on 18 April.

We entered the nest on 15 June to install a leg band, transmitter, and wingmarkers on the eaglet, and to obtain blood samples (Fig. 14, Table 2). The



**Figure 14. The Sauces chick at the time of banding on Santa Cruz Island, CA, 2010.**

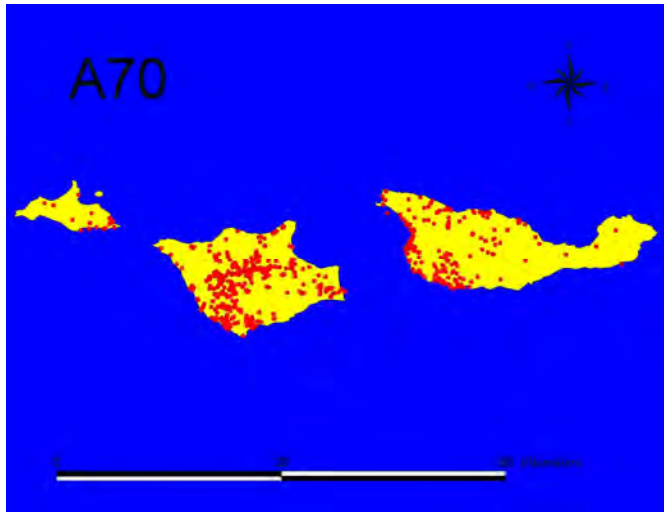
eagle fledged on 1 July. Unfortunately, the GPS-PTT transmitter failed, so we attempted to locate the eagle weekly through August and every other week thereafter using the functioning VHF transmitter. The last time we received a signal from this bird was on 8 September, at which time its signal was coming from Santa Rosa Island (it was seen on Santa Rosa in early 2011).

*Cueva Valdez Territory.* The Cueva Valdez pair built their first known nest this season in an unnamed canyon east of Baby's Harbor on the north coast of the island. The male, A-00, was produced by the ACC and hacked on Santa Cruz in 2002. The female, A-16, was removed from a nest in Alaska and hacked on Santa Cruz in 2003. We located the nest with an incubating adult on 2 April. A single chick hatched around 23 April.



**Figure 15. The Cueva Valdez chick at the time of banding on Santa Cruz Island, CA, 2010.**

We entered the nest on 16 June to install a leg band, transmitter, and wingmarkers on the eaglet, and to obtain blood samples (Fig. 15, Table 2). Based on the GPS data, the eaglet fledged around 8 July. He stayed on Santa Cruz until 8 September, at which time he flew to Santa Rosa. He returned to Santa Cruz on 9 September, but flew back to Santa Rosa on 10 September and remained there through the end of the year (Fig. 16).



**Figure 16. Movements of Eagle A-70 on the northern Channel Islands, CA in 2010.**

Besides the known nesting territories, we surveyed the following known or assumed territories where we had seen pairs on a regular basis, but did not find any signs of nesting.



*Yellowbanks Territory.* The Yellowbanks pair, comprised of A-11 and A-21, were seen repeatedly in the Yellowbanks area (Fig. 17), but not every time we went to search the area. In previous years we have seen at least one of the birds fly towards Anacapa, so it is possible that they spend some time on that island.



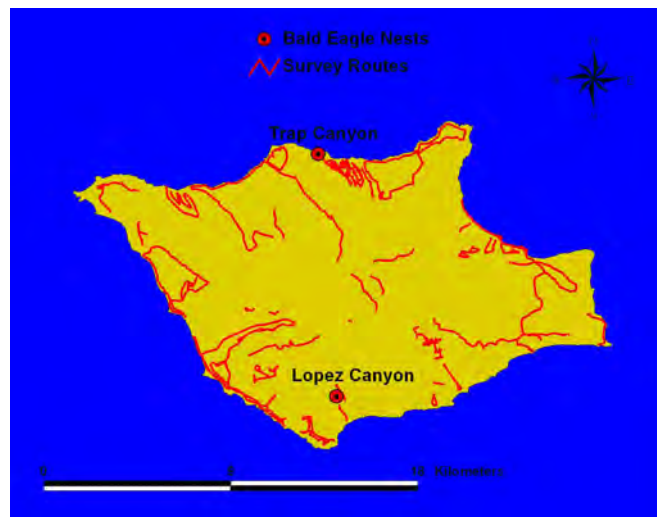
**Figure 17. Non-breeding bald eagle territories on Santa Cruz Island, CA.**

*Willows Territory.* Last season we saw A-45 (male) and A-51 (female) on the south side of the island around the Willows area (Fig. 17). Both birds were seen together in the area in 2010, but there was no indication of nesting.

*Fry's Harbor Territory.* Male A-46, aka Stephen Jr., spent most of his time in the Fry's Harbor area (Fig. 17) once he returned to the island early in the year (see below). He was seen with female A-24 on multiple occasions. A-46 is still carrying a functioning GPS transmitter, so we are confident that there was not a nesting attempt.

### ***Santa Rosa Island***

We spent 2-9 March, 6-20 April, 11-18 May, 5-8 June, and 26 July - 3 August surveying for eagles on Santa Rosa. During those surveys we were able to cover most of the coastal areas of the island, as well as many of the canyons (Fig. 19). During these surveys we were able to locate two nests: Trap Canyon and Lopez Canyon (Figs. 3 and 18).



**Figure 18. Survey routes and active bald eagle nests on Santa Rosa Island, CA, 2010.**

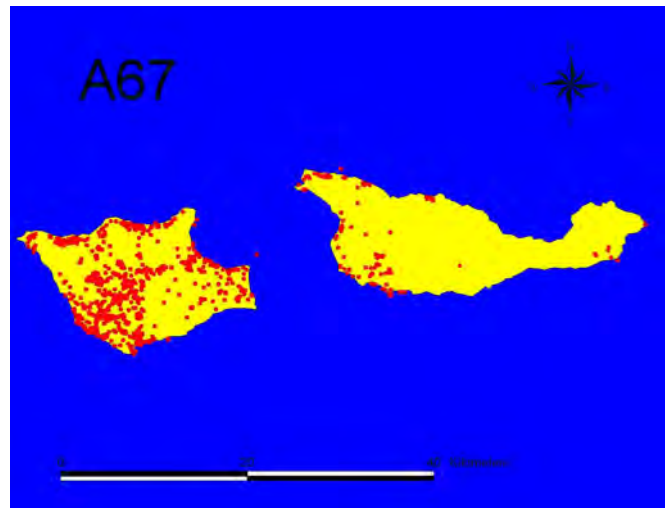
*Trap Canyon Territory.* The Trap Canyon pair built a new nest in an unnamed canyon between Cow and Verde Canyons on the north shore of the island. The male, A-08, was removed from a

nest in Alaska and hacked on Santa Cruz in 2002. The female, A-22, was produced by the ACC and hacked on Santa Cruz in 2004. The pair was located in the nesting area on 8 April. Although both birds were acting defensively, we were unable to locate a nest. Another search on 10 April again failed to find a nest. The next opportunity to search for a nest was on 11 May, at which time we located a nest on an overhung ledge, which is only visible from a limited portion of a nearby ridge. At this time, there was a large chick (~6-7 weeks old) in the nest. Because of the age, this was the first eagle to hatch during the 2010 season.

We entered the nest on 17 May to install a leg band, transmitter, and wingmarkers on the eaglet, and to obtain blood samples (Fig. 19, Table 2). Because we made few trips to Santa Rosa this season, we monitored the eagle primarily using its GPS data. However, NPS personnel



**Figure 19. The Trap Canyon chick at the time of banding on Santa Rosa Island, CA, 2010.**



**Figure 20. Movements of Eagle A-67 on the northern Channel Islands, CA in 2010.**

occasionally would check the nest for us. The eagle fledged around 15 June and remained on Santa Rosa through 7 October. He traveled to Santa Cruz for the period of 7-20 October, but then returned to Santa Rosa for the rest of the year (Fig. 20).

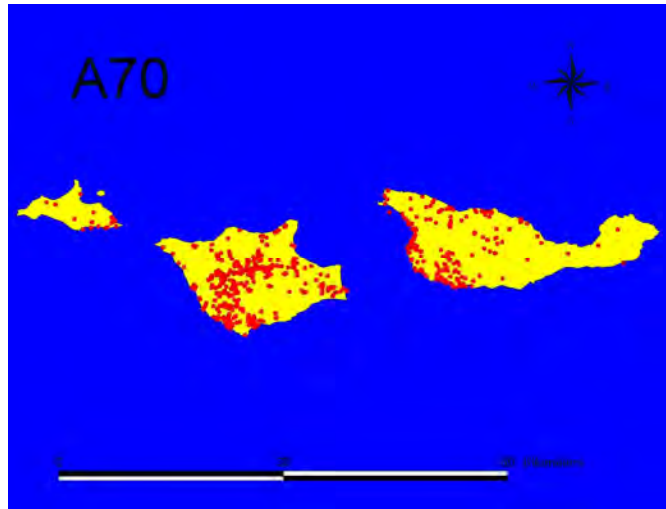
*Lopez Canyon Territory.* A new territory was located around Lopez Canyon on the south side of the island. The male, K-36, was produced by the ACC and fostered into the Two Harbors nest on Catalina in 2003. The female, A-43, was produced by the ACC and hatched on Santa Cruz in 2005. The nest was found in a large toyon (*Heteromeles arbutifolia*) on 5 March. The birds were observed incubating on 31



**Figure 21. The Lopez Canyon chick at the time of banding on Santa Rosa Island, CA, 2010.**

March and 7 April, at which time there were two eggs in the nest. On 13 April a chick was seen in the nest, estimated to have hatched on the 12<sup>th</sup>.

We entered the nest on 6 June to install a leg band, transmitter, and wingmarkers on the eaglet, and to obtain blood samples (Fig. 21, Table 2). Based upon GPS data, the eagle fledged around 11 July. She remained on Santa Rosa until 30 August, at which time it flew to Santa Cruz. She remained on Santa Cruz until 6 October and then returned to Santa Rosa for the rest of the year, except for a short visit to San Miguel on 27-30 October (Fig. 22).



**Figure 22. Movements of Eagle A-70 on the northern Channel Islands, CA in 2010.**

## **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 21-31 eggs this season, of which 15 (48-71%) hatched (Table 3). Fifteen chicks (100%) fledged and 7-10 (47-66%) of the fledged eaglets survived until the end of the year (seven known alive, five known dead, three unknown status

Table 3. Summary of nesting attempts by bald eagles on the California Channel Islands in 2010.

Island/Nest	Eggs	Chicks		Number Surviving Until End of Year
	Incubated	Hatched	Fledged	
Santa Catalina Island				
Twin Rocks	1-3	0	0	.
West End	2	2	2	0
Pinnacle Rock	2	1	1	0-1
Seal Rocks	2	1	1	0-1
Two Harbors	2	2	2	1-2
Rattlesnake	2	2	2	0
Middle Ranch	1-3	1	1	0
TOTAL	12-16	9	9	1-4
Santa Cruz Island				
Pelican Harbor	2	2	2	2
Sauces	1-3	1	1	1
Malva Real	2	0	0	.
Cueva Valdez	1-3	1	1	1
TOTAL	6-10	4	4	4
Santa Rosa Island				
Trap Canyon	1-3	1 <sup>a</sup>	1	1
Lopez Canyon	2	1	1	1
TOTAL	3-5	2	2	2
All Islands Combined	21-31	15	15	7-10

<sup>a</sup>Although unlikely, it is possible more than one chick hatched here and later died before the nest was found.

## 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 2010. Thirty bald eagles that were released or hatched on Catalina in previous years were seen during 2010 (Table 4). Seventeen of the birds were on Catalina, four on Santa Cruz, one on Santa Rosa, and seven on the mainland.

As of December, 11 of the eagles previously released or naturally hatched on Santa Cruz are being monitored via GPS data and 17 others were identified during our surveys or through sightings by other observers (Table 5). During 2010, we had no known mortalities of eagles released on the northern Channel Islands in previous years (Table 5).

Table 4. Status of bald eagles released or fledged from nests on Santa Catalina Island, CA prior to 2010 and known to have been alive in 2010.

FWS Leg Band	Sex <sup>1</sup>	Patagial Marker	Nest/Release Tower	Fledge Year	Status, Latest Location <sup>2</sup>
629-16077	F	K-17	Bullrush Tower	1984	Alive, Twin Rocks pair, Catalina Is.
629-16085	F	NA	Sweetwater Tower	1986	Alive, West End pair, Catalina Is.
629-16089	M	K-65	Bullrush Tower	1986	Alive, Pinnacle Rock pair, Catalina Is.
629-19925	M	K-25	Pinnacle Rock	1992	Alive, Seal Rocks pair, Catalina Is.
629-19923	M	K-33	Seal Rocks	1992	Alive, Twin Rocks pair, Catalina Is.
629-19928	F	K-34	Bullrush Tower	1993	Alive, Seal Rocks pair, Catalina Is.
629-39815	M	K-80	West End	1998	Alive, Rattlesnake pair, Catalina Is.
629-39816	M	K-81	West End	1998	Alive, Two Harbors pair, Catalina Is.
629-39817	F	K-82	Pinnacle Rock	1998	Alive, Two Harbors pair, Catalina Is.
629-29497	M	K-93	Bullrush Tower	1999	Alive, Middle Ranch pair, Catalina Is.
629-29499	F	K-02	West End	2000	Alive, Lake Hemet, CA
629-02780	M	K-10	Twin Rocks	2001	Alive, Pelican Harbor pair, Santa Cruz Is.
629-02782	M	K-11	West End	2001	Alive, Malva Real pair, Santa Cruz Is.
629-02793	F	K-26	West End	2002	Alive, Pelican Harbor pair, Santa Cruz Is.
629-47352	M	K-36	Two Harbors	2003	Alive, Lopez Canyon pair, Santa Rosa Is.
629-47371	F	K-47	Seal Rocks	2004	Alive, Rattlesnake pair, Catalina Is.
629-47395	M	K-51	Pinnacle Rock	2005	Alive, West End pair, Catalina Is.
629-47398	F	K-56	Seal Rocks	2005	Alive, Pinnacle Rock pair, Catalina Is.
629-52403	F	K-63	Two Harbors	2006	Alive, near Sacramento, CA, 6/26/10
629-52425	M	K-00	Pinnacle Rock	2006	Alive, near Hearst, CA 12/1/10
629-52428	M	K-73	West End	2007	Alive, Millerton Lake, CA 1/8/10
629-52430	M	K-76	Twin Rocks	2007	Alive, Tweedsmuir Park, B.C., 9/2/10
629-52432	M	K-78	Two Harbors	2007	Alive, Catalina Is., 5/3/10
629-52442	F	K-83	Two Harbors	2008	Alive, near CA/OR border 4/3/10
629-52443	M	K-88	Twin Rocks	2008	Alive, Catalina Is., 3/5/10
629-52446	F	K-67	West End	2008	Alive, Santa Cruz Is., 7/3/10
629-52448	M	K-90	Seal Rocks	2009	Alive, Catalina Is., 7/15/10
629-52449	F	K-87	Two Harbors	2009	Alive, Catalina Is., multiple sightings
629-52450	F	K-91	Two Harbors	2009	Alive, Macdoel Township, CA 6/24/10
629-03429	F	K-97	West End	2009	Alive, Lk. San Antonio, CA 7/3/10

<sup>1</sup> Determined by karyotyping and/or morphometrics.

<sup>2</sup> As of 12/31/10 unless otherwise noted.

Table 5. Status of bald eagles released or fledged from nests on Santa Cruz Island, CA in 2002-2009 and known to have been alive in 2010.

FWS Leg Band	Sex <sup>1</sup>	Patagial Marker	Source <sup>2</sup>	Fledge Year	Status, Latest Location <sup>3</sup>
629-02795	M	A-00	Zoo	2002	Alive, Cueva Valdez pair, Santa Cruz Is.
629-14045	M	A-08	Alaska	2002	Alive, Trap Canyon pair, Santa Rosa Is.
629-14048	F	A-11	Alaska	2002	Alive, Yellowbanks pair, Santa Cruz Is.
629-47359	F	A-16	Alaska	2003	Alive, Cueva Valdez pair, Santa Cruz Is.
629-47360 <sup>†</sup>	F	A-17	Alaska	2003	Alive, Malva Real pair, Santa Cruz Is.
629-47356	M	A-21	Alaska	2003	Alive, Yellowbanks pair, Santa Cruz Is.
629-47372	F	A-24	Alaska	2004	Alive, Fry's Harbor pair, Santa Cruz Is.
629-47375	F	A-27	Alaska	2004	Alive, Sauces pair, Santa Cruz Is.
629-47376	M	A-28	Alaska	2004	Alive, Sauces pair, Santa Cruz Is.
629-47377 <sup>†</sup>	M	A-29	Alaska	2004	Alive, Mainland S. CA (last data) 12/13/10
629-47380	F	A-32	Alaska	2004	Alive, San Clemente Is. 6/16/10
629-47385 <sup>†</sup>	F	A-34	Zoo	2005	Alive, Santa Rosa Is.
629-47386	F	A-35	Zoo	2005	Alive, Pt. Mugu, CA 3/9/10
629-47388	F	A-37	Zoo	2005	Alive, Middle Ranch pair, Catalina Is.
629-47390 <sup>†</sup>	M	A-39	Zoo	2005	Alive, Santa Rosa Is., 6/20/10 (last data)
629-47391	M	A-40	Zoo	2005	Alive, Santa Cruz Is.
629-47399	F	A-43	Zoo	2005	Alive, Lopez Canyon pair, Santa Rosa Is.
629-02800	M	A-45	Zoo	2005	Alive, Willows pair, Santa Cruz Is.
629-52404 <sup>†</sup>	M	A-46	Zoo	2006	Alive, Fry's Harbor pair, on mainland.
629-52406 <sup>†</sup>	F	A-48	Zoo	2006	Alive, Santa Rosa Is.?
629-52407	F	A-49	Pelican	2006	Alive, Santa Cruz Is.
629-52407	F	A-51	Zoo	2006	Alive, Willows pair, Santa Cruz Is.
629-52411 <sup>†</sup>	F	A-52	Zoo	2006	Alive, Santa Rosa Is.
629-52417	F	A-55	Zoo	2006	Alive, ~55 km SE of San Jose, CA 9/25/10
629-52420 <sup>†</sup>	M	A-58	Zoo	2006	Alive, Santa Rosa Is.
629-52421 <sup>†</sup>	F	A-59	Zoo	2006	Alive, Santa Cruz Is.
629-52422 <sup>†</sup>	M	A-60	Malva	2006	Alive, Santa Rosa Is.
629-52438 <sup>†</sup>	M	A-64	Pelican	2008	Alive, Santa Rosa Is.

<sup>1</sup> Determined by karyotyping for birds from San Francisco Zoo, and morphometrics for Alaskan birds.

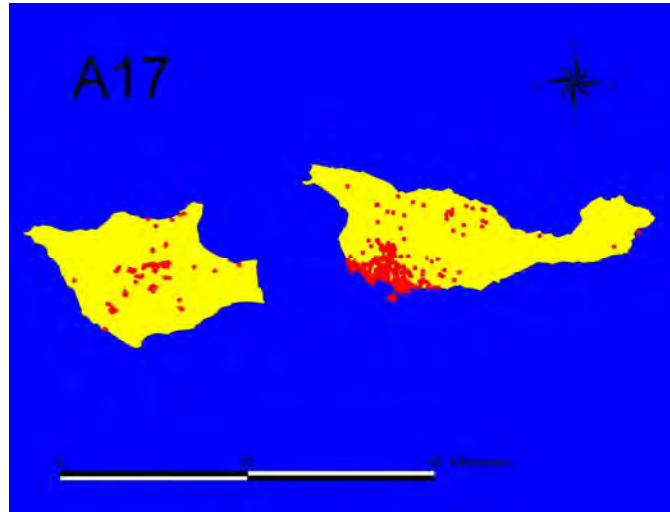
<sup>2</sup> Bald eagles from the San Francisco Zoo (Zoo), wild nests near Juneau, Alaska (Alaska), the Pelican Harbor (Pelican) or Malva Real (Malva) nests on Santa Cruz, or a rehabilitation center in northern California (Rehab).

<sup>3</sup> As of 12/31/10, unless otherwise noted.

<sup>†</sup> Carrying a GPS transmitter.

### **A-17 Movements**

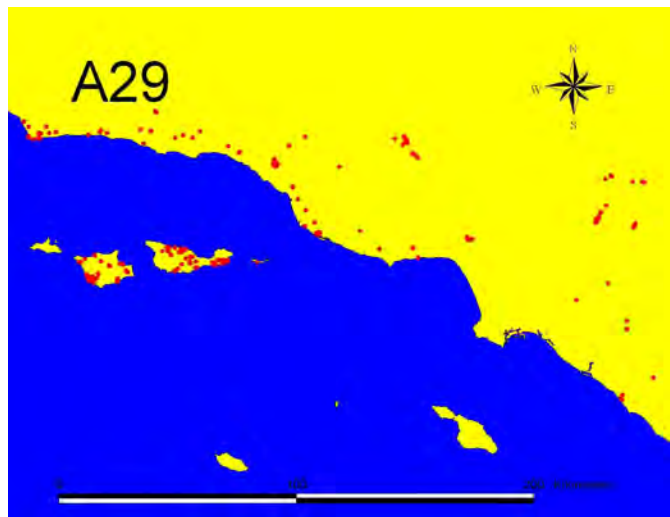
Eagle A-17 spent all year on either Santa Rosa or Santa Cruz (Fig. 23). She began the year on Santa Cruz and remained there through August. On 10 September she flew to Santa Rosa and stayed through at least 26 November, except for a two-day visit to Santa Cruz on 20-21 November. We received no data from 27 November until 21 December, at which time she was still on Santa Rosa.



**Figure 23. Movements of Eagle A-17 on the northern Channel Islands, CA in 2010.**

### **A-29 Movements**

We did not receive any data from Eagle A-29 until 19 February, at which time he was on Santa Rosa (Fig. 24). He flew to Santa Cruz on 8 March and then returned to Santa Rosa on 27 March. He returned to Santa Cruz on 1 April and then flew to the mainland via Anacapa on 14 April. He moved around southern California until his transmitter stopped transmitting on 6 July. At that time he was at Lake Piru, northwest of Santa Clarita, California. We began receiving data again on 1 October and the bird continued to move around southern California through at least 12 December (last data received in 2010).

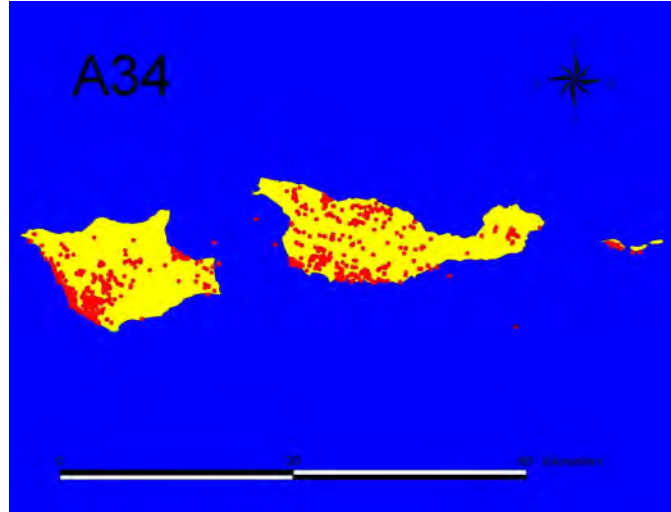


**Figure 24. Movements of Eagle A-29 in southern California in 2010.**

### **A-34 Movements**

We did not receive data from Eagle A-34 until 24 January, at which time she was on Santa Rosa (Fig. 25). She flew to Santa Cruz on 7 February, and then spent 9-10 February on Anacapa. She returned to Santa Cruz on 10 February and then flew back to Anacapa for 21-22

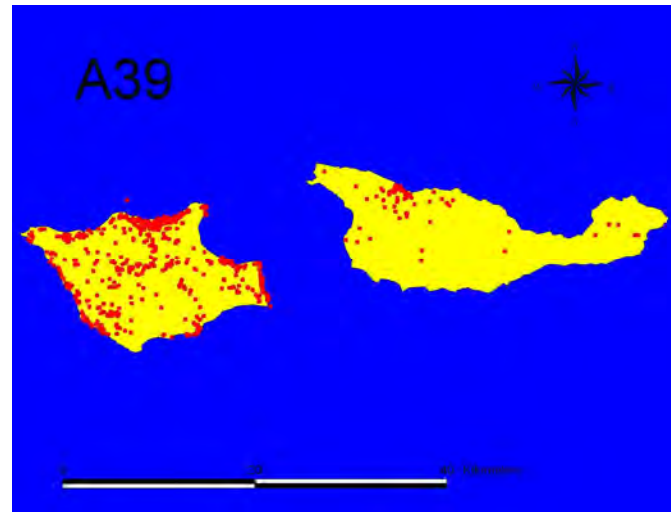
February. She flew to Santa Cruz on 22 February and then on to Santa Rosa on 23 February. She spent most of the next two months on Santa Rosa, with short trips to Santa Cruz on 23-27 March, 31 March - 2 April, 12-13 April, 15-17 April, and a trip to Anacapa on 13-15 April. She returned to Santa Cruz on 27 April and spent a month there before returning to Santa Rosa for the remainder of the year, except for a short visit to Santa Cruz on 22-24 November.



**Figure 25. Movements of Eagle A-34 on the northern Channel Islands, CA in 2010.**

### **A-39 Movements**

Eagle A-39 spent most of the year on Santa Rosa, with brief visits to Santa Cruz, until we stopped receiving data on 20 June. He was on Santa Rosa from the beginning of the year until 4 March and then made short visits to Santa Cruz on 5-11 March, 13-14 March, 23-27 March, and 4-6 April (Fig. 26).



**Figure 26. Movements of Eagle A-39 on the northern Channel Islands, CA in 2010.**

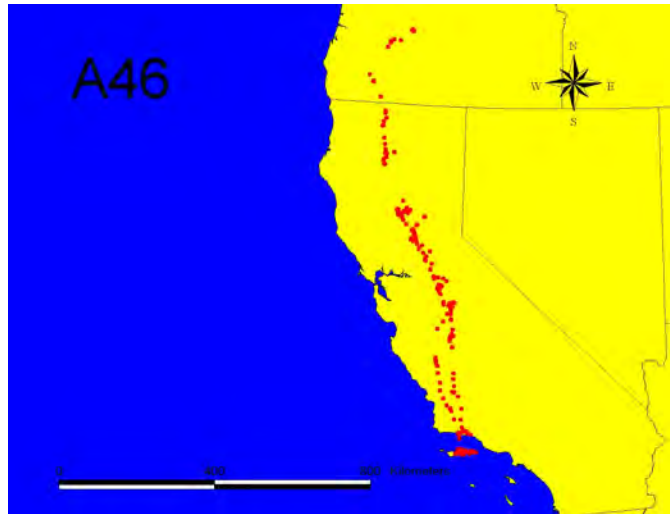
### **A-46 Movements**

Eagle A-46's first data of the year put him in Oregon on 30 January. He crossed into northern California on 2 February and reached Santa Cruz on 19 February. He made short trips to Santa Rosa on 16-17 March and Anacapa on 9-12 June, but otherwise he remained on Santa Cruz until 6 October, mostly in the Fry's Harbor area. On 6 October he flew to the mainland and was in Oregon by 15 October. He remained there until at least 17 November. We received no new data until 18 December, at which time he had moved approximately 400 km south into California. He continued south and was about 50 km southwest of Fresno, California on 31 December (Fig. 27).

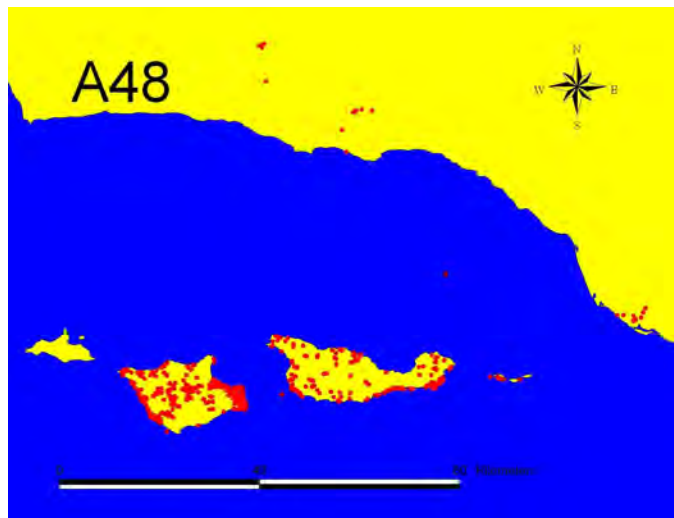


### **A-48 Movements**

Eagle A-48 moved frequently in 2010 and had several data gaps lasting up to a few days (Fig. 28). She began the year on Santa Rosa, making a trip to Santa Cruz on 9 January. By 12 January she was back on Santa Rosa. She returned to Santa Cruz by 19 January and then flew to the mainland on 24 January. She returned to Santa Cruz on 28 January and then flew to Santa Rosa on 30 January. She returned to Santa Cruz on 10 February and after a week there, she began making trips among the islands that lasted from 1-11 days through the end of April. She flew to Santa Rosa on 23 February, Santa Cruz on 25 February, Anacapa on 26 February, Santa Cruz and Santa Rosa on 2 March, Santa Cruz on 8 March, Santa Rosa on 14 March, Santa Cruz on 25 March, Santa Rosa on 7 April, Santa Cruz on 18 April, Anacapa on 24 April (data gap for next two days) and Santa Cruz by 27 April. She returned to Santa Rosa on 6 May and remained there through 13 December, except for trips to Santa Cruz on 18-26 June and 12-25 November. We received no data until 26 December, at which time she was on Santa Cruz. On 27 December she flew to the mainland, via Anacapa, and remained in the Ventura area through 28 December. We received no data on 29 December, but on 30 December she was back on Santa Cruz and remained there through the end of the year.



**Figure 27. Movements of Eagle A-46 on the northern Channel Islands and mainland California in 2010.**

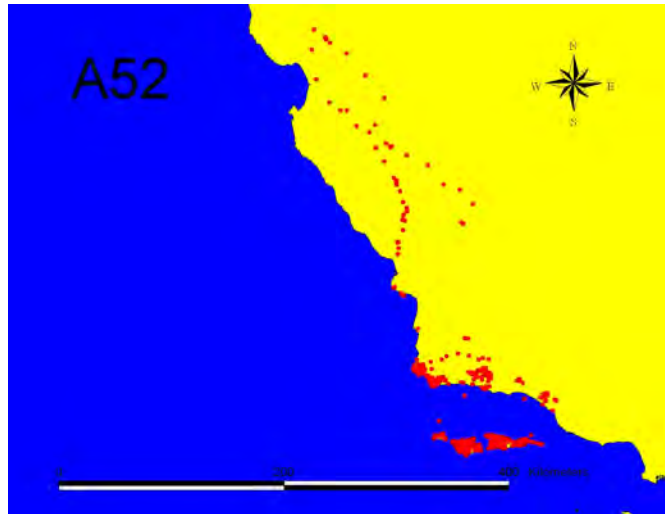


**Figure 28. Movements of Eagle A-48 on the northern Channel Islands and mainland California in 2010.**

### **A-52 Movements**

Eagle A-52 spent time on all four northern Channel Islands and the mainland in 2010 (Fig. 29). She started the year on the mainland before flying to Santa Cruz on 25 February. She spent two days on Santa Cruz before moving to Santa Rosa on 28 January. She remained on Santa Rosa until 16 February, visited Santa Cruz until the 20<sup>th</sup> and then returned to Santa Rosa. On 23 February she flew to the mainland and stayed there until 26 March. She

returned to Santa Rosa, via San Miguel, on 26 March. She spent 28-31 March on Santa Cruz and then made her first visit to Anacapa on 31 March - 3 April. She returned to Santa Cruz on 3 April, but was back on Anacapa on 5-7 April. After returning to Santa Cruz, she flew to Santa Rosa on 16 April, and spent 19-27 April on San Miguel. She flew to Santa Rosa on 27 April and then on to Santa Cruz on



**Figure 29. Movements of Eagle A-52 on the northern Channel Islands and mainland California in 2010.**

28 April. On 3 May she returned to Santa Rosa and remained there until 15 June. On 15 June she flew to Santa Cruz and then spent 16 June to 31 August on Anacapa. On 31 August she returned to Santa Cruz and then moved to Santa Rosa on 4 September, remaining there until 17 October, except for a day-trip to San Miguel on 6 October. On 17 October she flew to Santa Cruz, returned to Santa Rosa on 21 October, and then flew to the mainland, via San Miguel, on 28 October. She flew to central California, but returned to Santa Rosa, again via San Miguel, on 8 November and remained there through the end of the year.

### **A-58 Movements**

Eagle A-58 began the year on Santa Rosa and remained there until 25 February, except for two trips to Santa Cruz on 18-20 January and 3-20 February (Fig. 30). On 25 February, she returned to Santa Cruz and then flew to the mainland via Anacapa on 4 March. By late the same day she flew to Catalina. On 6 March, she flew to Santa Barbara Island, Anacapa, and Santa Cruz. She flew to Santa Rosa on 8 March and then returned to Santa Cruz for the period of 17 March - 27 April. She flew to Santa Rosa on 27 April and remained until 14 June. On 14 June

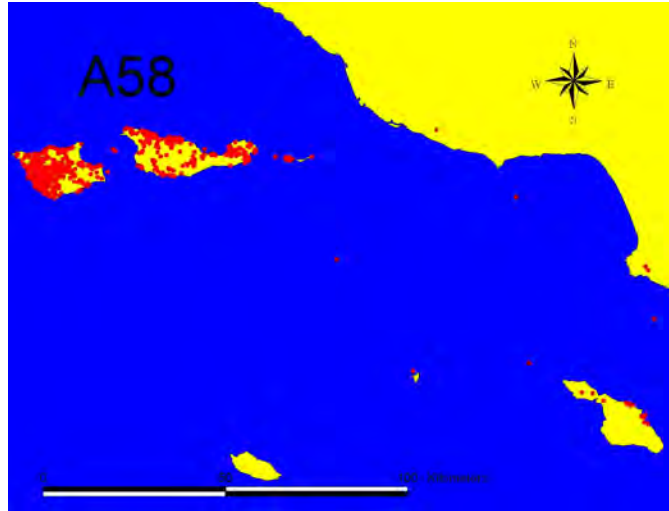
she flew to Santa Cruz and was on Anacapa the next time we received data on 17 June. There was another data gap from 21-30 June and on 1 July she was back on Santa Cruz. She returned to Anacapa on 6 July, went back to Santa Cruz on 28 July, returned to Anacapa on 3 August, and then flew back to Santa Cruz on 7 August. She flew to Santa Rosa on 8 August and remained there through most of the rest of the year, except for trips to Santa Cruz on 8-11 November and 12-15 December.

### ***A-59 Movements***

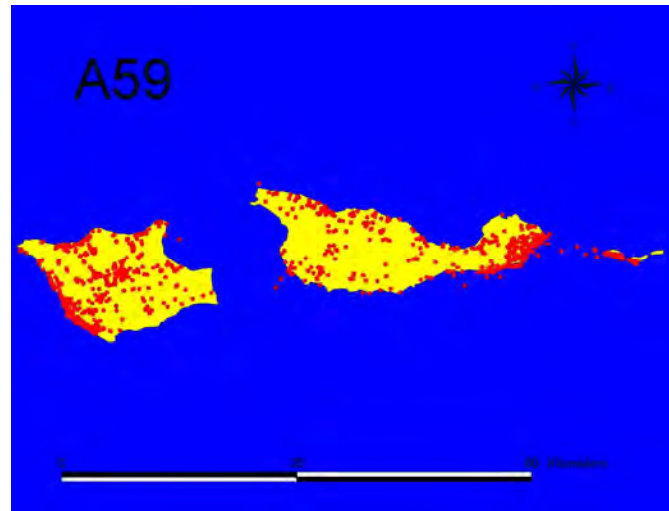
Eagle A-59 moved among the islands frequently in 2010 (Fig. 31). She spent much of January-February on Santa Rosa, but moved to Santa Cruz for 13-22 January, 2-12 February, and 15-19 February. On 25 February she returned to Santa Cruz and remained there through 7 August, except for short trips to Anacapa on 26 February, 5 March, 9-10 and 19-22 April, 9-10 and 24-25 May, 1-8 and 18-22 June, 28 June - 2 July, and 22-25 and 28-31 July. She also made a trip to Santa Rosa on 26-28 July. On 8 August, she flew to Santa Rosa and remained there until 16 December, except for a trip to Santa Cruz on 22-27 October. On 16 December she flew to Santa Cruz and remained there through the end of the year.

### ***A-60 Movements***

Eagle A-60, the 2006 Malva Real chick, spent most of the year on Santa Rosa (Fig. 32). He made eight visits to Santa Cruz on 9-11 and 21-23 February, 11-17 March, 5-9 April, 28 April-3 May, 8-23 June, 4-6 October, and 29-31 December.



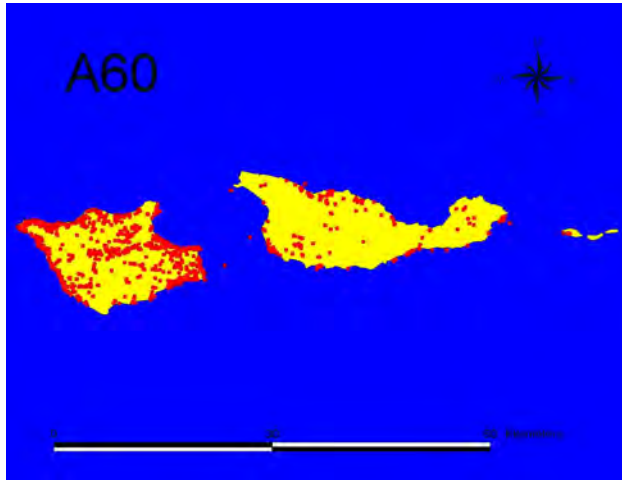
**Figure 30. Movements of Eagle A-58 on the Channel Islands and mainland California in 2010.**



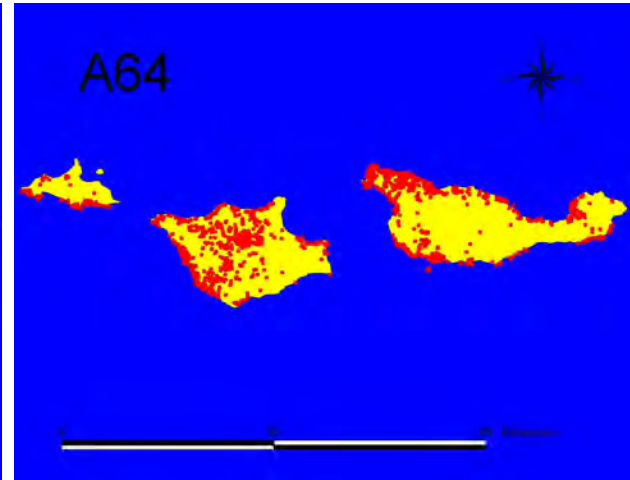
**Figure 31. Movements of Eagle A-59 on the northern Channel Islands, CA in 2010.**

### **A-64 Movements**

Eagle A-64 spent all year on either Santa Cruz or Santa Rosa, with the exception of a single visit to San Miguel (Fig. 33). He began the year on Santa Rosa and then flew to San Miguel on 6 March. He returned to Santa Rosa on 21 March and then moved to Santa Cruz on 23 March. He did not return to Santa Rosa until 7 October, where he remained through the end of the year.



**Figure 32. Movements of Eagle A-60 on the northern Channel Islands, CA in 2010.**



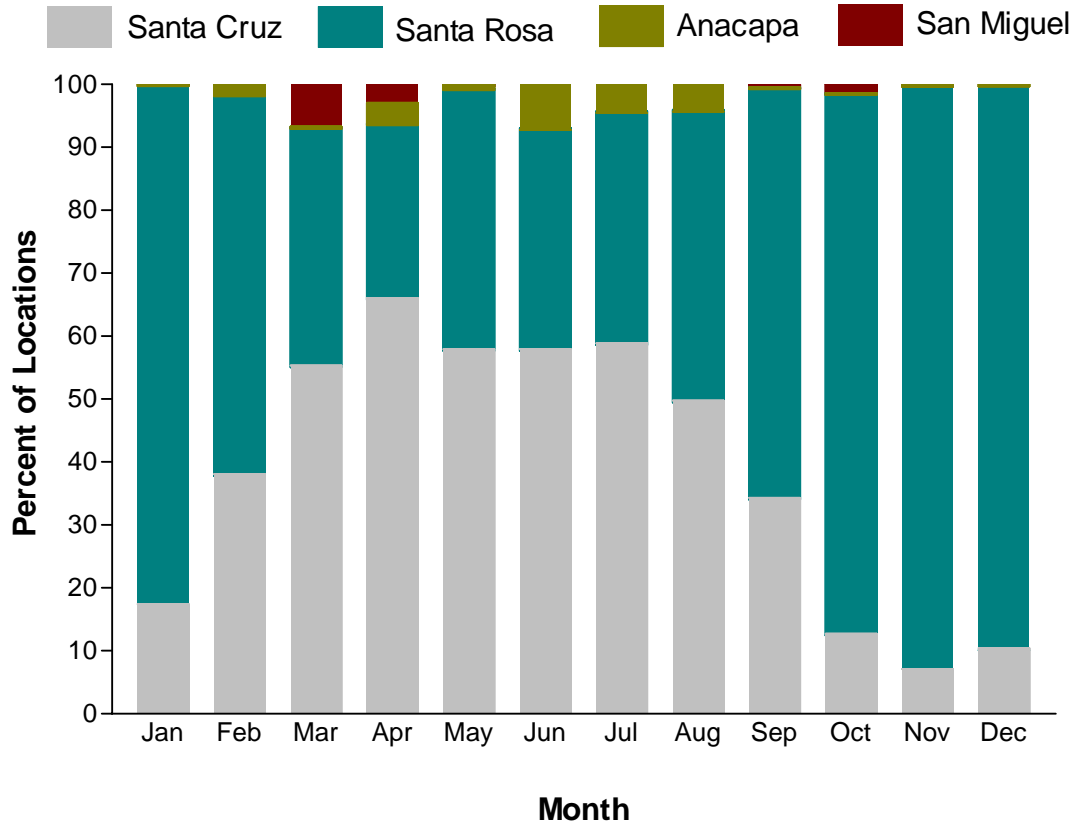
**Figure 33. Movements of Eagle A-64 on the northern Channel Islands, CA in 2010.**

### **Overall Island Use**

During 2010, we received 52,357 GPS locations on the islands from 16 different eagles that spent at least part of the year on the northern Channel Islands. Santa Cruz and Santa Rosa were used more than any other islands (Fig. 34). Time spent on Anacapa was highest from June - August, with a maximum of only 6.9% of points (June). Use of Santa Rosa was highest in January (~83% of points) and September - December (65-93% of points; Fig. 34).

## **DISCUSSION**

Bald eagle reproductive effort increased on the Channel Islands in 2010. There were a total of 13 known breeding attempts on three different islands: seven on Catalina, four on Santa Cruz, and two on Santa Rosa. Eleven (85%) of the nests were successful at hatching at least one chick (15 chicks total, average=1.36 chicks/nest) and there was 100% fledging success. In



**Figure 34. Use of the northern Channel Islands, CA by bald eagles during 2010. The bars represent the mean percent of time spent on each island as determined by GPS data.**

comparison, nesting success of bald eagles in northern California averaged 67% and they produced 0.97 young/year (Jenkins and Jackman 2006). Unfortunately, there was high mortality among the fledglings on Catalina, where three were found dead near their nests within 1-10 days after fledging and two more apparently drowned (one was recovered near the mainland). The status of three of the remaining fledglings is unknown. The higher than normal mortality on Catalina (at least 56% mortality) was offset by 100% survival of the six fledglings from the northern Channel Islands through the end of the year.

For the first time since 1950, bald eagles successfully bred on Santa Rosa in 2010. The first chick to hatch was produced by the Trap Canyon pair, which had nested unsuccessfully the previous two seasons. The nest was not found until the chick was about seven weeks old, primarily because we visited the island less frequently in 2010 and the nest was mostly hidden underneath an overhang. We will attempt to get to the island more frequently in 2011, especially during March and April, so as to have more opportunities to locate nests. Some of the birds that are most often located on Santa Rosa are carrying functioning GPS transmitters, so we may be able to locate some new nests by examining the GPS data.

Patterns of island use were similar as in previous years. There was increased usage of Anacapa in the spring and summer, which corresponds with the sea bird breeding season. However, overall use of Anacapa was lower than in previous years. For instance, in June 2010 about 6.9% of the data points were on Anacapa, down from about 16% in June 2009 and 63.8% in June 2007. As in previous years, more birds began spending time on Santa Rosa starting in September, which corresponds with the start of fall hunting for mule deer and elk on that island. More eagles were on Santa Rosa in January than any other island, possibly taking advantage of the marine mammal breeding season and the resulting carcass availability. The deer and elk are scheduled to be removed from Santa Rosa by the end of 2011, so it will be interesting to see how the island usage changes in the future.

We expect the number of nests to increase on Santa Cruz and Santa Rosa and remain stable on Catalina in 2011. There were additional pairs that we observed on Santa Cruz in 2010 that did not breed (i.e., Frazier Point, Willows, Yellowbanks, Fry's Harbor), so there could be up to eight pairs on Santa Cruz in 2011. Eagle A-46, the Fry's Harbor male, has left the island and gone north to Oregon or further every year, and 2010 was no different. However, he started heading south in December this year, compared to February in 2009, so it is likely that he will be back on Santa Cruz by the start of the 2011 breeding season. Although no other pairs were observed on Santa Rosa in 2010, we could have younger birds form pairs for the 2011 breeding season. Therefore, in 2011, there could be at least 15 breeding pairs on the California Channel Islands.

## **RECOMMENDATIONS**

Because more of the younger eagles will be of breeding age in 2011, we recommend that continued efforts be made to search for new nesting pairs on the Channel Islands. Personnel should spend February through May surveying Catalina, Santa Cruz and Santa Rosa. Continued efforts should be made to survey the more inaccessible portions of the islands by foot, boat, and helicopter.

We did not use a helicopter for surveying in 2010 because of the high cost. In 2011, we recommend using a helicopter to search targeted areas of Santa Cruz. Also, because we do not have a boat available on Catalina, we suggest doing a helicopter survey of the southern coast of

Catalina, which has not been intensively surveyed in several years.

We did not have the time to attempt trapping eagles in 2010, but recommend further attempts to trap eagles in 2011 for contaminants analyses and to apply new GPS units or VHF radios. When using the floating-fish noose method (Cain and Hodges 1989, Jackman et al. 1993), we suggest completing trapping activities before 0900 to reduce the impacts of gulls on the bait sets and to reduce the visibility of the monofilament line to the eagles. Birds that are not actively breeding can be targeted starting in June, when sea conditions may be better for navigating around the island in our small Zodiac boat. Additional efforts should be made to trap eagles on Santa Rosa using a bownet and/or net launcher during the annual hunt in the fall, as this will be our last opportunity to use deer and elk as bait before they are removed from the island. If we can get transmitters on more adults, then we could reduce the personnel time needed to search for the nests in the future.

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