

**PEREGRINE FALCON MONITORING ON THE CALIFORNIA  
CHANNEL ISLANDS, CALIFORNIA, 2020**

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## INTRODUCTION

American peregrine falcons (*Falco peregrinus anatum*; hereafter peregrines) were common residents on all the California Channel Islands (Willett 1912, Howell 1917, Kiff 1980), although the highest number of reported nests in a single year was 15 (Kiff 1980, 2000). Because peregrines and their nests are less conspicuous to casual observers than are other raptors historically found on the Channel Islands, such as bald eagles (*Haliaeetus leucocephalus*) and osprey (*Pandion haliaetus*), historical estimates of the number of peregrines on the islands were almost certainly too low (Kiff 1980) and could have been 30 or more pairs (Hunt 1994).

Peregrine numbers plummeted across much of the northern hemisphere starting in the late 1940s (Hickey and Anderson 1969). Peregrines were at their lowest numbers in the 1960s and early 1970s, at which time they were extirpated from the eastern United States and across the Midwest and reduced to a few hundred pairs in the western United States and Mexico (U.S. Fish and Wildlife Service 2003). Approximately 100 peregrine eyries in California were producing young each year until at least the mid-1940s, with more than a third of the verified or suspected peregrine nest sites occurring within 10 miles of the ocean, including the Channel Islands (Herman et al. 1970). By 1970, the number of breeding peregrines had dropped by at least 95% in California (Herman et al. 1970, Herman 1971). It appears that nests along the southern coast suffered the earliest reductions and the peregrine population on the Channel Islands was drastically reduced or extirpated by 1955 (Herman et al. 1970), with the last reported sighting of a probable Channel Islands breeding adult occurring on Anacapa Island in 1949 (Kiff 1980).

Overwhelming evidence indicated that declines in peregrines and other bird species feeding higher on the food chain were a result of the effects of DDE, a metabolite of DDT, on egg hatchability (Kiff 1980, Mesta 1999, Kiff 2000). The apparent source of the DDT pollution in the Southern California Bight was eventually traced to the Montrose Chemical Corporation's manufacturing plant in Torrance, California. Between 1947 and 1961, an estimated 37 to 53 million liters of DDT-contaminated acid sludge, containing 348-696 metric tons of DDT, was disposed at an ocean dump site 16 km northwest of Catalina Island (Chartrand et al. 1985). In addition, an estimated 1800 metric tons of DDT was discharged from the Joint Water Pollution Control Plant outfall, 3.3 km offshore of Palos Verdes Peninsula (Chartrand et al. 1985).

Peregrines were listed as endangered in 1970 under the Endangered Species Conservation Act of 1969, and later under the Endangered Species Act of 1973 (Mesta 1999). Populations

rebounded following restrictions on the use of organochlorine pesticides in Canada and the United States (banned in 1970 and 1972, respectively) and successful management activities, including the reintroduction of captive-bred and relocated peregrines (Mesta 1999). Between 1983 and 1998, the Santa Cruz Predatory Bird Research Group (SCPBRG) released 34 peregrines on the Channel Islands (10 on San Miguel, 17 on Catalina, 4 on Santa Rosa, and 3 on Santa Cruz; MSRP 2005, Bird Banding Lab unpublished data). The first pairs with young were seen on Anacapa and Santa Cruz islands in 1989 and 1990, respectively (Hunt 1994). During a 1992 survey, Hunt (1994) located 9 active eyries on 4 of the Channel Islands. Peregrines were removed from the Endangered Species list in 1999, at which time breeding targets for the Channel Islands (5 pairs) and the Pacific Coast (185 pairs) had been greatly exceeded (Mesta 1999). Ten years later, peregrines were removed from the State of California's list of Endangered and Threatened Animals (California Department of Fish and Game 2011).

After a successful lawsuit against Montrose Chemical et al. for damage caused by the release of DDTs and PCBs into the Southern California Bight, the Montrose Settlements Restoration Program (MSRP) was created to implement restoration projects aimed at restoring natural resources that were directly or indirectly harmed by DDT and PCB contamination. The final consent decree for the Montrose case stated that "the Trustees will use the damages for restoration of injured natural resources, including bald eagles, peregrines and other marine birds, fish and the habitats upon which they depend" (Montrose Settlements Restoration Program 2012). The Montrose Settlements Trustee Council (MSTC) was created to oversee the settlement monies and is composed of representatives of Federal and State agencies that have interests in the Southern California Bight: National Oceanic and Atmospheric Administration (NOAA), U.S. Fish and Wildlife Service (FWS), National Park Service (NPS), California Department of Fish and Wildlife (CDFW), California State Lands Commission, and the California Department of Parks and Recreation.

Since the conclusion of peregrine survey efforts in the early 1990s, there were limited surveys conducted on the Channel Islands and the distribution and extent of breeding pairs was not known. Under Phase 1 of MSRP's Restoration Plan, the MSTC contracted with the SCPBRG to conduct a peregrine falcon survey and monitoring project in 2007. The goal of that monitoring effort was to assess the current status of peregrines on the Channel Islands and determine whether their recovery was still being affected by on-going contamination in the local food web

(Montrose Settlements Restoration Program 2005). The 2007 survey located 27 occupied territories on 5 of the 8 islands, but also found that DDE contamination still appeared to be reducing peregrine falcon reproductive success (Latta 2012).

Under Phase 2 of the MSRP Restoration Plan, peregrine surveys were to be conducted at 5-year intervals (MSRP 2012), although the survey scheduled for 2012 was delayed until 2013. After the Institute for Wildlife Studies (IWS) conducted surveys on all 8 Channel Islands in 2013, the MSTC agreed to our proposal to conduct annual surveys through 2017 to gain more information on population demography and important population parameters, such as survival, immigration and emigration. As part of that effort and continued surveys after funding ended in 2017, IWS located 45 occupied territories in 2013, 48 in 2014, 48 in 2015, 46 in 2016, 51 in 2017, 38 in 2018, and 45 in 2019, with at least 2 territories on each island (Sharpe 2014, 2015, 2016, 2017, 2018; Sharpe and Melling 2018, Sharpe and Melling 2019). During 2020, we began surveys in February, but most efforts ended in early March due to the pandemic travel and housing restrictions. This report summarizes the results of the truncated 2020 field season.

## **STUDY AREA**

The California Channel Islands are composed of eight islands located off the coast of southern California (Fig. 1). All of the Channel Islands are subject to a Mediterranean climate regime characterized by cool, wet winters and warm, dry summers (Coonan and Schwemm 2009). The northern Channel Islands, which are composed of San Miguel Island, Santa Rosa Island, Santa Cruz Island, and Anacapa Island are located approximately 20 to 44 km off the coast of Ventura and Santa Barbara counties (Junak et al. 1995) and are a tightly clustered group with no more than 9.6 km separating adjacent islands (Moody 2000; Fig. 1). The southern Channel Islands, which are composed of San Nicolas Island, Santa Barbara Island, Santa Catalina Island, and San Clemente Island, are located 32-79 km from the mainland (Junak et al. 1995) and are more remote and scattered than the northern islands, with the closest islands (Santa Catalina and San Clemente Islands) separated by 34 km (Moody 2000; Fig. 1). We did not collect any information on peregrines on San Miguel, Santa Rosa, San Nicolas, or Santa Catalina islands in 2020.

Santa Cruz Island (hereafter Santa Cruz) is the largest of the 8 Channel Islands and is owned by the NPS (eastern 24% of the island) and The Nature Conservancy (TNC; western 76%

of the island). The island measures about 38 km long by 12 km wide at its widest point (Fig. 1), encompassing approximately 249 km<sup>2</sup> with a maximum elevation of 753 m (Junak et al. 1995).



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

Anacapa Island (hereafter Anacapa), which is composed of 3 islets (East, Middle, and West Anacapa; Fig. 1) is owned by the NPS. The island encompasses approximately 2.8 km<sup>2</sup>, spanning about 8 km from end to end and reaching a maximum elevation of 283 m (Junak et al. 1995).

Santa Barbara Island (hereafter Santa Barbara), owned by the NPS, is located 62 km from the nearest point on the mainland and 38 km east of its nearest neighboring island, Santa Catalina Island (Fig. 1). With an area of only 2.6 km<sup>2</sup> it is the smallest of the Channel Islands. It has a series of low terraces, with small peaks at the north and south ends of the island (high point at 193 m) and is bound by sheer cliffs on much of the north, west, and part of the south sides of the island (Drost and Junak 2009).

San Clemente Island (hereafter San Clemente), owned by the U.S. Navy, is the southernmost of the Channel Islands, located approximately 92 km off the coast of California (Fig. 1). The island is 143 km<sup>2</sup>, about 34 km long, and has a high point of 610 m (Willey 1997).

It is characterized by a series of marine terraces on the west side and a steep escarpment on the east side (Kaiser et al. 2009).

## **METHODS**

### **Permitting**

Our peregrine research activities were covered by multiple state and federal permits. IWS has a Memorandum of Understanding and Scientific Collecting Permits (Permit #s SC-2485 [Peter Sharpe] and SC-0932 [David Garcelon]) with the CDFW to conduct peregrine research on the Channel Islands, a banding permit (#21564) from the United States Geological Survey's Bird Banding Laboratory (BBL) allowing us to band peregrines with both federal and auxiliary leg bands and draw blood, and a research permit from the Catalina Island Conservancy. Our Migratory Bird Treaty Act permit (#MB95076A-0) allowed us to collect feathers, failed eggs, and eggshells at nests.

### **Survey Method**

We used a survey method similar to that used by the National Park Units in the Northern Colorado Plateau Network (NCPN), as described by Daw et al. (2006). The protocol involved monitoring potential nesting areas for up to 4 hours, normally the maximum time between eyrie visits/exchanges at the ledge (Daw et al. 2006), with a minimum of 3 visits to each known territory between February and June. The NCPN protocol allows for the use of recorded vocalizations to elicit vocal or behavioral responses from territorial birds, which has been found to increase the likelihood of detection and decrease the amount of time required to detect many bird species (Johnson et al. 1981, Anderson 2007, Barnes et al. 2012). Although call-broadcast surveys have typically been used for forest-dwelling raptors (Kimmel and Yahner 1990, Watson et al. 1999), they have also been used for non-forest raptors (Balding and Dibble 1984).

The call-broadcast technique we incorporated into our survey protocol was developed by Barnes et al. (2012) to survey for peregrines in the Lake Mead National Recreation Area. The 10-minute survey protocol begins with a 3-min passive observation period, followed by a 30-sec broadcast period, a 1-min observation period, a second 30-sec broadcast period, and a final 5-min passive observation period. We loaded recorded peregrine vocalizations (Stokes Field Guide

to Bird Songs: Western Region; Time Warner Trade Publishing, New York, NY), which were converted to mp3 format to be compatible with a digital game caller, to a FOXPRO NX4 game caller (FOXPRO Inc., Lewiston, PA). The vocalizations consisted of 5 sec of the ‘cack’ alarm call, immediately followed by 10 sec of the ‘eechup’ call from an adult female peregrine (described in Linthicum 1996), which were looped to produce 30 sec of continuous calling. During the call-broadcast a surveyor rotated up to 360° (depending on terrain, habitat, and broadcast location) in order to evenly project the sound around the broadcast point and the broadcast was discontinued immediately when a responding peregrine was detected.

We used the 4-hr passive observation and/or the 10-min call-broadcast protocol, depending on where and when we were conducting the survey, as described below. We did not conduct surveys or monitoring during periods of heavy rain, heavy fog, or severe cold. The general protocol called for not conducting surveys or monitoring during periods of sustained high winds greater than 25 km/h (~15 miles/hour). However, the Channel Islands can have long periods of high winds, which would have made it impossible to conduct any surveys for a week or more. Therefore, when there were high winds we attempted to conduct most surveys/monitoring on leeward sides of the islands.

## **Surveying Historical Nesting Areas**

IWS biologists began surveying territories for activity in February 2020. All territory locations on the Channel Islands that had been confirmed during our 2013-2019 surveys (Sharpe 2014, 2015, 2016, 2017, 2018; Sharpe and Melling 2018, Sharpe and Melling 2019) were uploaded into Garmin eTrex 20 GPS units (Garmin International Inc., Olathe, KS) to assist in locating the known territories on each island. We added satellite imagery (BirdsEye Satellite Imagery™, available through Garmin Basecamp™) onto each GPS unit for ease of orienting in relation to geographic features.

Initial surveys at each historical territory generally included a 10-min call-broadcast survey, followed by up to 4 hours of passive observations if no peregrines were detected. For the most part, we were unable to return to territories after initial surveys in 2020.

## Monitoring Active Territories

Active territories on Santa Barbara and San Clemente were visited sporadically through the season. Territories on Santa Cruz were not visited after February and only the Cathedral Cove territory was monitored on Anacapa (via web cam). We observed peregrines and potential or known nest sites from a distance of 150-1500 m using 20-60x spotting scopes and binoculars. Distances to peregrines or nest sites were estimated using a distance measuring function on our GPS units.

On each visit to an active territory we recorded data on weather conditions, time, observer location, peregrines observed, and behavior of any adult and chicks. To standardize behavioral observations made during these visits, we used the definitions and descriptions in Linthicum (1996). For most territories with chicks, we made our last visits when chicks were  $\geq 28$  days of age to determine success (see Terminology below).

## Nest Entry and Banding

We did not enter any nests in 2020.

## Terminology

There are a variety of definitions used to describe peregrine occupancy and nesting success, but we followed the guidelines in the 2003 Monitoring Plan for the American Peregrine falcon (U.S. Fish and Wildlife Service 2003), as defined below.

**Occupied Territory:** A territory where either a pair of peregrines is present (2 adults or an adult/subadult mixed pair), or there is evidence of reproduction (e.g., incubation, brooding, eggs or young, food delivery to an eyrie). We considered a territory occupied if there was evidence of occupancy on 2 or more visits to a territory.

**Nest Success:** The proportion of occupied territories on the Channel Islands in which 1 or more young  $\geq 28$  days old was observed, using the aging guidelines in Clum et al. (1996).

**Productivity:** The number of young observed at  $\geq 28$  days old per occupied territory, averaged across the Channel Islands.

We further categorized occupied territories based upon the following breeding stages (see Linthicum 1996 for further descriptions).



**Courtship:** Behavior indicative of pair bonding, such as cooperative hunting, adult prey exchanges, copulation, or ledge courtship displays.

**Incubation:** Adult observed in incubation posture (low horizontal position) or inferred to be incubating based upon behavior (for eyries that were not visible). The female does most of the incubation, but the male will bring her food several times per day and relieve her at incubation. During incubation, there is generally an adult present at the eyrie, except when disturbed or for short periods on warm days.

**Nestling:** Chick(s) present. May be able to see chicks, hear begging, or see adults in what appears to be feeding. Generally, only females brood and feed nestlings. An adult brooding young nestlings (< 7 days old) can look a lot like incubation, so we waited for a prey delivery to the eyrie to confirm that chicks were present.

**Fledgling:** When young reach  $\geq 28$  days old.

We classified the breeding activity of occupied territories as either successful, unsuccessful, unknown, or none as described below.

**Successful:** A pair produced 1 or more nestlings that survived until at least 28 days of age.

**Unsuccessful:** A pair that engaged in prolonged courtship or copulating that either did not produce eggs or failed during the incubation or nestling stage (chicks < 28 days old).

**Unknown:** There was insufficient survey data to make a determination as to the nesting outcome.

**None:** Pair present, but no or minimal signs of courtship observed.

## Data Management

Data were entered into island-specific Excel files that were shared via the cloud-based file storage program Dropbox. We combined the data into a master database and the field notebooks were kept on each island as backup records.

# RESULTS

## Surveying and Nest Monitoring

We visited 20 historical peregrine territories on the Channel Islands at least once in 2020 and located 1 previously unknown territory (Table 1). We confirmed a total of 13 occupied territories. Survey summaries for each island and territory are provided below.

### Santa Cruz Island

Surveys on Santa Cruz ran from 27 February to 2 March. We surveyed 12 historical territories and confirmed pairs were present in 6 territories and at least 1 adult was present in an additional 5 territories.

MC18 Gherini Knife Edge: We confirmed a pair was present in the historical Gherini Knife Edge territory (Fig. 2) on 28 February. They were exhibiting courtship behavior during our last visit on 2 March.

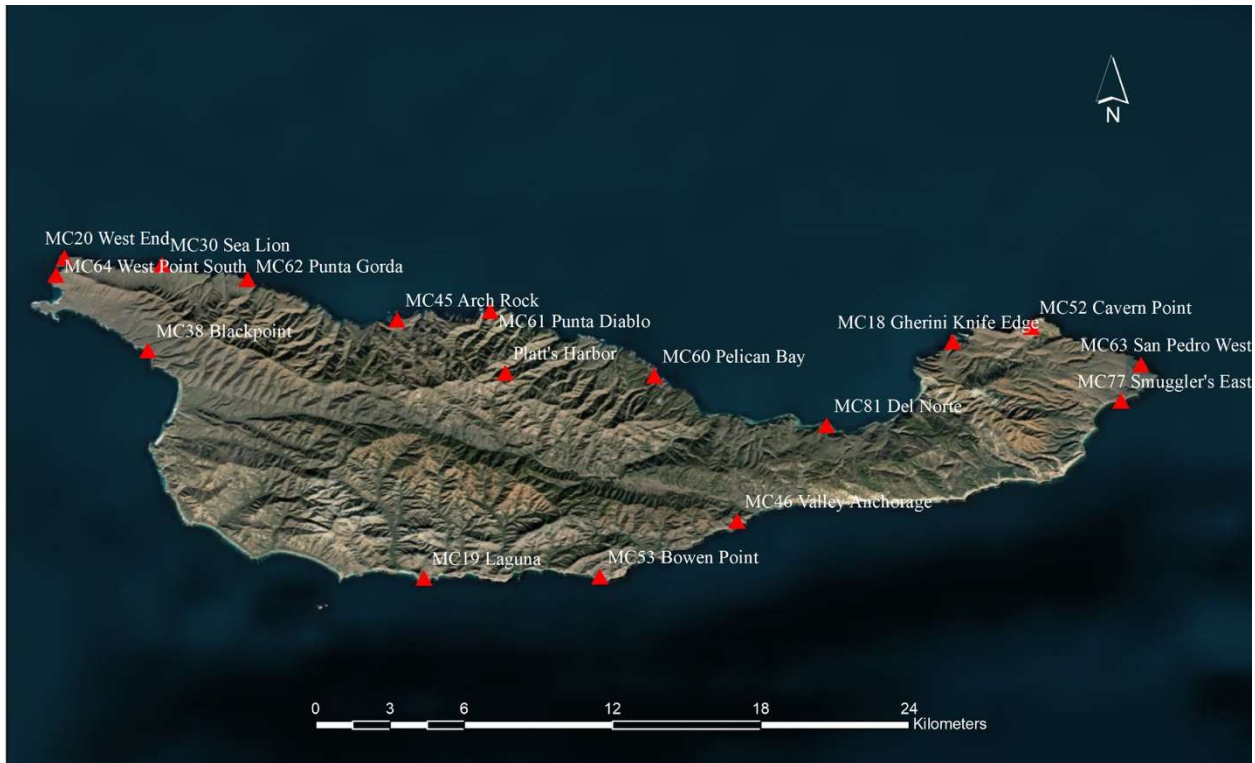


Figure 2. Known peregrine falcon territories on Santa Cruz Island, CA.

Table 1. Status and breeding activity observed at peregrine falcon territories surveyed on the California Channel Islands in 2020.

Island/ Territory Name	State Code <sup>a</sup>	Territory Type	Occupancy Status	Breeding Activity	# Chicks Hatched <sup>b</sup>	# of Fledglings <sup>b</sup>	Notes (see report text for more details)
<u>Santa Cruz</u>							
Gherini Knife Edge	MC18	Historical	Occupied	Unknown	.	.	Courtship observed
West End	MC20	Historical	Occupied	Unknown	.	.	Courtship observed
Sea Lion	MC30	Historical	Occupied	Unknown	.	.	Courtship observed
Black Point	MC38	Historical	Occupied	Unknown	.	.	Pair present
Arch Rock	MC45	Historical	Unknown	Unknown	.	.	1 adult present
Valley Anchorage	MC46	Historical	Unknown	Unknown	.	.	No adults observed
Punta Diablo	MC61	Historical	Unknown	Unknown	.	.	1 adult present
Punta Gorda	MC62	Historical	Unknown	Unknown	.	.	1 adult present
San Pedro West	MC63	Historical	Unknown	Unknown	.	.	1 adult present
West Point South	MC64	Historical	Occupied	Unknown	.	.	Courtship observed
East Smuggler's	MC77	Historical	Occupied	Unknown	.	.	Pair present
Del Norte	MC81	Historical	Unknown	Unknown	.	.	1 adult present
<u>Anacapa</u>							
West Anacapa	MC21	Historical	Occupied	Successful	3	3	3 fledglings seen at ledge with camera
<u>Santa Barbara</u>							
Signal Peak	MC33	Historical	Occupied	Successful	2	2	2 fledglings seen by J. Howard
North Peak	MC71	Historical	Occupied	Unknown	2	?	Did not confirm fledging
Rookery	TBD	New	Occupied	Unknown	1	?	Did not confirm fledging
<u>San Clemente</u>							
Seal Cove	MC79	Historical	Occupied	Unknown	.	.	Pair present
Wilson Cove	MC89	Historical	Occupied	Unknown	3	?	Did not confirm fledging
Pyramid	TBD	Historical	Occupied	Successful	1	1	1 fledgling observed

<sup>a</sup> Designated by the California Department of Fish and Wildlife (CDFW)

<sup>b</sup> Minimum number

MC20 West End: We confirmed a pair in the historical West End territory (Fig. 2) on 29 February, at which time they were exhibiting courtship behavior.

MC30 Sea Lion: We confirmed a pair exhibiting courtship behavior in the historical Sea Lion territory (Fig. 2) on 29 February.

MC38 Black Point: We confirmed a pair in the historical Black Point territory (Fig. 2) on 29 February.

MC45 Arch Rock: We observed a single adult in the historical Arch Rock territory (Fig. 2) on 27 February.

MC46 Valley Anchorage: We visited the historical Valley Anchorage territory (Fig. 2) on 29 February, but did not observe any adults.

MC61 Punta Diablo: We observed a single adult in the historical Punta Diablo territory (Fig. 2) on 27 February.

MC62 Punta Gorda: We observed a single adult in the historical Punta Gorda territory (Fig. 2) on 27 February.

MC63 San Pedro West: We observed a single adult in the historical San Pedro West territory (Fig. 2) on 28 February.

MC64 West Point South: We confirmed a pair exhibiting courtship behavior in the historical West Point South territory (Fig. 2) on 29 February.

MC77 East Smuggler's: We confirmed a pair present in the historical East Smuggler's territory (Fig. 2) on 28 February.

MC81 Del Norte: We observed a single adult in the historical Del Norte territory (Fig. 2) on 27 February.

## **Anacapa Island**

We did not conduct surveys of Anacapa in 2020. We were able to get information on the Cathedral Cove territory via a live web cam.



Figure 3. Known peregrine falcon territories on Anacapa Island, CA.

MC54 Cathedral Cove: The Cathedral Cove pair (Fig. 3) used a new nest in 2020, but we were able to confirm that they had at least fledglings when they began visited the eyrie with a live cam on 8 June.

### **Santa Barbara Island**

Jim Howard with the California Institute of Environmental Studies, conducted a limited survey of Santa Barbara for us this season. He located pairs in 2 historical territories and discovered a new territory.

MC33 Signal Peak: We observed 2 adults and 2 fledglings in the historical Signal Peak territory (Fig. 4) on 26 May.

MC71 North Peak: We confirmed 2 chicks in the historical North Peak territory (Fig. 4) on 28 April. Only 1 chick was seen on 26 May.

Rookery (MC# to be determined): We discovered 1 chick in a previously unknown territory on the eastern coast of the island (Fig. 4) on 26 May.

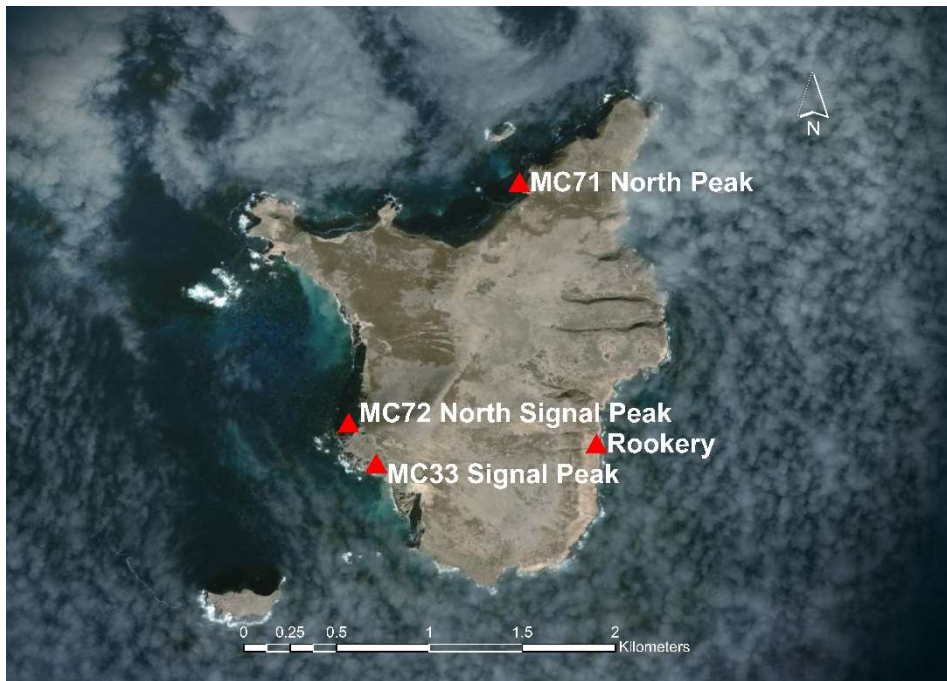


Figure 4. Known peregrine falcon territories on Santa Barbara Island, CA.

### San Clemente Island

IWS biologists that were able to continue working on the island during the pandemic were able to survey 3 historical territories during 2020 and confirmed pairs at each territory.

MC79 Seal Cove: We confirmed a pair in the historical Seal Cove territory (Fig. 5) on 7 February and 15 June. We do not know whether there were any breeding attempts.

MC89 Wilson Cove: We confirmed the presence of 3 chicks approximately 27-35 days old in the historical Wilson Cove territory (Fig. 5) on 7 June.

Pyramid (MC# to be determined): We confirmed a pair in the historical Pyramid territory (Fig. 5) on 12 March. The female of the pair (Band #1947-21681) fledged from the Cathedral Cove territory on Anacapa Island in 2016. We observed 1 adult and 1 fledgling flying in the area on 3 July.



Figure 5. Known peregrine territories on San Clemente Island, CA.

## Resightings

In 2020, we received sighting reports from the mainland for 4 peregrines that we had banded as nestlings on the islands.

A male banded in 2014 at the Carrington Point territory on Santa Rosa (Band #1156-16821) was the breeding male at Point Arguello in Santa Barbara County and successfully raised 2 chicks.

A female banded in 2015 at the Sea Lion territory on Santa Cruz (Band #1947-21663) was seen at Point Vincente on the Palos Verdes Peninsula in Los Angeles County on 22 May.

A female banded in 2016 at the Punta Gorda territory on Santa Cruz (Band #1947-21675) was seen in La Jolla, CA on 2 July.

A female banded in 2017 at the Krumholtz territory on Santa Rosa (Band #1156-16872) successfully raised 2 chicks in Laguna Beach, CA.

## DISCUSSION

Due to the 2020 pandemic, we were unable to conduct our regular surveys and monitoring of the peregrines on the Channel Islands in 2020. Due to budget shortfalls and the continuing pandemic as we head into the 2021 season, it is unlikely that we will be able to adequately survey for or monitor peregrines in the upcoming year. We recommend that regular surveys be conducted at least every 5 years to determine the status of peregrines across all the Channel Islands. The last full survey was in 2017, so efforts should be made to conduct a full survey in 2022.

## ACKNOWLEDGMENTS

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