PEREGRINE FALCON MONITORING ON THE CALIFORNIA CHANNEL ISLANDS, CALIFORNIA, 2013

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EXECUTIVE SUMMARY

American peregrine falcons (*Falco peregrinus anatum*) historically were common residents on all the California Channel Islands, with an estimated 15-30 pairs. Peregrine numbers plummeted across much of the northern hemisphere starting in the late 1940s and the peregrine population on the Channel Islands was drastically reduced or extirpated by 1955, likely as a result of the effects of DDE on egg hatchability.

The Santa Cruz Predatory Bird Research Group began peregrine falcon restoration on the Channel Islands in 1983, releasing 37 peregrine falcons on the islands through 1998. The first known successful hatching occurred on Anacapa Island in 1989. There were 9 occupied territories on the islands in 1992, which steadily increased to 27 occupied territories in 2007.

In 2013, the Institute for Wildlife Studies surveyed 35 historic peregrine territories and located 16 previously unknown territories on the Channel Islands using a combination of passive surveys and a call-broadcast survey. A total of 45 territories were occupied, including 29 of 35 historic territories (83%), with at least one occupied territory on each island. This was a 67% increase (8.9% annual increase) over the previous survey conducted in 2007. There were 10 occupied territories on San Miguel Island, 11 on Santa Rosa Island, 14 on Santa Cruz Island, 3 on Anacapa Island, 2 on San Nicolas Island, 3 on Santa Barbara Island, 1 on Santa Catalina Island, and 1 on San Clemente Island. The northern Channel Islands appear to be the stronghold for Channel Island peregrine falcons, likely due to more suitable nesting habitat and a larger prey base as compared to the southern Channel Islands.

A minimum of 69 chicks are known to have hatched on the Channel Islands in 2013, of which 63 are known to have survived to $\geq$ 28 days of age. The earliest and latest dates for the start of incubation were 26 February (North Signal Peak, Santa Barbara Island) and 18 May (Crook Point, San Miguel Island), respectively. The mean dates for the start of incubation and chick hatching were April 2 and 5 May, respectively. Nest success in occupied territories with known outcomes dropped from 66.7% in 2007 to 53.7% in 2013, but productivity was similar between 2007 (1.46 chicks/occupied territory) and 2013 (1.43 chicks/occupied territory).

Measurements on eggs and/or eggshell fragments collected from 21 peregrine territories on 6 islands had average thinning of 12.39%, which is a decrease from previous studies. Eggshell thinning in 2013 ranged from 5.22% to 30.49% and was generally higher on San Miguel Island.

We collected prey remains from 22 territories on 7 islands. Seventy-nine percent of prey items that were identified to at least the family level were sandpipers (32%), alcids (32%), or gulls (15%). Alcids and gulls have been shown to have high burdens of DDE, so they are a potential source of DDE for breeding peregrines on the Channel Islands.

The peregrine population on the California Channel Islands has recovered to a level that is above predicted historic levels and current productivity appears sufficient to at least maintain the population. However, more study into basic population parameters, such as survival, emigration and immigration rates on the islands is required.

ACKNOWLEDGMENTS

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TABLE OF CONTENTS

TABLE OF CONTENTS. CONTINUED.

TABLE OF CONTENTS. CONTINUED.

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

INTRODUCTION

American peregrine falcons (*Falco peregrinus anatum*; hereafter peregrines) historically 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 (USFWS 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 37 peregrines on the Channel Islands (12 on San Miguel, 17 on Catalina, 4 on Santa Rosa, and 4 on Santa Cruz; Latta 2012). 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 nine active eyries on four 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) that was created to oversee the settlement monies is composed of representatives of Federal and State agencies that have interests in the Southern California Bight: the 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 done 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 2012). The 2007 survey located 25 active pairs on five of the eight islands, but also found that DDE contamination still appeared to be reducing the reproductive success (Latta 2012).

Under Phase 2 of the MSRP Restoration Plan, another peregrine survey and monitoring effort was planned to be initiated in 2013 (Montrose Settlements Restoration Program 2012). The Institute for Wildlife Studies (IWS), which has been conducting wildlife research on the Channel Islands since 1980, was awarded the contract to conduct peregrine surveys and monitoring and this report summarizes the results of the 2013 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

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

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).

San Miguel Island (hereafter San Miguel) is owned by the U.S. Navy, but managed by the NPS (Fig. 1). It is approximately 13 x 6 km with a land area of approximately 37 km^2, a maximum elevation of 253 m, and a coastline of approximately 43 km (Channel Islands National Park (CINP) website (http://www.nps.gov/chis), Junak et al. 1995). The island is primarily a gently sloping plateau with long, sandy beaches that is fully exposed to the prevailing northwesterly winds (Coonan and Schwemm 2009).

Santa Rosa Island (hereafter Santa Rosa) is the second largest of the Channel Islands and is owned by the NPS (Fig. 1). The island is approximately 24 x 16 km and encompasses about 217 km^2 with a central mountain range reaching an elevation of 484 m (CINP website, Junak et al. 1995). The central highland is dissected by drainages; a relatively gentle marine terrace occurs north of the highland, whereas steep, deeply incised drainages comprise much of the south portion of the island (Coonan and Schwemm 2009).

Santa Cruz Island (hereafter Santa Cruz) is the largest of the eight Channel Islands and is owned by the NPS (eastern 24% of the island) and The Nature Conservancy (TNC; western 76% of the island). The island measures about 38 km long by 12 km wide at its widest point (Fig. 1), encompassing approximately 249 km^2 with a maximum elevation of 753 m (Junak et al. 1995) and a 124 km coastline with many cliffs (CINP website).

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

San Nicolas Island (hereafter San Nicolas) owned by the U.S. Navy, is the most remote of the Channel Islands. It is located 98 km from the mainland (Junak et al. 1995) and 45 km from its nearest neighbor, Santa Barbara Island (Moody 2000; Fig. 1). It is approximately 13 x 5 km in size and has an area of about 58 km^2 and a maximum elevation of 277 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^2 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).

Santa Catalina Island (hereafter Catalina), located 34 km south of Long Beach, California, is owned primarily by the Santa Catalina Island Conservancy (~90%). The island is 34 km long, 0.8 to 13.0 km wide, and has an area of 194 km^2, 80 km of coastline, and maximum elevation of 648 m (Junak et al. 1995; Fig. 1).

San Clemente Island (hereafter San Clemente), owned by the U.S. Navy, is the southernmost of the California Channel Islands, located approximately 92 km off the coast of California (Fig. 1). The island is 145 km^2, about 34 km long, between 2.5 and 6.5 km wide, and has a high point of 599 m. 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 California Channel Islands, a banding permit (# 21564) from the United States Geological Survey's Bird Banding Laboratory allowing us to band peregrines with both federal and auxiliary leg bands and draw blood, and research permits from the NPS (Permit # CHIS-2013-SCI-0004) and the Santa Catalina Island Conservancy (Permits 12-014 and 13-005) to allow us to conduct our research on Channel Islands National Park islands and Santa Catalina Island. Authorization for Migratory Bird Treaty Act (MBTA) permits were delayed, so IWS was added to the Region 8 FWS MBTA permit (Permit# MB164274-0) so that we could 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 four hours, normally the maximum time between eyrie visits/exchanges at the ledge (Daw et al. 2006), with a minimum of four 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 a digital game caller (FOXPRO NX4, 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 Cade et al. 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, especially San Miguel, Santa Rosa, San Nicolas, and Santa Barbara, tend to 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. If it was necessary to survey on the windward sides, we did not include the survey in the minimum of 4 surveys required to determine that a territory was inactive.

Surveying Historic Nesting Areas

IWS biologists began surveying territories for activity in February 2013. All known territory locations on the Channel Islands from Latta (2012) and from the CDFW's database (provided by Carie Battistone) 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 historic territory included a 10-min call-broadcast survey, followed by up to 4 hours of passive observations if no peregrines were detected. For each visit to an historic territory we completed a Peregrine Falcon Monitoring Occupancy and Productivity Data Form (Appendix I). If any peregrines were detected, we would return at approximately 10-14 day intervals for further monitoring (see Monitoring Active Territories below). If no pair was detected, we returned at least 3 more times at approximately 1-month intervals to verify that the territory was inactive.

Surveying for New/Unknown Territories

We used the 10-min call-broadcast method to conduct ground-based and boat surveys for new or unknown peregrine territories on the islands. Although peregrine habitat typically contains tall cliffs (50+ m) to serve as perching and nesting sites (Johnsgard 1990), we did not assume that those were the only places that peregrines would nest on the islands. In other studies, peregrines have been found nesting on the ground (Hickey and Anderson 1969, Pagel et al. 2010) and in tree nests of other raptors and in tree cavities (Campbell et al. 1977). Because peregrine nests have historically been found far inland in canyons on Santa Rosa Island (Pemberton 1928), we surveyed for peregrines both along the coastal bluffs and cliffs and in interior portions of the islands. Call-broadcast locations during a single day were generally ~1 km apart, although they could be more closely spaced if required for adequate coverage in areas of high topographic relief that may have minimized the distance at which the broadcast could be

heard by peregrines (e.g., opposite sides of a steep ridge, along a coastline with many harbors or prominent points) or where ocean noise impacted our ability to hear responding peregrines. We used GPS units to record our daily survey routes, call-broadcast locations, and sightings of peregrines. At each call-broadcast location we completed a Call-Broadcast Survey Form (Appendix II). We revisited areas with potential peregrine habitat at approximately monthly intervals to determine whether birds had gone undetected or had occupied an area after a previous survey.

Monitoring Active Territories

A primary goal of peregrine monitoring under Phase 2 of the MSRP Restoration Plan was to determine breeding chronology and outcome, including egg-laying and incubation periods, reproductive success/failure, recycling attempts, and number of young produced and fledged (Montrose Settlements Restoration Program 2012). We attempted to visit occupied territories at 10-14 day intervals to estimate the chronology of the breeding season. We were able to refine estimates of lay and hatch dates by aging the chicks using photos and descriptions in Cade et al. (1996) and assuming a 33-day incubation period. We only used the 10-min call-broadcast about one time per month at active territories, if needed, to minimize the chance that the birds would become acclimatized to the recorded vocalizations. We observed peregrines and potential or known nest sites from a distance of 150-1500 m using 20-60x60 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 on the Peregrine Falcon Monitoring Occupancy and Productivity Data Form (Appendix I). To standardize behavioral observations made during these visits, we used the definitions and descriptions in Cade et al. (1996). At each territory we took digital photos of the general area where peregrine activity was observed, the eyrie (if known and visible), and the adult birds, if possible. For territories with chicks, we made our last visits when chicks were $\geq$ 28 days of age to determine success, as described by Cade et al. 1996 (see Terminology below).

Nest Entry and Banding

We entered active nests either when the chicks were approximately 21-28 days of age (recommended age range is 21-35 days; Cade et al. 1996) or when the nest failed and there was no sign of further nesting attempts after a minimum of two weeks. We lowered the upper age limit to minimize the likelihood of chicks jumping from the eyrie, especially when the eyrie was located on tall cliffs above the ocean. Each eyrie was evaluated by our climbing team, Jim Campbell-Spickler and Joe Barnes, to determine the safest anchoring technique(s) and route of entry. For eyries that were only visible from a distant location, we had a biologist remain at the observation point to help direct the climbing team to the eyrie via handheld radios. In most cases, the chicks were placed in a small duffle bag and carried to the top of the nest cliff for processing. On some of the most difficult to access eyries, the chicks were processed at the eyrie.

Peregrines exhibit reverse size dimorphism and sex can be determined accurately based upon their size and appearance (Burnham et al. 2003). We determined the sex of each chick based primarily on weight, overall size, and the breadth of the tarsi (Burnham et al. 2003, J. Barnes *pers. comm.*). We attempted to band chicks when they were at least 21 days old, at which time they had developed sufficiently so that differences in the size of the tarsus was evident (Craig and Enderson 2004). Males were fit with a USFWS lock-on #6 band on the left leg and a black anodized aluminum band with silver alphanumerical characters (Acraft Sign & Nameplate Co., Edmonton, Alberta, Canada) on the right leg, and females were banded with a USFWS lock-on #7A band on the right leg and an Acraft band on the left leg (Fig. 2). If there was any question as to the sex of the birds, then we used the female bands (Cade et al. 1996, Gustafson et al. 1997). We collected approximately 0.5 cc of heparinized whole blood from most chicks for future DNA and/or contaminants analyses. We recorded banding and morphological information for each chick on a banding form (Appendix III).

During nest entries we collected addled eggs, eggshell fragments and prey remains. Samples were labeled and delivered to the Western Foundation of Vertebrate Zoology (WFVZ, Camarillo, CA) for contaminants analysis of addled eggs, determination of shell thickness (addled eggs and fragments), and prey identification. We also collected any nestling or adult peregrine feathers for stable isotope analyses to be conducted by Dr. Seth Newsome at the University of New Mexico. We enhanced nest ledges, if necessary, by removing sharp stones or adding suitable substrate to reduce the chance of eggs breaking in the nest in the future.

Figure 2. Peregrine falcon chicks with federal (silver) and Acraft (black) leg bands.

Prey Remains

Prey remains delivered to the WFVZ were analyzed by N. John Schmitt. He keyed out prey items using a reference collection and determined the minimum number of individuals (MNI) based upon duplicate feathers or body parts (e.g., 2 left feet of a species would indicate a minimum of 2 individuals).

Eggshell Measurements

René Coronado (WFVZ) measured the thickness of eggshells using 2 methods. Method 1, referred to as the René Coronado "RC" method, used a measuring device consisting of a thin gauge wire mounted to a digital gauge (Starrett Gauge; 0.00005 mm resolution) fixed to a mounting bracket with a moveable bottom plate. For whole eggs, 10 shell measurements were taken around the equator of each egg (not at the poles because more calcium is deposited at the ends), where there is no visible debris, both with and without the membrane, as applicable. If a

membrane is no longer attached to the shell at the equator, then measurements are taken without membrane, but an average membrane thickness is also measured separately and provided. For samples that contain only eggshell fragments, usually only 1-2 measurements were taken on each fragment. To ensure that the egg fragments actually belong to the species in question, only those fragments that could be clearly identified as peregrine eggshells were measured.

Method 2, referred to as the Sam Sumida "SS" method, uses a mechanical gauge (Federal Gauge; 0.01 mm resolution) attached to the same mounting bracket and pin used in Method 1, to allow for comparison with historical measurements taken by Sam Sumida and the WFVZ prior to 2003. Method 2 uses the same procedure as described for Method 1, except for the change in the gauge, and a tapping of the raising and lowering arm of the mounting bracket

Percent eggshell thinning was calculated by comparing measured eggshell thickness with the standard pre-DDT peregrine eggshell thickness in California of 0.364 mm (Kiff 1994) using the equation N% = [1-(thickness/0.364)] x 100 (Latta 2012).

Terminology

Different states and groups have used various definitions 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 (two 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 two or more visits to a territory.

Nest Success: the proportion of occupied territories on the Channel Islands in which one or more young $\geq$ 28 days old was observed, using the aging guidelines in Cade 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 Cade et al. 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 the majority of 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 at all times, 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 ≥ 28 days old.

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

Successful: A pair produced one 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).

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

Data Management

We maintained island-specific survey data on separate computers for San Miguel, Santa Rosa, and Santa Cruz islands. Data were emailed to Dr. Sharpe on a weekly basis to be maintained in a master database on Catalina. We downloaded data from our GPS units daily to the free Garmin Basecamp™ program, which allowed us to evaluate which areas needed additional surveys and to share data among our biologists. Information from each Call-Broadcast Survey Form was entered for each corresponding point in Basecamp™ so that we could easily find the results of previous surveys. Data from the Peregrine Falcon Monitoring Occupancy and Productivity Data Forms (Appendix I) were entered into an Excel spreadsheet on a weekly basis and emailed to Catalina to be added into the master spreadsheet. The datasheets were kept on each island until the end of the season as backup records. To facilitate the transfer of information between crews, the crew on each island sent an email to each biologist with a weekly summary of what areas were surveyed and the results of the surveys.

RESULTS

Surveying and Nest Monitoring

We surveyed 35 historic peregrine territories and located 16 previously unknown territories on the Channel Islands (Table 1). A total of 45 territories were occupied, including 29 of 35 historic territories (83%), with at least one occupied territory on each island (Figs. 3 and 4, Table 1, Appendix IV). We provide survey summaries for each island and territory below.

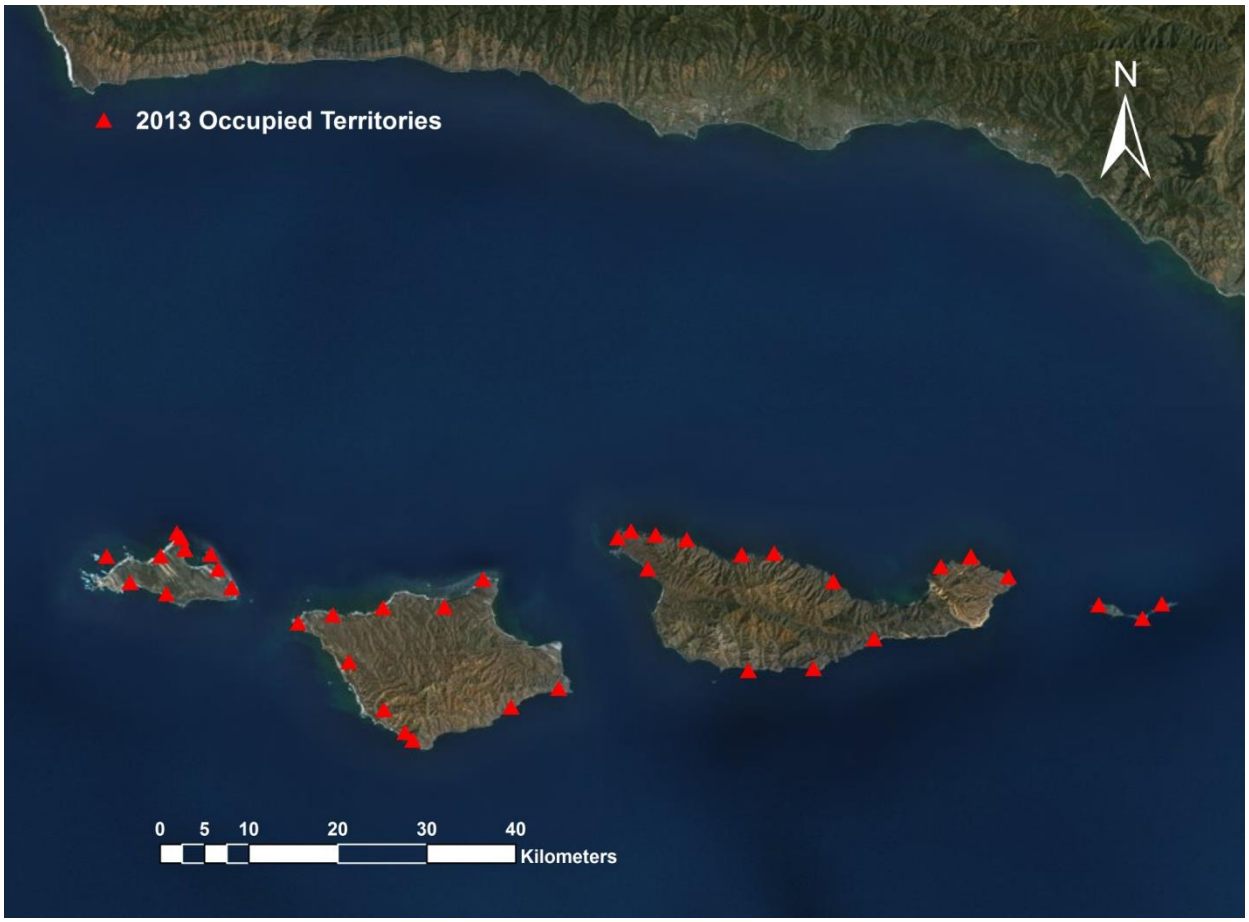

Figure 3. Occupied peregrine falcon territories located on the northern Channel Islands in 2013.

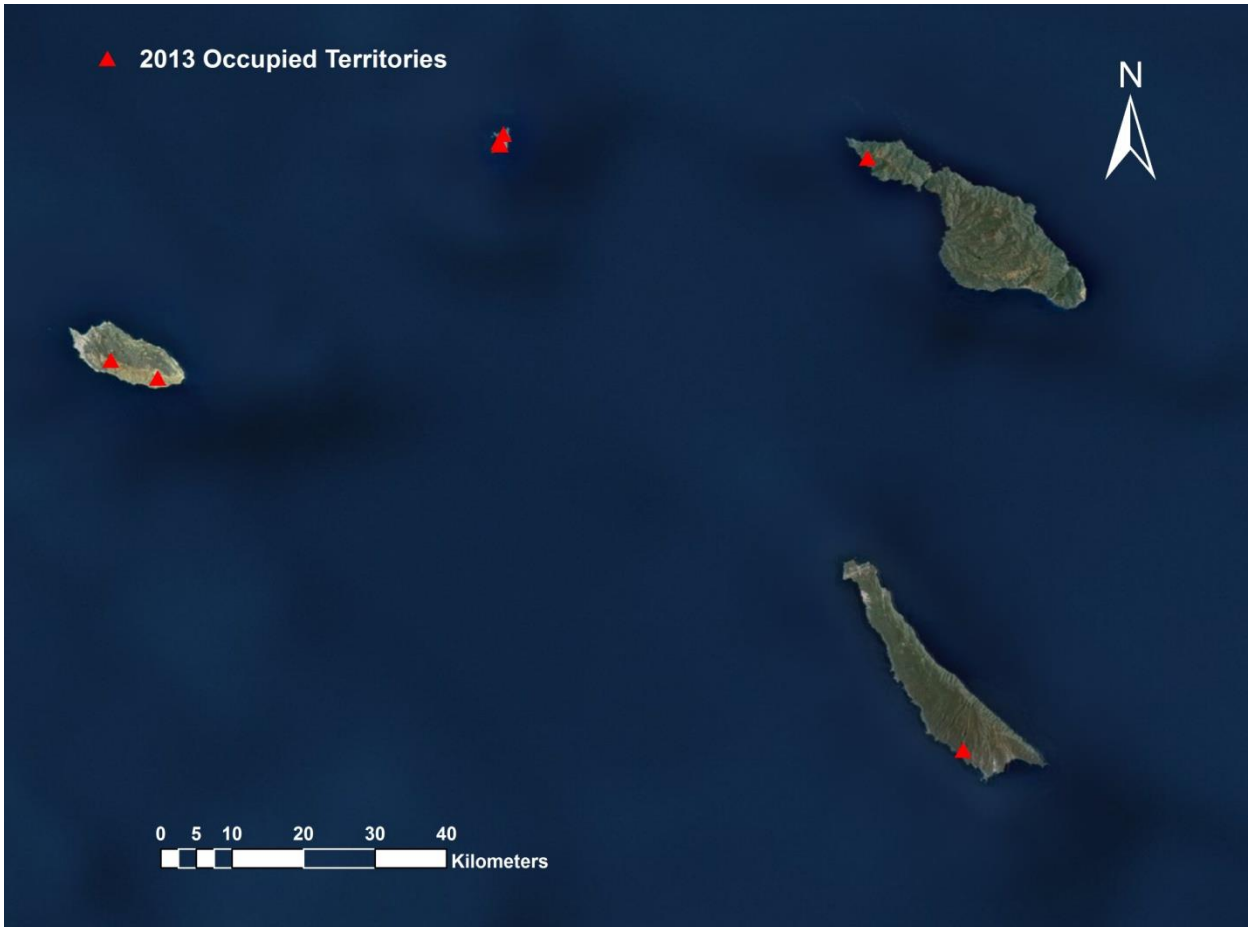

Figure 4. Occupied peregrine falcon territories located on the southern Channel Islands in 2013.

San Miguel Island

Surveys began on San Miguel on 21 February and continued every other week through 18 June. We made two additional trips to the island on 19-23 June and 19-23 July for banding and follow-up visits. We surveyed the eight previously known territories on San Miguel and located three previously unknown territories (Fig. 5), two of which were on off-shore rocks/islands.

MC17 Hoffman Point: We confirmed a pair in the historic Hoffman Point territory (Fig. 5) on 21 February, the first of our ten visits to the territory. The pair responded to our call-broadcast with flight and vocalizations. The pair was categorized as being in the courtship stage through 20 May, but there was no sign of nesting during visits made on 1 and 13 June or 22 July.

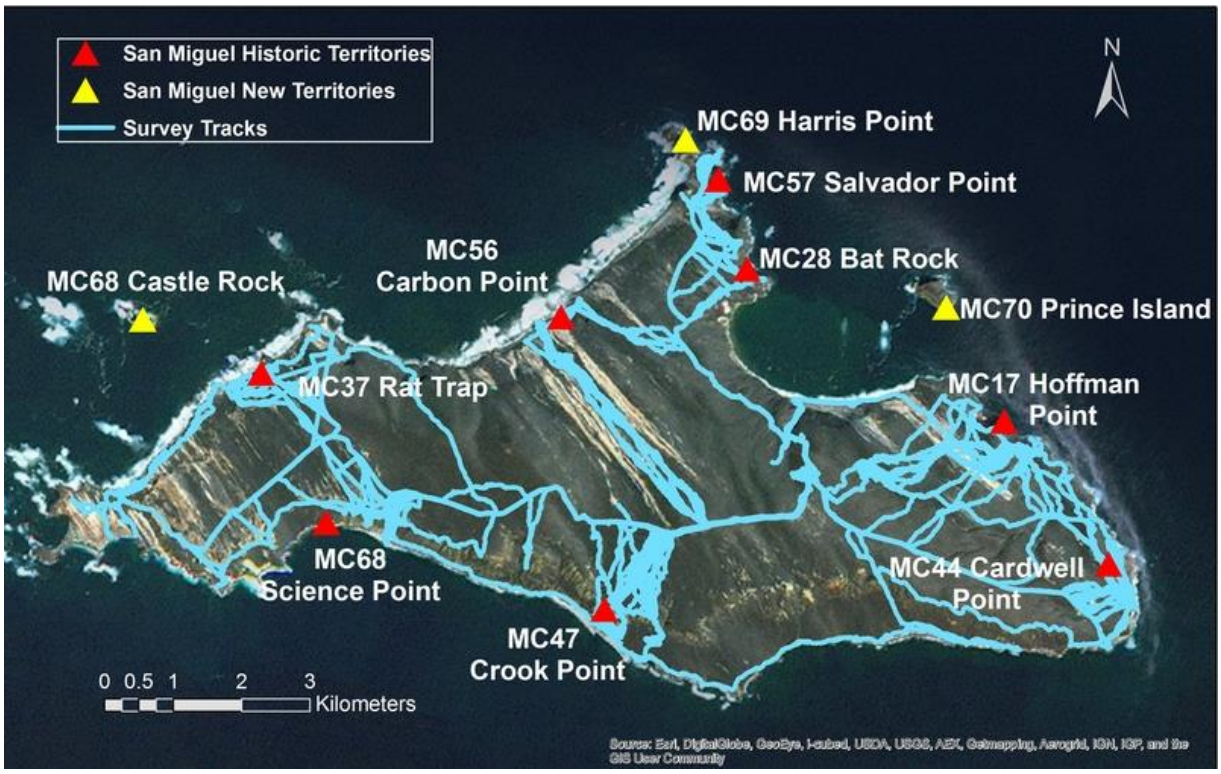

Figure 5. Peregrine falcon survey routes and territories on San Miguel Island, CA, 2013

MC28 Bat Rock: We confirmed a pair in the historic Bat Rock territory (Fig. 5) on 23 February without the use of a call-broadcast (both birds were perched upon arrival). The pair was first classified in the courtship stage on 20 March and as incubating on 2 May. We suspected that there were nestlings, based upon adult behavior, on 30 May and 11 June. We entered the eyrie on 20 June and banded 3 chicks (2 F: 1 M) that were approximately 24-30 days old (Table 2, Appendix V). We confirmed successful fledging of all 3 chicks during our next visit on 21 July.

MC37 Rat Trap: We observed a pair in the historic Rat Trap territory (Fig. 5) on 22 February, but could not confirm that a pair was present during the remaining 5 visits to the territory. We made full 4-hour surveys on 23 March, 7 April, and 2 June; an adult male was seen during the April survey and an adult female was seen during the June survey. Because we only saw a pair of birds on one occasion early in the breeding season, we did not classify the territory as occupied. We believe that the pair from this territory may have bred on Castle Rock (see below).

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Table 1. Status and breeding activity observed at peregrine falcon territories surveyed on the California Channel Islands in 2013.

Island/ Territory Name	State Code[a]	Territory Type	Occupancy Status	Breeding Activity	# Chicks Hatched[b]	# of Fledglings	Notes (see report text for more details)
San Miguel							
Hoffman Point	MC17	Historic	Occupied	Unsuccessful	.	.	Extended courtship, no signs of laying.
Bat Rock	MC28	Historic	Occupied	Successful	3	3	Banded 3 chicks 6/20.
Rat Trap	MC37	Historic	Unoccupied	None	.	.	May have moved to MC68 Castle Rock.
Cardwell Point	MC44	Historic	Occupied	None	.	.	Pair present, no extended courtship seen.
Crook Point	MC47	Historic	Occupied	Unsuccessful	1-2	0	Young chick seen 6/21. Failed by 7/20.
Carbon Point[c]	MC56	Historic	Occupied	Unsuccessful	.	.	Failed during incubation.
Salvador Point[d]	MC57	Historic	Occupied	None	.	.	Pair present, no extended courtship seen.
Science Point[e]	MC58	Historic	Occupied	Successful	3-4	3	Eyrie unknown, 3 fledglings seen on 6/2.
Castle Rock	MC68	New	Occupied	Successful	3-4	3	Eyrie unknown, 3 fledglings seen on 6/2.
Harris Point	MC69	New	Occupied	Unsuccessful	0	0	Failed during incubation.
Prince Island	MC70	New	Occupied	Unknown	.	.	Pair first seen on 6/13, unknown status.
Santa Rosa							
Carrington Point	MC16	Historic	Occupied	Successful	3-4	3	Banded 3 chicks on 5/8.
Lime Point	MC27	Historic	Unoccupied	.	.	.	Likely same birds as MC27a
Lobos Canyon	MC27a	Historic	Occupied	None	.	.	Pair present, no courtship observed.
Water Canyon	MC31	Historic	Unoccupied	.	.	.	Single bird seen 3 times in February.
Bee Rock Canyon	MC34	Historic	Occupied	Unsuccessful	.	.	Failed during incubation, 3 eggs seen.
Orr's Camp	MC35	Historic	Occupied	Successful	3	3	Banded 3 chicks on 5/8.
Lost Hat	MC36	Historic	Unoccupied	.	.	.	No peregrines seen during 7 visits.
Trancion	MC50	Historic	Occupied	Successful	2	2	Banded 2 chicks on 5/22.
Krumholtz	MC51	Historic	Occupied	Unsuccessful	0-1	0	Female removed dead chick on 5/4.
Soledad	MC55	Historic	Occupied	Unsuccessful	2	0	One chick died 6/5, banded other 6/10.
Gnoma[f]	MC76	Historic	Occupied	Successful	1	1	Banded 1 chick on 5/21.
Bonn Point	MC65	New	Occupied	Unsuccessful	.	.	Extended courtship, no signs of laying.
Chickasaw Canyon	MC66	New	Occupied	Unsuccessful	.	.	Extended courtship, no signs of laying.
Sandy Point	MC67	New	Occupied	Unsuccessful	.	.	Failed during incubation.

Table 1. Continued.

Island/ Territory Name	State Code[a]	Territory Type	Occupancy Status	Breeding Activity	# Chicks Hatched[b]	# of Fledglings	Notes (see report text for more details)
Santa Cruz							
Gherini Knife Edge	MC18	Historic	Occupied	Successful	3	3	Banded 3 chicks on 5/10.
Laguna	MC19	Historic	Occupied	Successful	2-4	2	Banded 2 chicks on 6/18.
West End	MC20	Historic	Occupied	Unsuccessful	.	.	Two eggs seen, failed during incubation.
Sea Lion	MC30	Historic	Occupied	Unsuccessful	.	.	Failed during incubation
Black Point	MC38	Historic	Occupied	Successful	2	2	Banded 2 chicks on 6/17.
Arch Rock	MC45	Historic	Occupied	Unsuccessful	.	.	Failed during incubation.
Valley Anchorage	MC46	Historic	Occupied	Successful	3-4	3	Banded 3 chicks on 5/31.
Bowen Point	MC53	Historic	Occupied	Successful	3-4	3	Banded 1 of 3 chicks on 5/29.
Cavern Point[g]	MC59	Historic	Occupied	Unsuccessful	.	.	Extended courtship, no signs of laying.
Pelican Bay	MC60	New	Occupied	Unsuccessful	.	.	Second year female, no signs of laying.
Punta Diablo	MC61	New	Occupied	Successful	2-4	2	Banded 2 chicks on 6/7.
Punta Gorda	MC62	New	Occupied	Successful	3-4	3	Banded 3 chicks on 5/30.
San Pedro West	MC63	New	Occupied	Successful	1	1	Banded 1 chick on 5/25.
West Point South	MC64	New	Occupied	Successful	2-4	2	Banded 2 chicks on 5/31.
Anacapa							
West Anacapa Alt.	MC21	Historic	Occupied	Successful	3-4	3	Eyrie was not visible or accessible.
Middle Anacapa	MC43	Historic	Occupied	Successful	2-4	2	Eyrie was not visible or accessible.
Cathedral Cove	MC54	Historic	Occupied	Successful	4	4	Banded 4 chicks on 5/26.
San Nicolas							
Harrington	MC73	New	Occupied	Successful	2	2	Banded 2 chicks on 6/4.
Cattail Canyon	MC74	New	Occupied	Successful	3	3	Banded 3 chicks on 6/5.
Santa Barbara							
Signal Peak	MC33	Historic	Occupied	Successful	4	4	Banded 4 chicks on 5/10.
North Peak	MC71	New	Occupied	Unsuccessful	.	.	Extended courtship, no signs of laying.
North Signal Peak	MC72	New	Occupied	Successful	3-4	3	Territory found when close to fledging

Table 1. Continued.

Island/ Territory Name	State Code[a]	Territory Type	Occupancy Status	Breeding Activity	# Chicks Hatched[b]	# of Fledglings	Notes (see report text for more details)
Santa Catalina							
Long Point	MC42	Historic	Unoccupied	.	.	.	One possible sighting on 2/15.
Bullethead	MC49	Historic	Unoccupied	.	.	.	One adult peregrine seen on 3/17.
Silver Peak	MC75	New	Occupied	Unsuccessful	3	0	Banded 3 chicks on 6/16. None fledged.
San Clemente							
Cave Canyon	MC52	Historic	Occupied	Successful	3-4	3	J. Pagel banded 2 of 3 on 5/15.

[a] Designated by the California Department of Fish and Wildlife (CDFW).
[b] Range of number of chicks is listed when the eyrie was not visible and it is possible that chicks died before banding or fledging. Assumes maximum clutch of 4.
[c] Reported as MC57 in Latta (2012), but redesignated by CDFW in 2013.
[d] Reported as MC58 in Latta (2012), but redesignated by CDFW in 2013.
[e] Reported as MC59 in Latta (2012), but redesignated by CDFW in 2013.
[f] Reported as MC56 in Latta (2012). No record with CDFW, so designated in 2013.
[g] Reported as MC52 in Latta (2012), but redesignated by CDFW in 2013.

MC44 Cardwell Point: Although we saw individual peregrines at the historic Cardwell Point territory (Fig. 5) starting on 21 February, we did not confirm that a pair was present until 24 March, at which time they were showing signs of courtship. Two birds were observed on 19 April, but their breeding status was unknown. No individuals were observed during 4-hour surveys on 3 and 16 May, and we saw only one individual during a 6-hour survey on 1 June. We classified this territory as occupied, but could not confirm a breeding attempt.

MC47 Crook Point: Although we saw no peregrines on our first visit to the historic Crook Point territory (Fig. 5) on 24 February, we confirmed the presence of a pair on 11 March. The pair exhibited courtship behavior beginning on 21 March and were showing signs of incubation on 5 May. We did not have a view into the eyrie from our observation point, so were never able to see the eggs or confirm hatching. We entered the eyrie on 21 June and found a single chick that was approximately 1 day old. Thus, it appears that the Crook Point pair laid a second clutch of eggs after their first clutch failed. We returned to the eyrie on 20 July to band the chick, but the nest had already failed.

MC56 Carbon Point: We confirmed a pair in the historic Carbon Point territory (Fig. 5) on 20 February and they showed signs of courtship on our next visit on 9 March. The pair showed signs of incubation on 1 May, but appeared to have failed by 29 May. We entered the eyrie on 19 June and collected eggshell fragments (Appendix V).

MC57 Salvador Point: We confirmed a pair in the historic Salvador Point territory (Fig. 5) during our second visit on 20 March. Although the pair showed signs of territorial defense, we saw no indications of courtship or nesting activities through our last visit on 12 June.

MC58 Science Point: We confirmed a pair in the historic Science Point territory (Fig. 5) on 22 February. We made 7 additional visits through 19 May, but could not confirm courtship or nesting activities. On 2 June, we saw 3 fledglings estimated to be more than 40 days old, based upon plumage characteristics. On 20 July, we attempted to locate the eyrie by rappelling in the area. We were unable to locate the eyrie, but collected peregrine feather samples from a dead fledgling below the cliff and from a likely feeding perch (Appendix V).

Table 2. Summary of peregrine falcon banding on the California Channel Islands, CA, 2013.

Island/Territory Name	Sex	Age (days)	USGS Band #	Color Band	Wt. (g)	Notes
San Miguel						
MC28 Bat Rock	Female	30	1947-21628	75/AC	925	
MC28 Bat Rock	Male	30	1156-16820	06/AC	705	
MC28 Bat Rock	Female	24	1947-21629	52/AC	625	Under-developed
Santa Rosa						
MC35 Orr's Camp	Female	22	1947-21601	93/AC	700	
MC35 Orr's Camp	Male	20-22	1156-16802	41/AC	600	
MC35 Orr's Camp	Male	~21	1156-16801	99/AC	580	Color band size 7A
MC16 Carrington Point	Female	17-20	1947-21603	84/AC	680	
MC16 Carrington Point	Female	17-20	1947-21602	56/AC	620	
MC16 Carrington Point	Male	20	1156-16803	32/AC	570	
MC76 Gnoma	Female	24-25	1947-21607	66/AC	690	
MC50 Trancion	Female	~23	1947-21609	95/AC	660	
MC50 Trancion	Female	~23	1947-21608	89/AC	640	
MC55 Soledad	Male	20-21	1156-16814	43/AC	440	Unhealthy
Santa Cruz						
MC18 Gherini Knife Edge	Male	24	1156-16805	44/AC	650	
MC18 Gherini Knife Edge	Male	24	1156-16806	39/AC	600	
MC18 Gherini Knife Edge	Male	17	1156-16807	27/AC	370	
MC63 San Pedro West	Female	26-28	1947-21610	70/AC	890	
MC53 Bowen Point	Female	20-23	1947-21611	97/AC	790	Banded 1 of 3
MC62 Punta Gorda	Female	28	1947-21617	87/AC	910	
MC62 Punta Gorda	Male	28	1156-16808	12/AC	710	
MC62 Punta Gorda	Male	21	1156-16809	31/AC	470	
MC64 West Point South	Male	30	1156-16810	00/AC	780	
MC64 West Point South	Female	28	1947-21618	80/AC	1000	
MC46 Valley Anchorage	Male	24	1156-16811	46/AC	600	
MC46 Valley Anchorage	Female	24	1947-21619	85/AC	840	
MC46 Valley Anchorage	Female	23	1947-21620	65/AC	780	
MC61 Punta Diablo	Male	26	1156-16813	48/AC	750	
MC61 Punta Diablo	Female	26	1947-21625	60/AC	980	
MC38 Black Point	Male	23-25	1156-16818	20/AC	665	
MC38 Black Point	Female	23-25	1947-21626	77/AC	635	
MC19 Laguna	Male	25-26	1156-16819	35/AC	570	
MC19 Laguna	Female	25-26	1947-21627	73/AC	815	

Table 2. Continued.

Island/Territory Name	Sex	Age (days)	USGS Band #	Color Band	Wt. (g)	Notes
Anacapa						
MC54 Cathedral Cove	Female	17-18	1947-21612	88/AC	720	
MC54 Cathedral Cove	Female	14	1947-21614	59/AC	460	
MC54 Cathedral Cove	Female	18	1947-21615	54/AC	740	
MC54 Cathedral Cove	Female	18	1947-21616	68/AC	560	
San Nicolas						
MC73 Harrington	Female	28	1947-21621	55/AC	950	
MC73 Harrington	Female	28	1947-21622	92/AC	950	
MC74 Cattail Canyon	Female	23-25	1947-21623	57/AC	960	
MC74 Cattail Canyon	Female	23-25	1947-21624	67/AC	970	
MC74 Cattail Canyon	Male	23-25	1156-16812	05/AC	740	
Santa Barbara						
MC33 MC 33 Signal Peak	Female	25-30	1947-21604	94/AC	780	
MC33 MC 33 Signal Peak	Female	25-30	1947-21605	62/AC	1030	
MC33 MC 33 Signal Peak	Female	25-30	1947-21606	71/AC	870	
MC33 MC 33 Signal Peak	Male	25-30	1156-16804	24/AC	680	Injured on San Clemente, 1/7/14
Santa Catalina						
MC75 Silver Peak	Male	18-21	1156-16815	02/AC	355	
MC75 Silver Peak	Male	18-21	1156-16816	09/AC	415	
MC75 Silver Peak	Male	18-21	1156-16817	04/AC	510	
San Clemente						
MC52 Cave Canyon	Male	.	1126-02021	01/A	.	Banded by J. Pagel
MC52 Cave Canyon	Male	.	1126-02016	00/A	.	Banded by J. Pagel

MC68 Castle Rock: The Castle Rock territory is a previously unknown territory on an off-shore rock (Fig. 5). We did not identify the territory until 2 June, at which time there were 3 chicks approximately 39 days old observed moving around the rocks. No fledglings were observed on our 16 June visit, but the birds should have been fully flighted and may have moved to San Miguel.

MC69 Harris Point: We located a new pair that was incubating in the previously unknown Harris Point territory (Fig. 5) on 20 April. The nest failed by 15 May and we conducted a search of the eyrie on 22 June, collecting eggshell fragments and peregrine feathers (Appendix V).

MC70 Prince Island: We located a probable territory on Prince Island (Fig. 5) on 13 June, at which time a pair was engaged in territorial defense. One adult was observed on the next visit on 22 July, but we were unable to determine the breeding status of this pair.

Santa Rosa Island

Surveys began on Santa Rosa on 7 February and continued weekly through 25 June. We surveyed 10 previously known territories on Santa Rosa and located 3 new territories (Fig. 6).

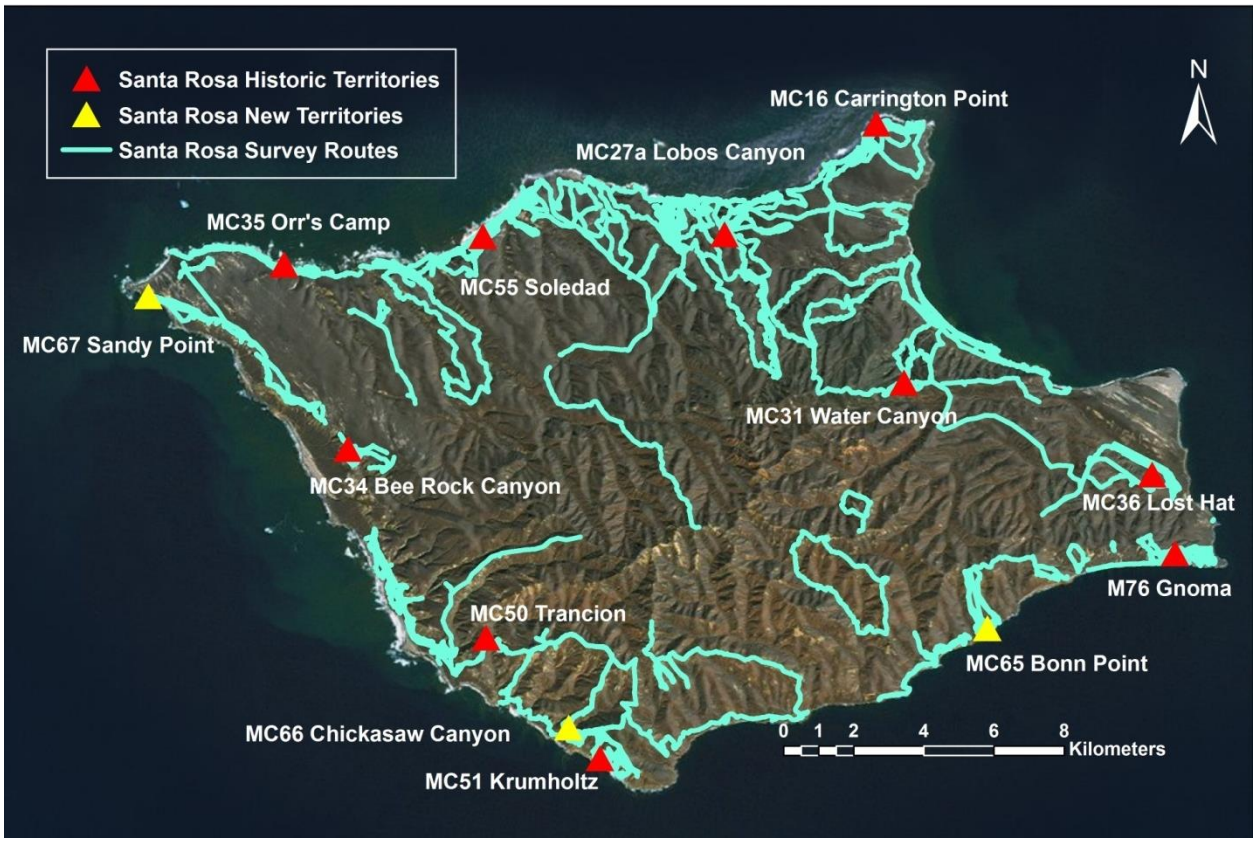

Figure 6. Peregrine falcon survey routes and territories on Santa Rosa Island, CA, 2013.

MC16 Carrington Point: We confirmed a pair engaged in courtship activities on our first visit to the historic Carrington Point territory (Fig. 6) on 12 February. The eyrie was located in an area out of view of any observation point and we were unable to confirm incubation. Adult behavior indicated that there were chicks present on 3 May and we entered the eyrie on 8 May and found 3 chicks that were approximately 17-20 days old (2 F: 1 M), which we banded (Table 2). We

were unable to confirm fledging, but the adults were still delivering prey to the eyrie on 24 May, when the chicks would have been 33-36 days old.

MC27a Lobos Canyon: We did not locate peregrines in the historic Lobos Canyon territory (Fig. 6) until our third visit on 26 February. There was at least 1 peregrine detected on 9 of the 12 remaining visits we made to the area through 21 June, but there was no indication of any courtship or breeding activity.

MC31 Water Canyon: We made 9 surveys of the historic Water Canyon territory (Fig. 6) between 7 February and 30 April, including 5 surveys of at least 4 hours. We saw single individuals during visits on 7, 21, and 28 February, but none in March or April. We considered the territory unoccupied.

MC34 Bee Rock Canyon: We confirmed a pair in the historic Bee Rock Canyon territory (Fig. 6) during our first survey on 13 February. Courtship activities were confirmed on 12 March and the birds were incubating on 20 April. Incubation continued through at least 15 May, but the nest failed before our next visit on 25 May.

MC35 Orr's Camp: We confirmed a pair in the historic Orr's Camp territory (Fig. 6) on our first survey on 10 February. The pair began incubating by 22 March and two chicks and an unhatched egg were observed on 20 April. Three chicks were present on 26 April and we entered the eyrie to band them (2 F: 1 M) on 8 May (Table 2, Appendix V). There were still 3 chicks near fledging age present on our last visit on 27 May.

MC36 Lost Hat: We surveyed the historic Lost Hat territory (Fig. 6) on 7 occasions between 14 February and 14 May and no peregrines were observed.

MC50 Trancion: We confirmed a pair in the historic Trancion territory (Fig. 6) on 8 February. Courtship was confirmed on 23 February and the birds were incubating on 30 March. We observed 2 chicks that were approximately 1 week old on 5 May and we banded the chicks (2 F)

on 22 May (Table 2, Appendix V). There were still two chicks present (approximately 35-36 days old) on our last visit on 5 June.

MC51 Krumholtz: We conducted our first survey of the historic Krumholtz territory (Fig. 6) on 8 February, at which time we observed a single peregrine. We continued to see single birds until our 5th visit on 4 March, at which time we confirmed a pair. The first signs of courtship were observed on 15 March and the pair was confirmed to be incubating on 12 April. The pair failed by 9 May and we entered the eyrie on 22 May and collected shell fragments and prey remains (Appendix V).

MC55 Soledad: We visited the historic Soledad territory (Fig. 6) 23 times between 20 February and 21 June. We confirmed a pair exhibiting courtship activity on 4 March and they were incubating by 25 April. The pair had at least 1 nestling on 19 May. During observations on 5 June, 2 chicks that were about 15-17 days old were being fed by the adult female when one of the chicks tumbled out of the nest and off the cliff. We accessed the eyrie on 10 June to band the remaining chick, which was a male (Table 2, Appendix V) and to collect shell fragments (Appendix V). The chick was small for his age and appeared weak. The nest failed by our next visit on 21 June.

MC56 Gnoma: The location of the historic Gnoma territory (Fig. 6) was not available in the CDF&W database or the 2007 survey report (Latta 2012). We located a pair near a plot of *Dudleya gnoma* (munchkin liveforever) and assume this is the Gnoma territory. We located a pair exhibiting courtship behavior on our second survey of the area on 3 March. The pair were incubating by 1 April and at least one chick was assumed to be present, based upon adult behavior, on 6 May. We entered the eyrie and banded a single female chick on 21 May (Table 2, Appendix V).

MC65 Bonn Point: We located a pair exhibiting courtship behavior in a new territory, which we named Bonn Point (Fig. 6), on our first survey of the area on 17 February. There was pre-laying/laying behavior on 28 April, but the birds never began incubation through our last visit on 19 June.

MC66 Chickasaw Canyon: We located birds in a new territory, which we named Chickasaw Canyon (Fig. 6). We saw at least 1 bird on each of our 16 surveys between 3 March and 23 June and although they showed signs of courtship, there was no indication that they produced eggs.

MC67 Sandy Point: We located an incubating pair in the new Sandy Point territory (Fig. 6) on 19 April. Incubation continued through at least 2 May, but the nest failed by 15 May.

Santa Cruz Island

Surveys began on Santa Cruz on 16 January and continued weekly through 24 June. We surveyed 9 historic territories and located 5 previously unknown territories (Fig. 7).

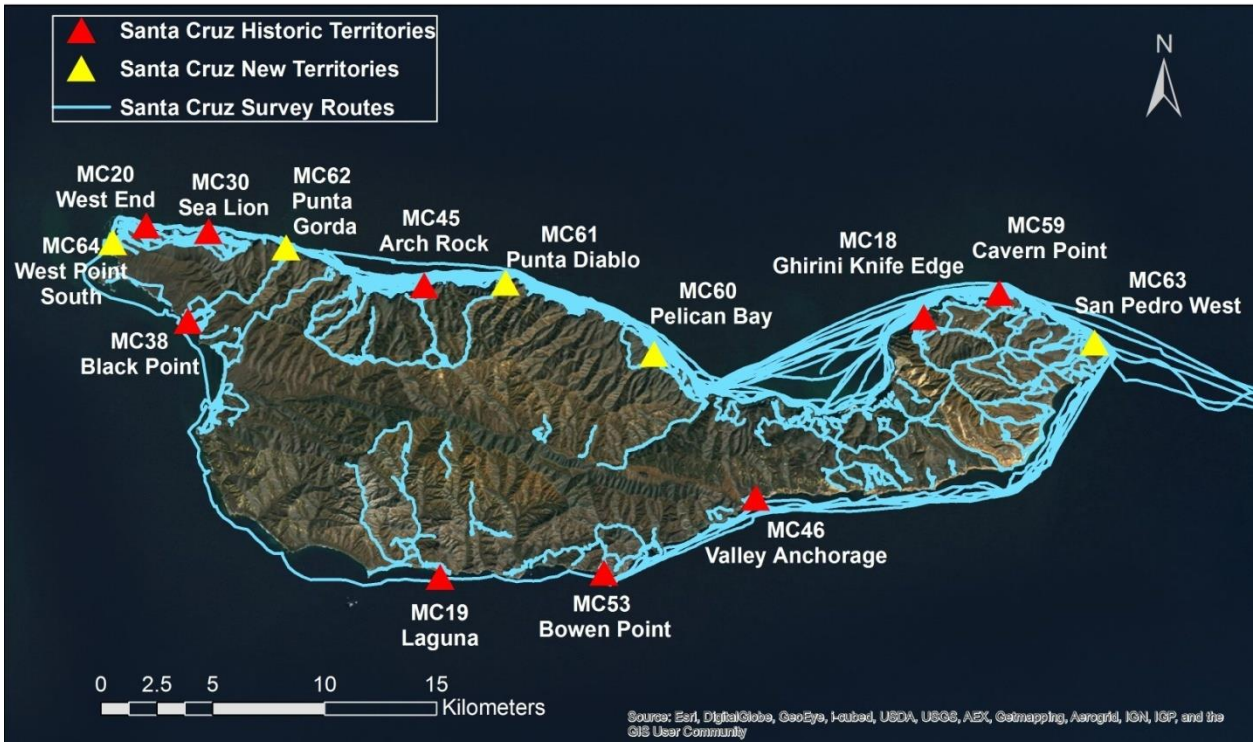

Figure 7. Peregrine falcon survey routes and territories on Santa Cruz Island, CA, 2013.

MC18 Gherini Knife Edge: We identified a pair in the historic Gherini Knife Edge territory (Fig. 7) on 31 January during a training session for the new crew. Courtship behavior was seen on 2 February and the first egg was seen in the eyrie on 8 March. There were 4 eggs visible on 28 March and 3 chicks were present on 20 April. We entered the eyrie on 10 May and banded 3

chicks (3 M) about 17-24 days old and collected an addled egg (Table 2, Appendix V). All 3 chicks were still present on our last visit on 22 May.

MC19 Laguna: We located a pair in the historic Laguna territory (Fig. 7) during training in the survey protocol on 21 January. Courtship behavior was observed on 2 March, but incubation did not begin until around 2 May. Chicks were present on 2 June and we entered the eyrie on 18 June to band 2 chicks (1 F: 1 M) that were approximately 25-26 days old (Table 2, Appendix V). Both chicks were still present on our last visit on 24 June, when they were about 32 days old.

MC20 West End: We located a pair exhibiting courtship behavior in the area of the historic West End territory (Fig. 7) on 25 February. We found another pair south of this pair (see MC64 West Point South below) and because none of the birds were banded it was not possible to determine which may have been the original West End pair. Therefore, we designated the pair using the northern coast of Santa Cruz from West Point east towards Del Mar Cove as the West End pair. They were confirmed to be incubating on 17 April, but the nesting attempt failed by 14 May. We entered the eyrie on 8 June and collected some adult peregrine feathers for stable isotope analyses (Appendix V).

MC30 Sea Lion: We confirmed a pair in the historic Sea Lion territory (Fig. 7) on 1 February. They showed signs of courtship activity on 5 March and at least 1 egg was present on 20 April, although incubation wasn't confirmed until 4 May. The nesting attempt failed by 15 May and we entered the eyrie on 8 June and collected eggshell remains and adult peregrine feathers for analyses (Appendix V).

MC38 Black Point: We confirmed a pair exhibiting courtship behavior in the historic Black Point territory (Fig. 7) on 16 February. The birds began incubating by 28 April and chicks were present on 29 May. We entered the eyrie on 17 June to band two chicks (1 F: 1 M) that were approximately 23-25 days old (Table 2, Appendix V). Both chicks were still present on our last visit on 23 June.

MC45 Arch Rock: We confirmed a pair in the historic Arch Rock territory (Fig. 7) on 28 February. The pair exhibited courtship behavior on 14 March and were found incubating on 25 April. There were no signs that chicks ever hatched and we confirmed that the nesting attempt had failed by 5 June.

MC46 Valley Anchorage: We observed a pair in the historic Valley Anchorage territory (Fig. 7) on 16 January. We saw the first signs of courtship activity on 25 March and incubation began by 15 April. Based upon adult behavior, we determined that at least one chick was present on 11 May and found 3 chicks (2 F: 1 M) approximately 23-24 days old when we entered the eyrie on 31 May for banding (Table 2, Appendix V). We made our last visit on 7 June, at which time we could only confirm that two chicks were present. The third chick could easily have been hidden in the eyrie.

MC52 Cavern Point: We confirmed a pair in the historic Cavern Point territory (Fig. 7) on 2 February. Courtship behavior was observed on 13 March, but there was never any confirmed incubation through our last visit on 14 June.

MC53 Bowen Point: We confirmed a pair in the historic Bowen Point territory (Fig. 7) on 21 January while being trained in the call-broadcast protocol. The pair began exhibiting courtship activity by our next survey on 16 February. Incubation began by 4 April and adult behavior indicated that chicks were present on 9 May. We entered the eyrie on 29 May to band the nestlings; however, the adult female was unusually defensive and would not leave the eyrie Therefore, we were able to band only 1 of the 3 chicks present, a female 20-23 days old (Table 2, Appendix V). We confirmed that all 3 chicks were still present on our last visit on 8 June. The adult female was unbanded, so there has been a change in the pair since 2007, because the breeding female in 2007 had a leg band (N. Todd, *pers. comm*.).

MC60 Pelican Bay: We located a pair exhibiting courtship behavior in a new territory, which we named Pelican Bay (Fig. 7), on 9 April. The female appeared to be a second year bird, so likely not ready to breed. The pair exhibited courtship behavior through our last visit on 6 June.

MC61 Punta Diablo: We located a pair in a new territory, Punta Diablo (Fig. 7), on 16 February. The pair was incubating on 10 April and adult behavior indicated that there were chicks present on 13 May. We entered the eyrie on 7 June and banded 2 chicks (1 F: 1 M) approximately 26 days old (Table 2, Appendix V). Both chicks were still present on our last visit on 15 June.

MC62 Punta Gorda: We located a previously unknown pair in a territory that we named Punta Gorda (Fig. 7) on 28 February. Courtship behavior was exhibited on 14 March and they were thought to be incubating on 8 May. Based upon adult behavior, we believe that there were chicks present on 20 May. We entered the eyrie on 30 May and banded 3 chicks (1 F: 2 M) that were approximately 21-28 days old (Table 2, Appendix V). All 3 chicks were still present on our last visit on 9 June.

MC63 San Pedro West: We located a new pair exhibiting courtship behavior near San Pedro Point, which we named San Pedro West (Fig. 7) on 16 February and confirmed incubation on 28 March. There was at least 1 chick present on 5 May and we banded a female chick approximately 26-28 days old on 25 May (Table 2, Appendix V). This bird was seen at Oceano Dunes State Vehicle Recreation Area near San Luis Obispo, CA on 11 December (Fig. 8).

MC64 West Point South: We located a pair on the cliffs south of West Point on 16 February. We named this territory West Point South (Fig. 7) and are considering this a new pair, although, as described above, these could have been the original West Point birds from 2007 (Latta 2012). The birds were incubating on 23 April and young nestlings were present, based upon adult behavior, on 14 May. We banded the 2 chicks (1 F: 1 M), which were already 28-30 days old, on 31 May (Table 2, Appendix V).

Anacapa Island

We surveyed Anacapa from a charter boat (the "Retriever"), our Zodiac inflatable boat, and via Island Packers trips to East Anacapa (to check Cathedral Cove from land) between 4 March and 14 June. We located pairs in each of the three historic territories and did not locate any new occupied territories (Fig. 9).

Figure 8. The San Pedro West chick (70/AC) at Oceano Dunes on 11 December 2013. Photo courtesy of Ryan Slack.

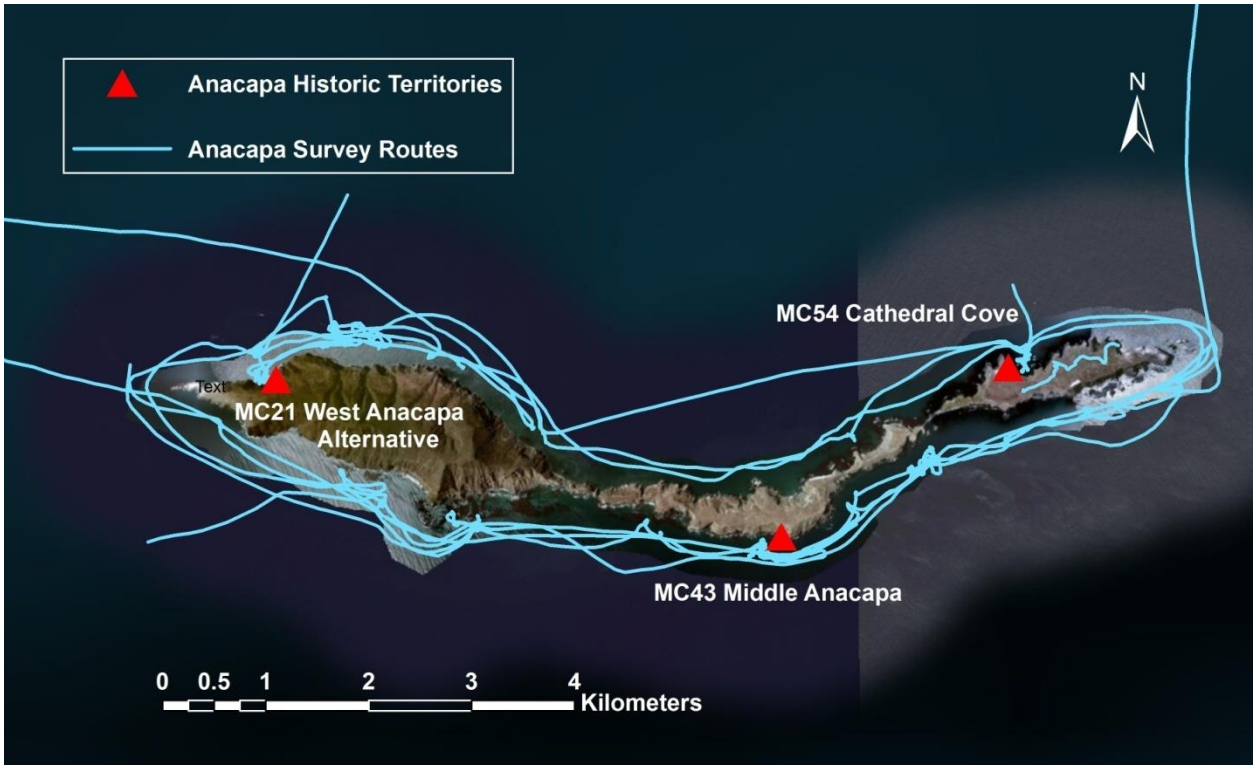

Figure 9. Peregrine falcon survey routes and territories on Anacapa Island, CA, 2013.

MC21 West Anacapa: We located a pair exhibiting courtship behavior in the historic West Anacapa territory (Fig. 9) on 4 March. We inferred the presence of young on 20 May, based upon adult behavior. At least 2 chicks were confirmed present on 3 June, and 3 chicks were confirmed on 10 June, with an estimated age of 36-40 days. West Anacapa is not accessible during most of the spring/early summer because of breeding seabirds, so we did not attempt banding.

MC43 Middle Anacapa: We identified a pair exhibiting courtship behavior in the historic Middle Anacapa territory (Fig. 9) on 4 March. We were unable to locate an eyrie until 20 May, when the adults' behavior indicated that chicks were present. We confirmed the presence of 2 chicks greater than 28 days of age on 3 June.

MC54 Cathedral Cove: We located a pair exhibiting courtship behavior in the historic Cathedral Cove territory (Fig. 9) on 5 March. We confirmed incubation on 26 April and the presence of chicks on 13 May. We accessed the eyrie, which was in a small cave on a steep slope (Fig. 10), on 26 May. All 4 chicks were females that ranged in age from about 14-18 days of age (Table 2, Appendix V). All four chicks were still present on our last visit on 14 June, at which time they were about 33-37 days of age.

Figure 10. The Cathedral Cove eyrie (circled) in 2013.

San Nicolas Island

We surveyed San Nicolas on 25-28 March, 16-17 April, and 1-2 May and 16-17 May. We located two active territories on the south side of the island (Fig. 11). There was a potential pair near the eastern tip of the island in 2007, which is near the end of the airport runway. A male peregrine was hit by a plane on 19 February 2013 and sent to a rehabilitation facility on the mainland, where it was later euthanized. Another adult, most likely a female, was seen in the general area on 26 March and 2 May.

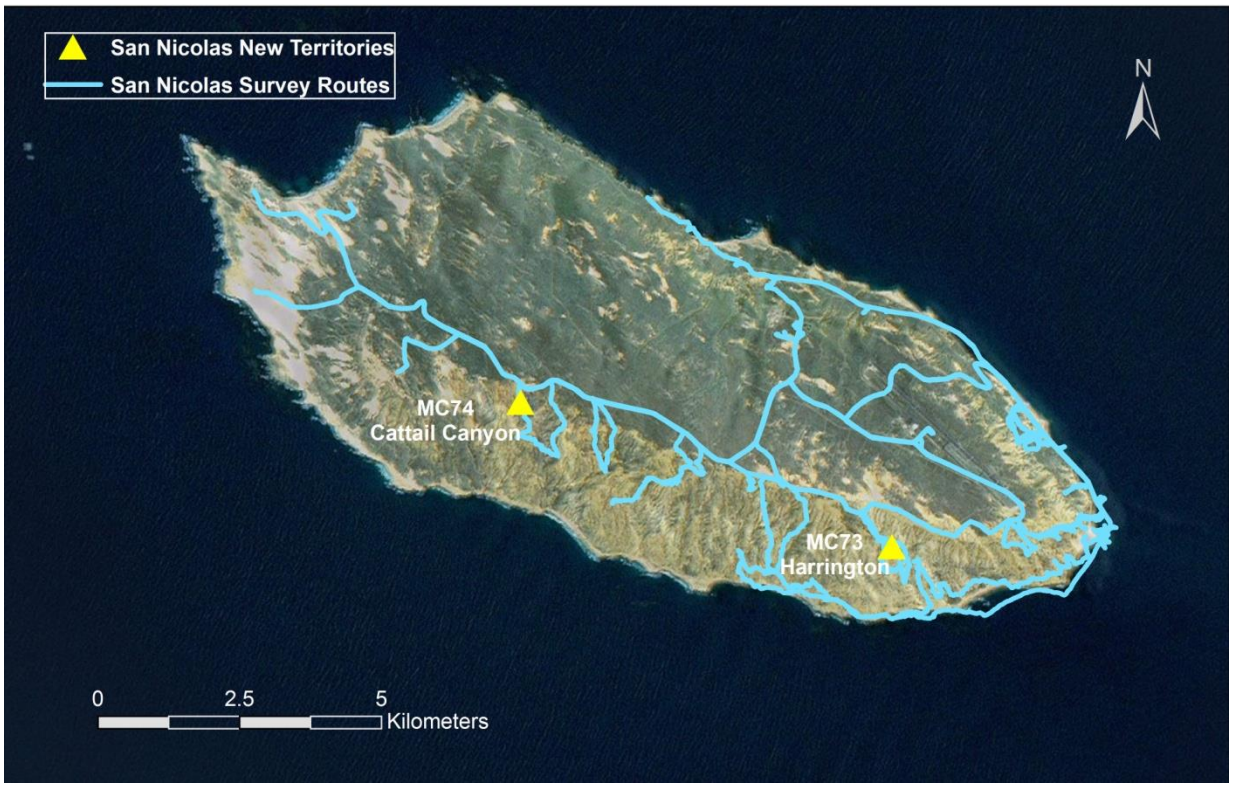

Figure 11. Peregrine falcon survey routes and territories on San Nicolas Island, CA, 2013.

MC73 Harrington: A single adult was observed on 26 and 27 March and a previously used eyrie was located on the cliff, as determined by whitewash around the back of the ledge. We confirmed a pair incubating in the eyrie on 17 April and named the territory Harrington (Fig. 11). The birds were still incubating on 2 May, but there were two chicks (~10 days old) in the eyrie on 16 May. We entered the eyrie on 4 June and banded two female chicks that were approximately 28 days old (Table 2, Appendix V). On our final visit to the territory on 27 June there were no fledglings seen around the nest cliff, but possible vocalizations were heard down the canyon.

MC74 Cattail Canyon: We first observed a single adult male on the nest cliff of the new Cattail Canyon territory on 2 May (Fig. 11). We returned on 17 May and located an eyrie with 3 chicks approximately 5 days old. We entered the eyrie on 5 June and banded 3 chicks (2 F: 1 M) that were 23-25 days old (Table 2, Appendix V). On our final visit on 27 June we observed all 3 fledglings flying and perching on the nest cliff and down canyon from the nesting area.

Santa Barbara Island

We surveyed on Santa Barbara every other week between 14 March and 14 May. We located pairs in one historic territory and two new territories (Fig. 12).

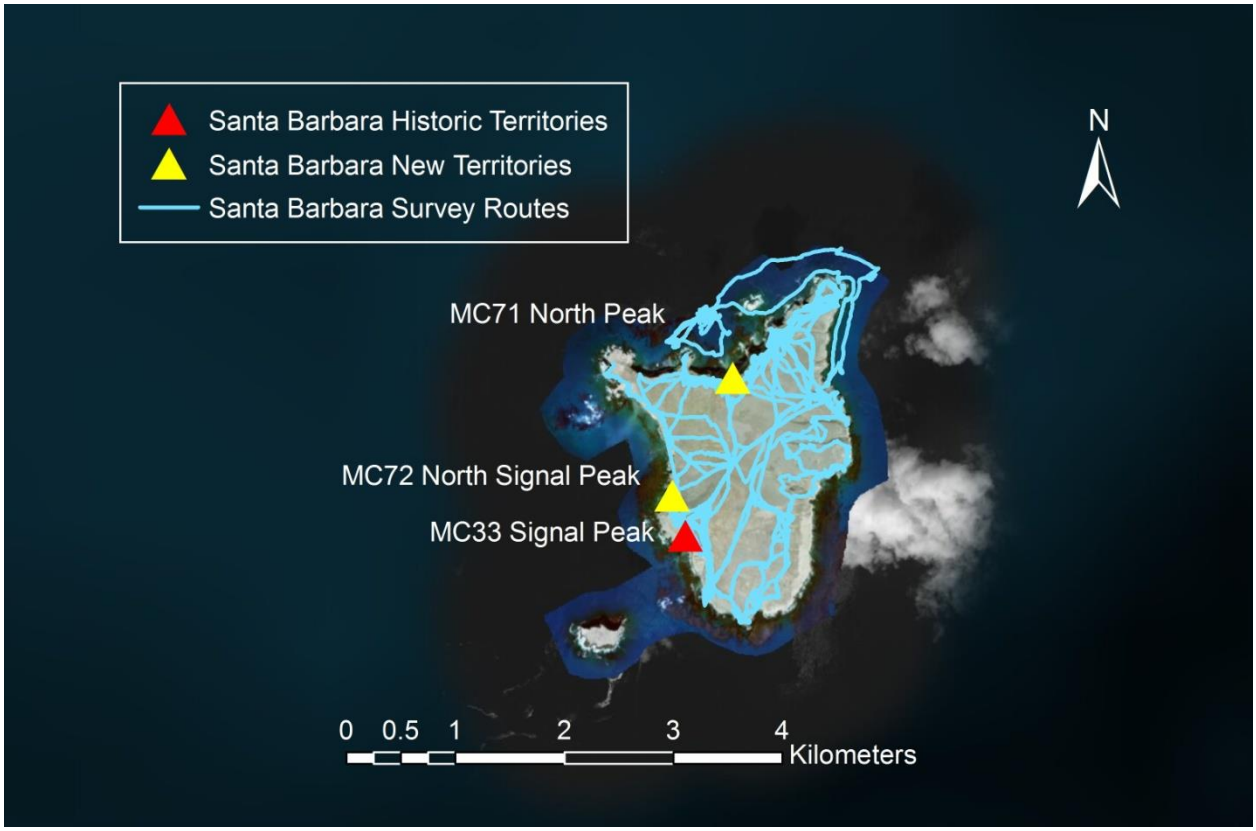

Figure 12. Peregrine falcon survey routes and territories on Santa Barbara Island, CA, 2013.

MC33 Signal Peak: We confirmed a pair exhibiting courtship behavior in the historic Signal Peak territory (Fig. 12) on 14 March. The pair appeared to be incubating on 2 April, although we could not see the eyrie. We were unable to determine the presence of nestlings until 9 May, but we entered the eyrie on 10 May to band any chicks. We found 4 chicks (3 F: 1 M) that ranged in

age from about 25-30 days (Table 2, Appendix V). There were several prey deliveries to the eyrie on our last visit on 13 May, when the chicks would all have been over 28 days of age.

MC71 North Peak: We located a new pair exhibiting courtship behavior near North Peak (Fig. 12) on 18 March. We surveyed the area 15 times through 14 May, but were unable to determine whether the birds nested.

MC72 North Signal Peak: We discovered a previously unknown pair north of Signal Peak (Fig. 12) on 28 April. On 29 April, we found that there were 3 chicks present ranging in age from about 25-30 days. By 9 May the chicks were near fledging age and were moving out of the eyrie. On 14 May, we saw an adult hunting, but saw no chicks or adults around the eyrie, so we presumed that all 3 chicks fledged successfully.

Santa Catalina Island

We surveyed the two previously identified territories on the island, both of which were classified as wintering territories during the 2007 surveys (Latta 2012), and located one new territory (Fig. 13).

MC42 Long Point: A single peregrine was seen for only a few seconds before it flew out of view on 15 February, but no birds were seen during 4-hour surveys on 13 March, 23 April, or 29 May.

MC49 Bullethead: A probable adult peregrine was seen flying during a 4-hour survey on 17 March, but no birds were seen during 4-hour surveys on 10 April or 30 May.

MC75 Silver Peak: We located a new pair of peregrines that were already incubating on 24 April near the western end of the island, which we named the Silver Peak territory (Fig. 13). Two young chicks were seen on 26 May. We entered the eyrie on 16 June and banded 3 chicks (all males) that ranged in age from about 18-21 days (Table 2, Appendix V). On our next visit on 21 June, only the oldest chick was present, but it also was no longer in the eyrie on 30 June, which would have been too early for it to have fledged.

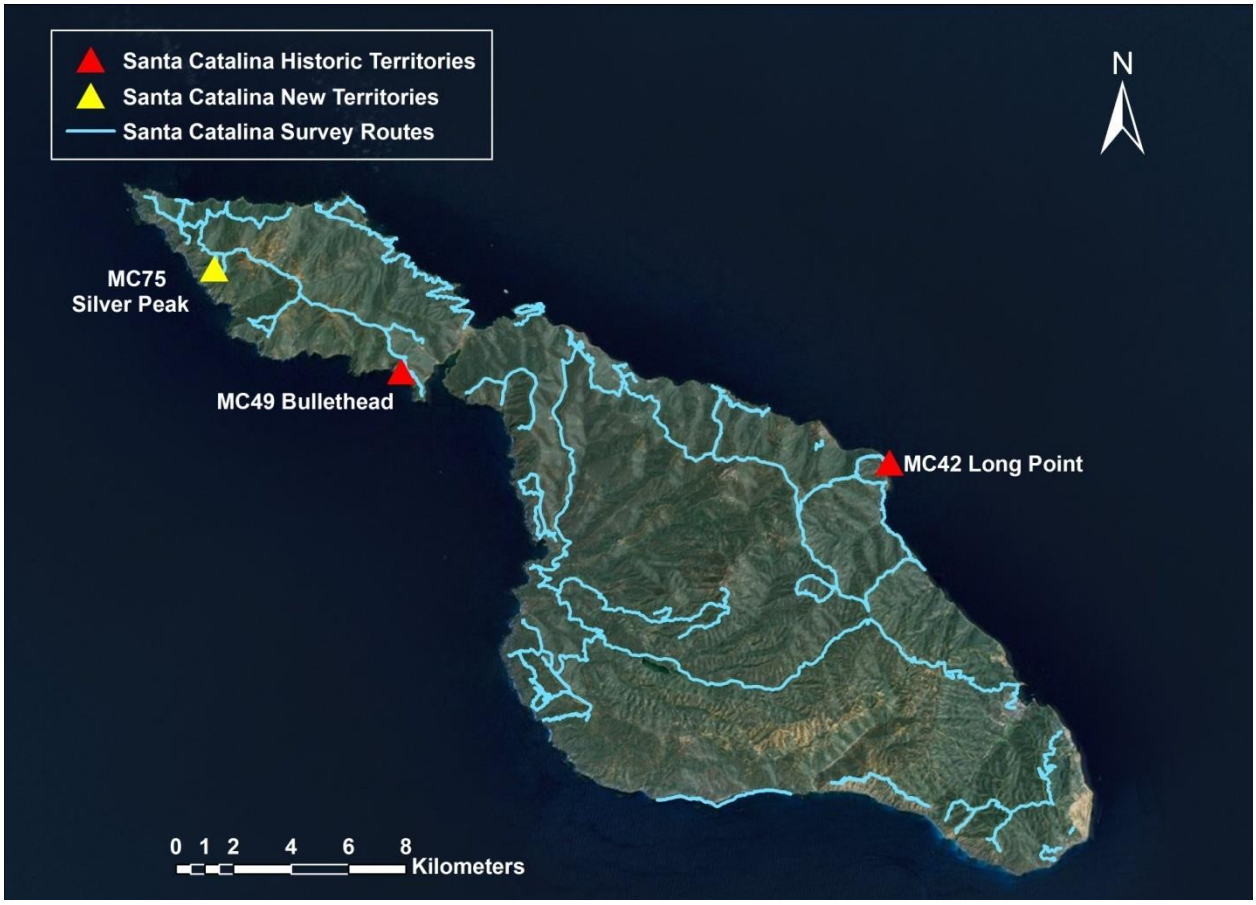

Figure 13. Peregrine falcon survey routes and territories on Santa Catalina Island, CA, 2013.

San Clemente Island

We surveyed the one historic territory on the island and IWS biologists monitored for peregrines during other activities on the island, although they generally did not GPS their survey tracks (Fig. 14).

MC52 Cave Canyon: We confirmed a pair exhibiting courtship behavior in the historic Cave Canyon territory on 23 February. The birds appeared to be incubating on 17 April and we saw a chick and an egg on 2 May. Dr. Joel "Jeep" Pagel entered the eyrie on 15 May, at which time there were 3 chicks. He banded 2 of the chicks, both males, but the third chick was too young to band (Table 2). The nest was still active on 5 June and at least 2 of the fledglings were seen on 9 July.

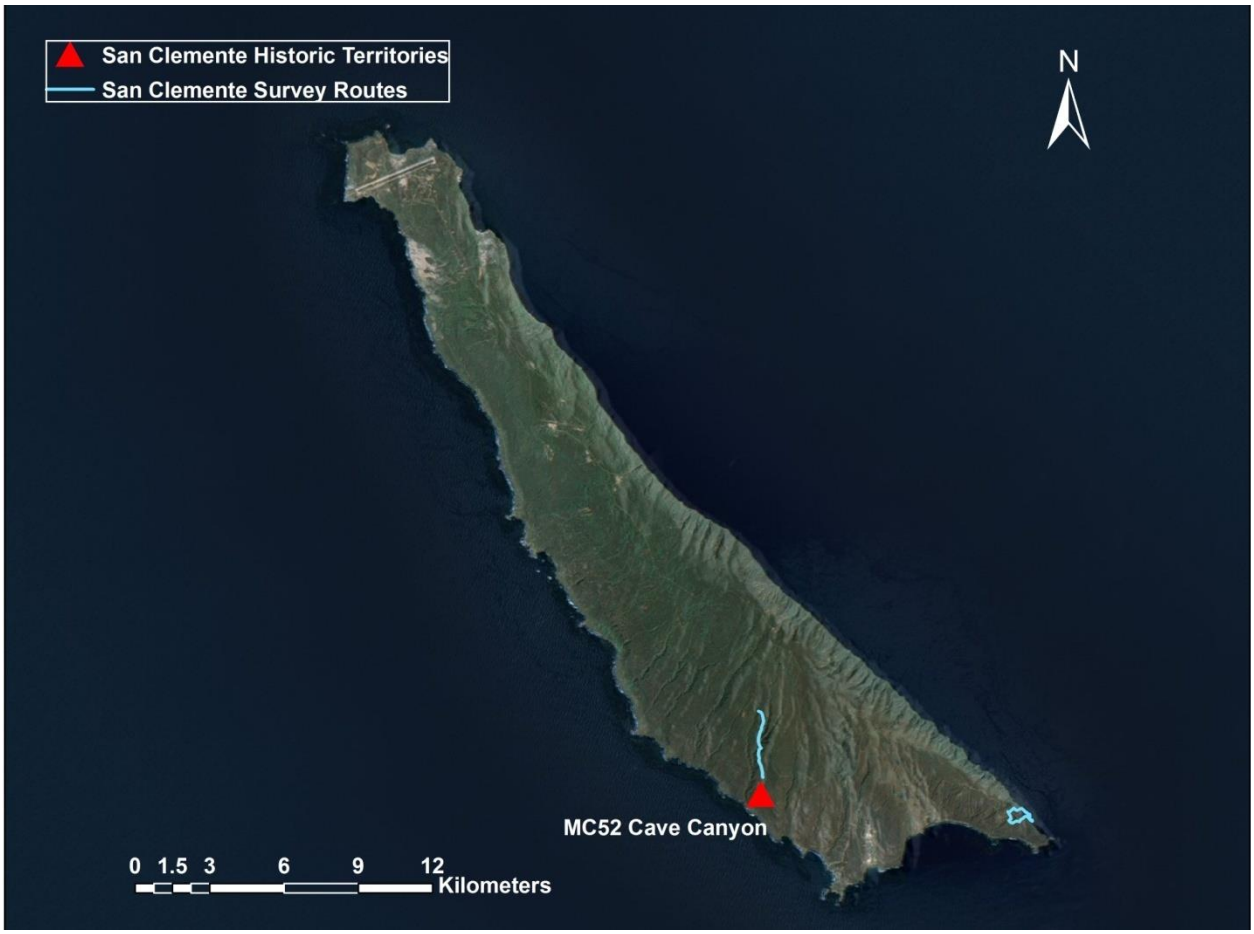

Figure 14. Peregrine falcon survey routes and territories on San Clemente Island, CA, 2013.

PREY REMAINS

We collected prey remains from 22 territories on 7 islands. N. John Schmitt identified a minimum of 107 individual prey items of 29 different species (Table 3). Thirteen prey items could be identified only to genus, 11 prey items were identified to the family level, 13 birds were classified as unidentified passerines, and there were two mammalian prey remains (Table 3). The most common species identified from prey remains were Red-necked Phalarope (*n*=26), Scripps's Murrelet (*n*=15), and Pigeon Guillemot (*n*=14). Sixty-four percent of prey items that were identified to at least the family level were sandpipers (Scolopacidae, *n*=42) and alcids (Alcidae, *n*=42). Gulls (Laridae) made up 15% of prey remains.

Table 3. Prey items (minimum number of individuals) collected from peregrine falcon territories on the California Channel Islands in 2013.

Family/ Scientific Name	Common Name	Island[a]							Total
		SMI	SRI	SCI	ANA	SNI	SBI	CAT	
Alaudidae									
Eremophila alpestris	Horned Lark	1							1
Alcidae									
Cepphus Columba	Pigeon Guillemot	4	3	7					14
Synthliboramphus scrippsi	Scripps's Murrelet	1		1	1		12		15
Ptychoramphus aleuticus	Cassin's Auklet	1	1	2			1		5
Uria spp.	Murre spp.			1					1
Unidentified Alcid		1	6						7
Anatidae									
Duck spp.			1						1
Bombycillidae									
Bombacilla cedrorum	Cedar Waxwing					1			1
Caprimulgidae									
Phalaenoptilus nuttallii	Common Poorwill	1							1
Cardinalidae									
Pheucticus melanocephalus	Black-headed Grosbeak	1		1			1		3
Piranga ludoviciana	Western Tanager	1	1	1					3
Piranga spp.	Tananger spp.			1		1			2
Charadriidae									
Pluvialis squatarola	Black-bellied Plover			1					1
Columbidae									
Streptopelia decaocto	Eurasian Collared Dove	3	2				1		6
Zenaida macroura	Mourning Dove		1						1
Columba livia	Rock Pigeon	1						1	2
Corvidae									
Aphelocoma insularis	Island Scrub Jay			1					1
Emberizidae									
Pipilo maculates	Spotted Towhee		1						1
Melospiza spp.	Unidentified Sparrow	1		2					3
Falconidae									
Falco sparverius	American Kestrel			3			2	3	8
Fringillidae									
Carpodacus mexicanus	House Finch	2	2	8		3		2	17
Haematopodidae									
Haematopus bachmani	Black Oystercatcher			2					2
Hyrdobatidae									
Oceanodroma furcata	Fork-tailed Storm-Petrel	1		1					2
Oceanodroma spp.	Storm-petrel spp.	2		1					3

Table 3. Continued

Family/ Scientific Name	Common Name	Island[a]							Total
		SMI	SRI	SCI	ANA	SNI	SBI	CAT	
Icteridae									
Icterus bullockii	Bullock's Oriole		1	1					2
Sturnella neglecta	Western Meadowlark		3	2		3			8
Molothrus ater	Brown-headed Cowbird			1					1
Laniidae									
Lanius ludovicianus	Loggerhead Shrike			1				1	2
Laridae									
Larus californicus	California gull	1	2	4			2		9
Larus occidentalis	Western Gull	1	2		1		1		5
Larus delawarensis	Ring-billed Gull		1						1
Larus spp.	Unknown gull	1	2	1					4
Mimidae									
Mimus polyglottos	Northern Mockingbird							1	1
Odontophoridae									
Callipela californica	California Quail							1	1
Parulidae									
Dendroica spp.	Warbler spp.	1		1					2
Cardellina/Geothlypis spp.	Warbler spp.			1					1
Geothlypis/Oporornis spp.	Warbler spp.		1						1
Warbler spp.	Orange crowned?		1	1	1		1	1	5
Phalacrocoracidae									
Phalacrocorax pelagicus	Pelagic Cormorant		1						1
Phasianidae									
Alectoris chukar	Chukar					1			1
Picidae									
Colaptes auratus	Northern Flicker			2					2
Podicipediformes									
Podiceps nigricollis	Eared Grebe	2	1			1			4
Podilymbus podiceps	Pied-billed Grebe			1					1
Grebe spp.		1							1
Scolopacidae									
Tringa incana	Wandering Tattler	1	1						2
Arenaria spp.	Turnstone spp.,	2	1						3
Calidris alba	Sanderling		1						1
Limnodromus sp.	Dowitcher sp.			1					1
Actitis macularius	Spotted Sandpiper		1						1
Calidris spp.	Sandpiper spp.		1						1
Numenius phaeopus	Whimbrel			1					1
Phalaropus lobatus	Red-necked Phalarope	3	10	12	1				26
Phalaropus fulicarius	Red Phalarope	1		3		1			5
Tringa melanoleuca	Greater Yellowlegs	1							1

Table 3. Continued

Family/ Scientific Name	Common Name	Island[a]							Total
		SMI	SRI	SCI	ANA	SNI	SBI	CAT	
Stermnidae									
Sterna spp.	Tern spp.,		1						1
Sturnidae									
Sturnus vulgaris	European Starling			2		2			4
Troglodytidae									
Thryomanes bewickii	Bewick's Wren			1					1
Turdidae									
Catharus guttatus	Hermit Thrush				1				1
Unidentified Thrush.			1	1					2
Tyrannidae									
Sayornis nigricans	Black Phoebe			1					1
Tyrannus verticalis	Western Kingbird			1					1
Empidonax spp.			1						1
Unidentified Passerine		4	4	2	1	2			13
Small Mammal Skull					1				1
Large Mammal rib fragment					1				1

[a]San Miguel Island (SMI), Santa Rosa Island (SRI), Santa Cruz Island (SCI), Anacapa Island (ANA), San Nicolas Island (SNI), Santa Barbara Island (SBI), Santa Catalina Island (SCA).

EGGSHELL MEASUREMENTS

We collected failed eggs and/or eggshell fragments from 21 peregrine territories on 6 islands in 2013, including the collections made by J. Pagel on San Clemente and provided courtesy of the USN (Table 4, Appendix V). The eggshell measurements using the "SS" method were thicker, and thus had less eggshell thinning, than the "RC" method in 16 of 20 samples (80%) where both methods were used (Table 4). Percent eggshell thinning, compared to peregrine eggs from pre-1947 in California, ranged from 5.22% (MC35 Orr's Camp and MC63 San Pedro West) to 30.49% (MC47 Crook Point) using the SS method, and 3.02% (MC51 Krumholtz) to 34.89% (MC47 Crook Point) using the "RC" method. Overall, the eggshell thinning was higher on San Miguel than on any other island.

Table 4. Eggshell measurements for peregrine falcon eggs and eggshell fragments collected from nests on the California Channel Islands in 2013.

	Clutch Means (SS Technique)		Clutch Means (RC Technique)		
Island/Territory	Eggshell Thickness (mm)	% Thinning	Eggshell Thickness (mm)	% Thinning	Notes
San Miguel Island					
MC28 Bat Rock	0.338	7.14	0.306	15.93	6 measurements of fragments, without membranes
MC47 Crook Point	0.253	30.49	0.237	34.89	6 measurements of fragments, 3 with and 3 w/o membranes
MC56 Carbon Point	0.314	13.74	0.315	13.46	6 measurements of fragments, without membranes
MC58 Science Point	0.334	8.24	0.294	19.23	6 measurements of fragments, with membranes
MC69 Harris Point	0.29	20.33	0.298	18.13	6 measurements of fragments, without membranes
Island Mean	0.306	15.99	0.29	20.33	
Santa Rosa Island					
MC16 Carrington Point	0.313	14.01	0.287	21.5	6 measurements of fragments, with membrane
MC35 Orr's Camp	0.345	5.22	0.326	10.44	6 measurements of fragments, with membrane
MC50 Trancion	0.315	13.46	0.304	16.48	4 measurements of fragments, with membranes
MC51 Krumholtz	0.298	18.13	0.353	3.02	6 measurements of fragments, without membranes
MC55 Soledad	0.334	8.24	0.323	11.26	6 measurements of fragments without membranes
MC76 Gnoma	0.316	13.19	0.315	13.46	Whole egg with 2 embryos
Island Mean	0.320	12.04	0.318	12.69	
Santa Cruz Island					
MC18 Gherini Knife Edge	0.329	9.62	0.311	14.56	Whole egg; no embryo
MC30 Sea Lion	0.317	12.91	0.293	9.51	6 measurements of fragments, with membrane
MC19 Laguna	0.331	9.07	0.308	15.38	Measured 2 pieces from whole egg
MC38 Black Point	0.321	11.81	0.31	14.84	3 measurements of 1 small fragment, with membrane

Table 4. Continued

Island/Territory	Clutch Means (SS Technique) Eggshell Thickness (mm)	Clutch Means (SS Technique) % Thinning	Clutch Means (RC Technique) Eggshell Thickness (mm)	Clutch Means (RC Technique) % Thinning	Notes
Santa Cruz Island (Cont.)					
MC61 Punta Diablo	0.258	.	0.228	.	6 measurements of fragments; not corrected for membrane
MC62 Punta Gorda	0.326	10.44	0.31	14.84	6 measurements of fragments; 3 with and 3 w/o membranes
MC63 San Pedro West	0.345	5.22	0.293	19.51	6 measurements of fragments, with membranes
Island Mean	0.328	9.85	0.304	14.77	Does not include MC61
Anacapa Island					
MC54 Cathedral Cove	0.307	15.66	0.295	18.96	6 measurements of fragments, with membranes
San Nicolas Island					
MC73 Harrington	0.333	8.52	0.31	14.84	6 measurements of fragments, without membranes
San Clemente Island					
MC52 Cave Canyon	.	.	0.331	9.07	Collected by J. Pagel with permission of the U.S. Navy

PRODUCTIVITY

A minimum of 69 chicks are known to have hatched on the Channel Islands in 2013, of which 63 are known to have survived to ≥ 28 days of age. We know the outcome of breeding attempts in 44 territories. Thirty-five pairs (79.5%) laid eggs and 24 of 44 occupied territories (54.5%) successfully produced at least one chick ≥28 days of age. Productivity was 1.43 chicks per occupied territory, or 2.6 chicks per successful nesting attempt.

BREEDING CHRONOLOGY

We calculated the breeding chronology of pairs that produced chicks based upon estimated hatch dates and a 33-day incubation period (Cade et al. 1996) and approximately 42 days of chick-rearing. The earliest start of incubation was on Santa Barbara, where we estimate that the new North Signal Peak (MC72) territory began incubating around 26 February (Fig. 15) and the Signal Peak pair (MC33) began incubating about 10 days later. The latest known incubation was at the Crook Point territory (MC47) on San Miguel, where we estimate incubation began on 18 May, although this may have been a renesting attempt (Fig. 15). Except for the two earliest breeding attempts being made on Santa Barbara, there did not appear to be a relationship between breeding chronology and island. The mean and median date of the start of incubation was April 2 and 30 March, respectively. The mean and median dates of chicks hatching (first chick of clutch) was 5 May and May 2, respectively.

DISCUSSION

During the 2013 season, the number of known occupied peregrine territories on the California Channel Islands increased by 67% compared to 2007 (45 in 2013 versus 27 in 2007; Latta 2012), which equates to an 8.9% annual increase. It is likely that some of these territories were active in 2007, but they were not located because of restricted or limited access to some islands and/or the use of only passive surveys. Our incorporation of a call-broadcast into our survey protocol decreased the time necessary to determine occupancy in historic territories and

was instrumental in our locating previously unknown territories. Of 38 occupied territories in which we did call-broadcasts on the first visit, one or both birds responded about 58% of the time, allowing us to determine presence of at least one adult in less than 10 minutes. Many of our first visits were in late January and February, which was generally the precourtship period, so we might not expect a strong response at that time of the year. We often got responses on subsequent visits to territories in which we had no responses on our initial visit, so it is possible that many times the adults simply were not present during the earlier surveys. The 10-minute call-broadcast

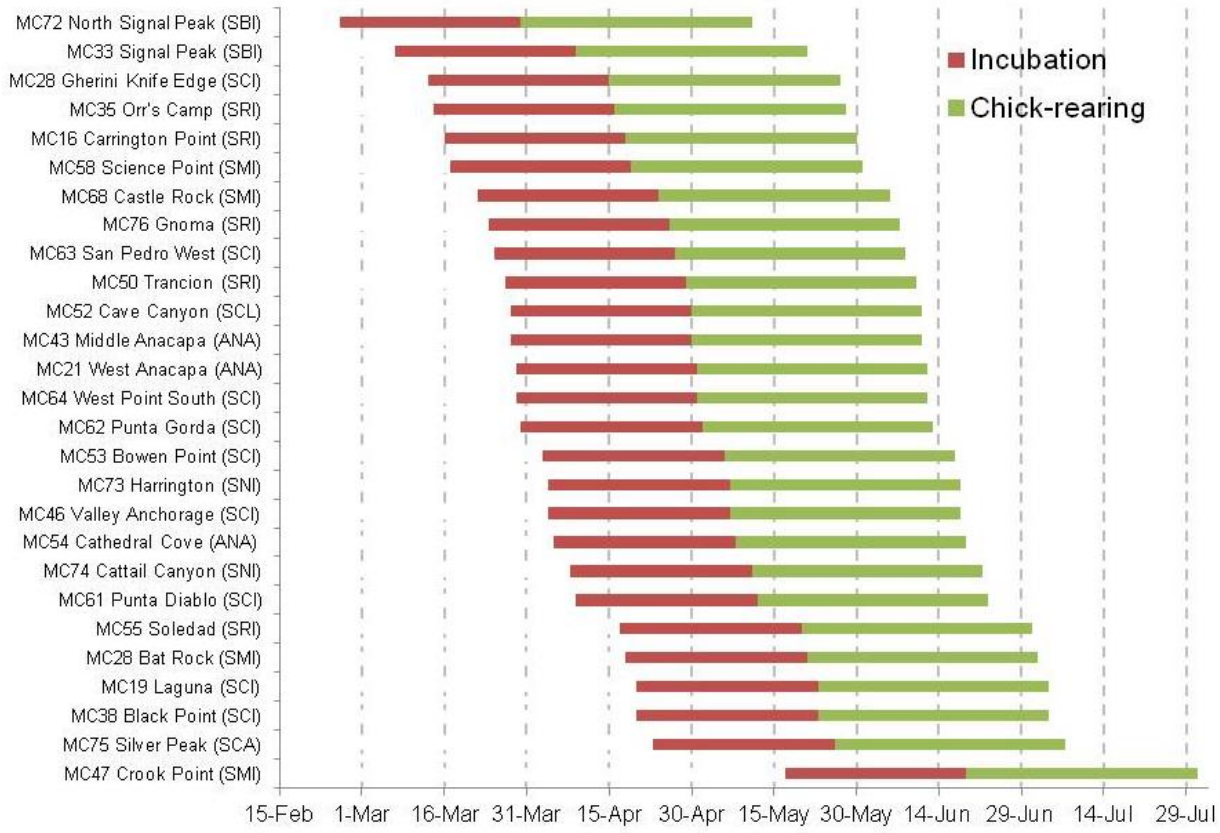

Figure 15. Breeding chronology of peregrine falcons on the California Channel Islands, CA during 2013.

protocol has been used as a rapid assessment technique to locate new territories by the Nevada Department of Wildlife (Klinger and Tomlinson 2010) and we would recommend its use in any future peregrine surveys on the islands.

The peregrine population on the California Channel Islands has recovered to a level that is above Hunt's (1994) predicted historic levels (Fig. 16), which were likely conservative. The

northern Channel Islands appear to be the stronghold for Channel Island peregrines. These islands tend to have more cliffs with ledges and potholes for nesting substrate and an abundance of breeding seabirds as a prey base. Suitable nesting habitat is less common on most of the southern Channel Islands. Hunt (1994) reported that favorable nesting habitat on San Clemente was relatively small and that they found no cliffs on San Nicolas. During our surveys on San Nicolas, we located few potential nesting areas, and most of those were on the southern side of the island at higher elevations. At first glance, Catalina appears to have abundant cliff habitat, especially along the southwestern coast. However, most of these areas tend to be steep, dirt slopes unsuitable for nesting when examined more closely. The only active territory on Catalina (MC75 Silver Peak) was located on a small cliff at an elevation of approximately 350 m, which we would not have traditionally been considered good nesting habitat. Future peregrine surveys on the southern Channel Islands may be able to locate additional territories by expanding survey efforts into less suitable habitat.

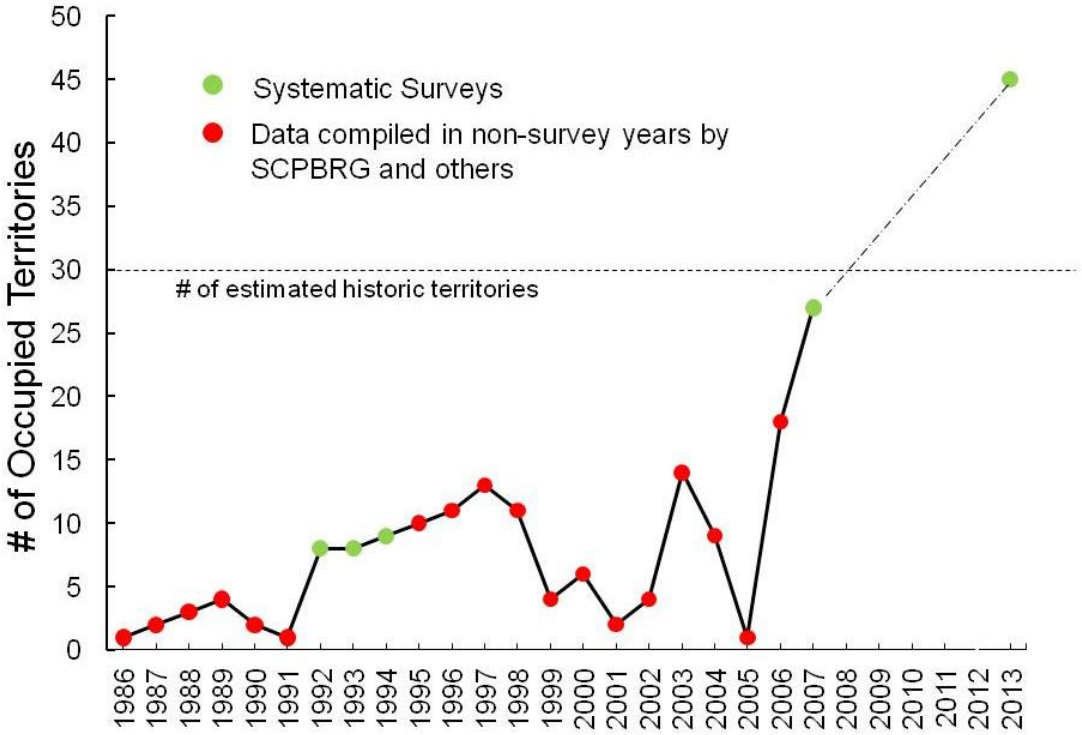

Figure 16. Number of known occupied peregrine falcon territories on the California Channel Islands from 1986 to 2013. Green points represent data from years when there were systematic surveys; red points are from years when there were no systematic surveys as reported in Appendix IV of Latta (2012).

We located nests with chicks on two islands, Catalina and San Nicolas, where there had not been visual confirmation of hatching in at least 50 years. We located a single occupied territory on Catalina, the new Silver Peak (MC75) territory, which had 3 chicks at banding. Unfortunately, all 3 disappeared over the following 1-2 weeks, making Catalina the only island without successful peregrine nesting in 2013. Adult presence at the nest was infrequent during the last few weeks of activity and they were not present during our banding visit. It is possible one of the adults died and the remaining adult had to spend more time hunting and could not defend the nest from predators, such red-tailed hawks and ravens, both of which were seen in and around the eyrie. We located two nests on San Nicolas, an island where there are no historical records of nesting peregrines, although it is likely that they nested there (Kiff 1980). This was at least the second season of use of the Harrington (MC73) eyrie, as we identified the eyrie prior to incubation because it had a ring of whitewash along the back wall, which is indicative of an eyrie that has had chicks present (J. Barnes, *pers. comm.*). Suitable nesting habitat is limited on San Nicolas, so it is unlikely that the nesting population will grow above 3-4 pairs of peregrines. Because of its inaccessibility due to military use, San Clemente has not been surveyed extensively for peregrines. There is suitable habitat for additional peregrine territories, especially along the cliffs on the southeastern coast of the island, which we plan to survey from the water in 2014.

Nest success in occupied territories with known outcomes dropped from 66.7% (16 of 24 territories) in 2007 (Latta 2012) to 54.5% (24 of 44 territories) in 2013, but productivity was similar between the 2007 survey (1.46 chicks/occupied, Latta 2012) and the 2013 survey (1.43 chicks/occupied territory). Averaged across both surveys, nest success was 58.8% and productivity was 1.44 chicks/occupied territory. Nest success on the Channel Islands is slightly lower than the national average of about 68% and productivity is lower than the 1.5 chicks/territory found in the Pacific States (Mesta 1999).

When calculating nest success and productivity there are different ages at which chicks can be considered "successful". Steenhof (1987) typically determined nestlings to be successful when they were at least 80% of the average age of fledging, or about 34 days old. However, the peregrine monitoring plan (U.S. Fish and Wildlife Service, 2003) suggested using an age of $\geq$ 28 days, which fell within the suggested age of banding, because it is often difficult to count all the young in a nest with certainty without visiting the eyrie. Therefore, we determined nest success

and productivity based upon nestlings that had reached 28 days of age, although we returned to territories through fledging, when possible, to try to verify survival to fledging.

The potential impact of DDE on the productivity of peregrines on the Channel Islands is of continuing concern. Historically, peregrine populations with eggshell thinning exceeding 17% were either declining or extirpated (Peakall and Kiff 1988), but populations with average thinning below 14.5% appeared normal (Fyfe et al. 1988). Eighteen clutches collected on the Channel Islands from 1988-1993 had 19.8% thinning (Kiff 1994) and mean eggshell thinning was 18.34% in 2007 (Latta 2012). In 2013, the average thinning across all the islands was 12.39% (n=19) using the "SS" method, which should be the same method used in the previous Channel Island studies, and only 3 territories had >17% thinning. Many of the samples from this season were comprised of only a few eggshell fragments, so while there is evidence that eggshell thickness is increasing, we have to take into consideration that there can be a large variation in eggshell thickness within clutches and that shell thickness decreases and variation increases with second and third clutches (Burnham et al. 1984).

Given the eggshell thinning, there is little doubt that DDE is still in the food chain. Peregrines prey on a wide variety of species, as indicated by the prey remains collected in 2007 (Latta 2012) and 2013. These prey collections may indicate the breadth of the diet, but not necessarily the proportional component of the diet. However, the data elucidate the potential pathways through which peregrines could acquire DDE. We would expect birds that feed largely on marine fish to have higher DDE body burdens than birds that feed on other food sources. Therefore, alcids and gulls, which made up approximately 47% of the prey items identified in 2013, would likely have more DDE in their tissues than other families of birds in the peregrine diet. Enderson et al. (1982) reported that peregrines feeding on prey with 1.0 ppm DDE during the breeding season could be expected to lay eggs with 16% eggshell thinning. Alcids and gulls collected around the Channel Islands have had DDE body burdens of 2 ppm or higher (Garcelon et al. 1989, Hunt 1994), so these species could be the primary sources of DDE to Channel Island peregrines. Peregrine feathers collected during this study will be analyzed by Dr. Seth Newsome at the University of New Mexico to further examine prey use and potential pathways for contamination.

There are no clear relationships between productivity and eggshell thinning among the islands, so it is debatable whether DDE is having a measurable impact on peregrine productivity.

Bald eagles, which were similarly impacted by DDE, are now breeding successfully on the Channel Islands (Sharpe 2014), so we would expect that peregrines are having fewer reproductive problems too.

We believe that the peregrine population will continue to expand into available breeding habitat that is currently unoccupied, especially on the northern Channel Islands. Although the levels of productivity appear sufficient to maintain the population, factors such as juvenile/adult survival and emigration/immigration rates play an important role in population persistence. More frequent population monitoring and banding of young could help us gain an understanding of these population parameters for the Channel Island peregrines and help determine whether contaminants or other issues are negatively impacting the population.

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Appendix I. Peregrine Falcon Monitoring Occupancy and Productivity Data Form

Date:_____ Observer:_____

Territory Name and/or State Code:_____
Island: ANA SCI SRI SMI SBI SNI SCA SCL
Survey Method: Foot_____ Boat_____ Other_____
Survey Type: Passive_____ Call-Broadcast_____ Mixed_____
Observation Point: Latitude:_____ Longitude:_____
Observation Start Time:_____ Observation Stop Time:_____
Wind speed: : <5 6-15 >15 Cloud Cover (%):_____
Dominant Habitat Type within 0.5 km:_____

If Nest is Identified:
Distance to Nest_____m Bearing to Nest_____ Aspect of Nest_____
Nest Location: Latitude:_____ Longitude:_____
Nest Location:
Ledge on Cliff____ Stick Nest on Cliff____ Cavity/Pothole on Cliff____ Open Hillside____
Level Ground____ Other____

Possible to view the nest site well enough to see eggs or young? Yes No
If unable to see nest site, please explain:_____

Occupancy Status: Are birds present? No Yes (fill in below if Yes)

# of Birds Present:
Male: SY___ A___ Unk___
Female: SY___ A___ Unk___
Unidentified: _____

Stage of Reproduction at time of visit: Courtship Incubation Nestling Fledgling Unknown
Eggs Observed:_____ # Young Observed:_____

Activity/Behavior (Check those that apply)		
Territorial Defense	Pair Present	Courtship Display
Cooperative Hunting	Copulation	Vocalizing
Adult Prey Exchange	Individual Hunting	Young Present
Prey Delivery to Ledge	Brooding	Incubation
Feeding Young	Describe other behavior in Comments	

Signs of Productivity			
Age of Young:	<28 Days	≥28 Days	Unknown
# Fledglings Confirmed:			

COMMENTS:

Photos Taken (file names)_____

Appendix II. Call-Broadcast Survey Form: Peregrine Falcons

Date:

<table>
<tr><td colspan="3">Island: ANA SCI SRI SMI SBI SNI SCA SCL</td></tr>
<tr><td colspan="2">Observers:</td><td>Survey Mode: Foot___ Boat___ Other _____</td></tr>
<tr><td colspan="2">Location Name/Description:</td><td>Latitude: Longitude:</td></tr>
<tr><td>Start Time:</td><td>End Time:</td><td>Wind Speed: <5 6-15 >15</td></tr>
<tr><td colspan="2">Response to Call-broadcast: Yes No</td><td>Time to Detection (min):</td></tr>
<tr><td colspan="2">Type of Response:: Flight Vocal Both</td><td>Duration of Response (min):</td></tr>
<tr><td colspan="2">Distance to Responding Individuals (m)</td><td>Peregrines Detected? (circle one) Yes No</td></tr>
<tr><td colspan="2"># Responding PEFAs[1]:
Male: N____ SY____ A____
Unk____
Female: N____ SY____ A____
Unk____
Unidentified:</td><td># Non-Responding PEFAs[1]:
Male: N____ SY____ A____
Unk____
Female: N____ SY____ A____
Unk____
Unidentified:</td></tr>
<tr><td>Young Present:
Y N Unk</td><td>Breeding Stage[2] (circle):
C I N F Unk</td><td>Interspecifics Present:</td></tr>
<tr><td colspan="3">Comments (include description of habitat quality and whether the area should be resurveyed):</td></tr>
</table>

Appendix III. Peregrine banding form.

Start Time:
End Time:

Peregrine Banding/Trapping Data Form

Date Banded/Trapped _____ Banding/Trapping Location _____

Trapping Method _____

FWS Band # _____ Leg _____ Acraft Band # _____ Leg _____

Blood Drawn _____ cc (Whole Blood _____ cc, Plasma _____ cc, RBC ____ cc) Date Blood Spun _____

Plumage Photographed: Y N Estimated Sex : M F Confirmed Sex: M F

<u>Morphometrics</u>

Total Tail Length (center feather) _____ mm

Amount of 4th Primary Emerged from Sheath _____ mm

Weight _____ g - Bag wt. _____ g = _____ g

Notes:

Appendix IV. Territory codes, as designated by the California Department of Fish and Wildlife, in numerical order and the island where they are located.

State Code	Territory Name	Island	Year of First Known Occupancy[a]
MC16	Carrington Point	Santa Rosa	1989
MC17	Hoffman Point	San Miguel	1986
MC18	Gherini Knife Edge	Santa Cruz	1991
MC19	Laguna	Santa Cruz	1991
MC20	West End	Santa Cruz	1989
MC21	West Anacapa	Anacapa	1989
MC27	Lime Point	Santa Rosa	1992
MC27a	Lobos Canyon	Santa Rosa	1992
MC28	Bat Rock	San Miguel	1992
MC30	Sea Lion	Santa Cruz	1993
MC31	Water Canyon	Santa Rosa	1995
MC33	Signal Peak	Santa Barbara	1995
MC34	Bee Rock Canyon	Santa Rosa	1996
MC35	Orr’s Camp	Santa Rosa	1996
MC36	Lost Hat	Santa Rosa	1998
MC37	Rat Trap	San Miguel	1999
MC38	Black Point	Santa Cruz	2000
MC42	Long Point	Santa Catalina	2002
MC43	Middle Anacapa	Anacapa	2003
MC44	Cardwell Point	San Miguel	2002
MC45	Arch Rock	Santa Cruz	2003
MC46	Valley Anchorage	Santa Cruz	2006
MC47	Crook Point	San Miguel	2006
MC49	Bullethead	Santa Catalina	2004
MC50	Trancion	Santa Rosa	2006
MC51	Krumholtz	Santa Rosa	2006

Appendix IV. Continued

State Code	Territory Name	Island	Year of First Known Occupancy[a]
MC52	Cave Canyon	San Clemente	2011
MC53	Bowen Point	Santa Cruz	2007
MC54	Cathedral Cove	Anacapa	2007
MC55	Soledad	Santa Rosa	2007
MC56	Carbon Point	San Miguel	2006
MC57	Salvador Point	San Miguel	2004
MC58	Science Point	San Miguel	2007
MC59	Cavern Point	Santa Cruz	2007
MC60	Pelican Bay	Santa Cruz	2013
MC61	Punta Diablo	Santa Cruz	2013
MC62	Punta Gorda	Santa Cruz	2013
MC63	San Pedro West	Santa Cruz	2013
MC64	West Point South	Santa Cruz	2013
MC65	Bonn Point	Santa Rosa	2013
MC66	Chickasaw Canyon	Santa Rosa	2013
MC67	Sandy Point	Santa Rosa	2013
MC68	Castle Rock	San Miguel	2013
MC69	Harris Point	San Miguel	2013
MC70	Prince Island	San Miguel	2013
MC71	North Peak	Santa Barbara	2013
MC72	North Signal Peak	Santa Barbara	2013
MC73	Harrington	San Nicolas	2013
MC74	Cattail Canyon	San Nicolas	2013
MC75	Silver Peak	Santa Catalina	2013
MC76	Gnoma	Santa Rosa	2007

[a]Data from California Department of Fish and Wildlife and Latta 2012 (Appendix IV)

Appendix V. Samples collected in 2013.

Sample ID	Island[a]	Territory	Sample Type	Collection Date	Notes
13-MC33-AE-1	SBI	MC33 Signal Peak	Addled Egg	5/9/2013	Egg from Scripps's Murrelet
13-MC18-AE-1	SCI	MC18 Gherini Knife Edge	Addled Egg	5/10/2013	Unhatched peregrine falcon egg
13-MC56-AE-1	SRI	MC76 Gnoma	Addled Egg	5/21/2013	Unhatched peregrine falcon egg
13-MC35-WB-1	SRI	MC35 Orr's Camp	Whole Blood	5/8/2013	Collected from 1947-21601
13-MC35-WB-2	SRI	MC35 Orr's Camp	Whole Blood	5/8/2013	Collected from 1156-16801
13-MC35-WB-3	SRI	MC35 Orr's Camp	Whole Blood	5/8/2013	Collected from 1156-16802
13-MC16-WB-1	SRI	MC16 Carrington Point	Whole Blood	5/8/2013	Collected from 1156-16803
13-MC16-WB-2	SRI	MC16 Carrington Point	Whole Blood	5/8/2013	Collected from 1947-21603
13-MC16-WB-3	SRI	MC16 Carrington Point	Whole Blood	5/8/2013	Collected from 1947-21602
13-MC33-WB-1	SBI	MC33 Signal Peak	Whole Blood	5/9/2013	Collected from 1947-21605
13-MC33-WB-2	SBI	MC33 Signal Peak	Whole Blood	5/9/2013	Collected from 1947-21604
13-MC18-WB-1	SCI	MC18 Gherini Knife Edge	Whole Blood	5/10/2013	Collected from eyrie during banding
13-MC56-WB-1	SRI	MC76 Gnoma	Whole Blood	5/21/2013	Collected from 1947-21607
13-MC50-WB-1	SRI	MC50 Trancion	Whole Blood	5/22/2013	Collected from 1947-21608
13-MC50-WB-2	SRI	MC50 Trancion	Whole Blood	5/22/2013	Collected from 1947-21609
13-SPW-WB-1	SCI	MC63 San Pedro West	Whole Blood	5/25/2013	Collected from 1947-21610
13-MC54-WB-2	ANA	MC54 Cathedral Cove	Whole Blood	5/25/2013	Collected from 1947-21615
13-MC54-WB-1	ANA	MC54 Cathedral Cove	Whole Blood	5/26/2013	Collected from 1947-21612
13-MC53-WB-1	SCI	MC53 Bowen Point	Whole Blood	5/29/2013	Collected from 1947-21611
13-PG-WB-1	SCI	MC62 Punta Gorda	Whole Blood	5/30/2013	Collected from 1156-16808
13-PG-WB-2	SCI	MC62 Punta Gorda	Whole Blood	5/30/2013	Collected from 1947-21617
13-MC46-WB-1	SCI	MC46 Valley Anchorage	Whole Blood	5/31/2013	Collected from 1156-16811
13-MC46-WB-2	SCI	MC46 Valley Anchorage	Whole Blood	5/31/2013	Collected from 1947-21619
13-MC46-WB-3	SCI	MC46 Valley Anchorage	Whole Blood	5/31/2013	Collected from 1947-21620
13-WPS-WB-1	SCI	MC64 West Point South	Whole Blood	5/31/2013	Collected from 1947-21618
13-WPS-WB-2	SCI	MC64 West Point South	Whole Blood	5/31/2013	Collected from 1156-16810
13-HAR-WB-1	SNI	MC73 Harrington	Whole Blood	6/4/2013	Collected from 1947-21621
13-HAR-WB-2	SNI	MC73 Harrington	Whole Blood	6/4/2013	Collected from 1947-21622

Appendix V. Continued.

Sample ID	Island[a]	Territory	Sample Type	Collection Date	Notes
13-CC-WB-1	SNI	MC74 Cattail Canyon	Whole Blood	6/5/2013	Collected from 1947-21624
13-CC-WB-2	SNI	MC74 Cattail Canyon	Whole Blood	6/5/2013	Collected from 1947-21623
13-CC-WB-3	SNI	MC74 Cattail Canyon	Whole Blood	6/5/2013	Collected from 1156-16812
13-PD-WB-1	SCI	MC61 Punta Diablo	Whole Blood	6/7/2013	Collected from 1947-21625
13-PD-WB-2	SCI	MC61 Punta Diablo	Whole Blood	6/7/2013	Collected from 1156-16813
13-MC55-WB-1	SRI	MC55 Soledad	Whole Blood	6/10/2013	Collected from 1156-16814
13-SP-WB-1	SCA	MC75 Silver Peak	Whole Blood	6/16/2013	Collected from 1156-16819
13-SP-WB-2	SCA	MC75 Silver Peak	Whole Blood	6/16/2013	Collected from 1156-16816
13-MC38-WB-1	SCI	MC38 Black Point	Whole Blood	6/17/2013	Collected from 1156-16818
13-MC38-WB-2	SCI	MC38 Black Point	Whole Blood	6/17/2013	Collected from 1947-21626
13-MC16-SF-1	SRI	MC16 Carrington Point	Shell Fragments	5/8/2013	Collected from eyrie during banding
13-MC35-SF-1	SRI	MC35 Orr's Camp	Shell Fragments	5/8/2013	Collected from eyrie during banding
13-MC51-SF-1	SRI	MC51 Krumholtz	Shell Fragments	5/22/2013	Collected from eyrie during banding
13-MC50-SF-1	SRI	MC50 Trancion	Shell Fragments	5/22/2013	Collected from eyrie during banding
13-SPW-SF-1	SCI	MC63 San Pedro West	Shell Fragments	5/25/2013	Collected from eyrie during banding
13-MC54-SF-1	ANA	MC54 Cathedral Cove	Shell Fragments	5/26/2013	Collected from eyrie during banding
13-PG-SF-1	SCI	MC62 Punta Gorda	Shell Fragments	5/30/2013	Collected from eyrie during banding
13-HAR-SF-1	SNI	MC73 Harrington	Shell Fragments	6/4/2013	Collected from eyrie during banding
13-PD-SF-1	SCI	MC61 Punta Diablo	Shell Fragments	6/7/2013	Collected from eyrie during banding
13-MC30-SF-1	SCI	MC30 Sea Lion	Shell Fragments	6/8/2013	Collected from eyrie during banding
13-MC55-SF-1	SRI	MC55 Soledad	Shell Fragments	6/10/2013	Collected from eyrie during banding
13-MC38-SF-1	SCI	MC38 Black Point	Shell Fragments	6/17/2013	Collected from eyrie during banding
13-MC19-SF-1	SCI	MC19 Laguna	Shell Fragments	6/18/2013	Collected from eyrie during banding
13-MC57-SF-1	SMI	MC56 Carbon Point	Shell Fragments	6/19/2013	Collected from failed nest
13-MC59-SF-1	SMI	MC58 Science Point	Shell Fragments	6/20/2013	From eyrie prior to 2013
13-MC28-SF-1	SMI	MC28 Bat Rock	Shell Fragments	6/20/2013	Collected from eyrie during banding
13-HP-SF-1	SMI	MC69 Harris Point	Shell Fragments	6/22/2013	Collected from failed nest

Appendix V. Continued

Sample ID	Island[a]	Territory	Sample Type	Collection Date	Notes
13-MC47-SF-1	SMI	MC47 Crook Point	Shell Fragments	7/20/2013	Collected from failed nest
WFVZ-187975	SCL	MC52 Cave Canyon	Shell Fragments	5/15/2013	Collected during banding by J. Pagel
13-MC35-PR-1	SRI	MC35 Orr's Camp	Prey Remains	5/8/2013	Collected from eyrie during banding
13-MC16-PR-1	SRI	MC16 Carrington Point	Prey Remains	5/8/2013	Collected from eyrie during banding
13-MC33-PR-1	SBI	MC33 Signal Peak	Prey Remains	5/9/2013	Collected from eyrie during banding
13-MC33-PR-2	SBI	MC33 Signal Peak	Prey Remains	5/9/2013	Collected from eyrie during banding
13-MC33-PR-3	SBI	MC33 Signal Peak	Prey Remains	5/9/2013	Collected from eyrie during banding
13-MC18-PR-1	SCI	MC18 Gherini Knife Edge	Prey Remains	5/10/2013	Collected from eyrie during banding
13-MC56-PR-1	SRI	MC76 Gnoma	Prey Remains	5/21/2013	Collected from eyrie during banding
13-MC50-PR-1	SRI	MC50 Trancion	Prey Remains	5/22/2013	Collected from eyrie during banding
13-MC51-PR-1	SRI	MC51 Krumholtz	Prey Remains	5/22/2013	Collected from eyrie during banding
13-SPW-PR-1	SCI	MC63 San Pedro West	Prey Remains	5/25/2013	Collected from eyrie during banding
13-MC54-PR-1	ANA	MC54 Cathedral Cove	Prey Remains	5/26/2013	Collected from eyrie during banding
13-PG-PR-1	SCI	MC62 Punta Gorda	Prey Remains	5/30/2013	Collected from eyrie during banding
13-WPS-PR-1	SCI	MC64 West Point South	Prey Remains	5/31/2013	Collected from eyrie during banding
13-MC46-PR-1	SCI	MC46 Valley Anchorage	Prey Remains	5/31/2013	Collected from eyrie during banding
13-HAR-PR-1	SNI	MC73 Harrington	Prey Remains	6/4/2013	Collected from eyrie during banding
13-CC-PR-1	SNI	MC74 Cattail Canyon	Prey Remains	6/5/2013	Collected from eyrie during banding
13-PD-PR-1	SCI	MC61 Punta Diablo	Prey Remains	6/7/2013	Collected from eyrie during banding
13-MC55-PR-1	SRI	MC55 Soledad	Prey Remains	6/10/2013	Collected from eyrie during banding
13-SP-PR-1	SCA	MC75 Silver Peak	Prey Remains	6/16/2013	Collected from eyrie during banding
13-MC28-PR-1	SMI	MC28 Bat Rock	Prey Remains	6/20/2013	Collected from eyrie during banding
13-MC59-PR-1	SMI	MC58 Science Point	Prey Remains	6/21/2013	From PEFA nest prior to 2013
13-MC38-PR-1	SCI	MC38 Black Point	Prey Remains	6/17/2013	Collected from eyrie during banding
13-MC19-PR-1	SCI	MC19 Laguna	Prey Remains	6/18/2013	Collected from eyrie during banding
13-MC59-PR-2	SMI	MC58 Science Point	Prey Remains	6/21/2013	Collected at plucking perch 3-5 m from eyrie
13-HP-PR-1	SMI	MC69 Harris Point	Prey Remains	6/22/2013	Collected from failed nest

Appendix V. Continued

Sample ID	Island[a]	Territory	Sample Type	Collection Date	Notes
13-MC46-AF-1	SCI	MC46 Valley Anchorage	Feather	5/31/2013	Adult peregrine falcon feather
13-MC30-AF-1	SCI	MC30 Sea Lion	Feather	6/8/2013	Adult peregrine falcon feather
13-MC20-AF-1	SCI	MC20 West End	Feather	6/8/2013	Adult peregrine falcon feather
13-SP-AF-1	SCA	MC75 Silver Peak	Feather	6/16/2013	Adult peregrine falcon feather
13-MC69-F-1	SMI	MC69 Harris Point	Feathers	6/22/2013	Peregrine falcon feathers
13-MC47-F-1	SMI	MC47 Crook Point	Feathers	7/20/2013	Peregrine falcon feathers
13-MC58-F-1	SMI	MC58 Science Point	Feathers	7/20/2013	Peregrine falcon feathers
13-MC58-F-2	SMI	MC58 Science Point	Feathers	7/20/2013	Peregrine falcon feathers
13-MC58-F-3	SMI	MC58 Science Point	Feathers	7/20/2013	From dead fledgling (2 tail, 1 secondary)
2013-SBI-WG01	SBI	N/A	Egg	7/23/2013	Western gull egg for contaminants analyses
2013-SBI-WG02	SBI	N/A	Egg	7/23/2013	Western gull egg for contaminants analyses
2013-SBI-WG03	SBI	N/A	Egg	7/23/2013	Western gull egg for contaminants analyses
2013-SBI-WG04	SBI	N/A	Egg	7/23/2013	Western gull egg for contaminants analyses
2013-SBI-WG05	SBI	N/A	Egg	7/23/2013	Western gull egg for contaminants analyses
2013-SBI-WG06	SBI	N/A	Egg	7/23/2013	Western gull egg for contaminants analyses
2013-SBI-WG07	SBI	N/A	Egg	7/23/2013	Western gull egg for contaminants analyses
2013-SBI-WG08	SBI	N/A	Egg	7/24/2013	Western gull egg for contaminants analyses
2013-SBI-WG09	SBI	N/A	Egg	7/24/2013	Western gull egg for contaminants analyses
2013-AI-WG01	AI	N/A	Egg	7/25/2013	Western gull egg for contaminants analyses
2013-AI-WG02	AI	N/A	Egg	7/25/2013	Western gull egg for contaminants analyses
2013-AI-WG03	AI	N/A	Egg	7/25/2013	Western gull egg for contaminants analyses
2013-AI-WG04	AI	N/A	Egg	7/25/2013	Western gull egg for contaminants analyses
2013-AI-WG05	AI	N/A	Egg	7/25/2013	Western gull egg for contaminants analyses

[a]AI=Anacapa Island, SMI=San Miguel Island, SRI=Santa Rosa Island, SCI=Santa Cruz Island, SNI=San Nicolas Island, SCA=Santa Catalina Island, SCL=San Clemente Island.