

LAND BIRD
MONITORING HANDBOOK

D-145



Channel Islands

National
Park

National Park Service
U.S. Department of the Interior

**LAND BIRD
MONITORING HANDBOOK
CHANNEL ISLANDS NATIONAL PARK
CALIFORNIA**

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INTRODUCTION

This monitoring handbook has been compiled to assist the resource management staff of Channel Islands National Park in assessing changes in relative population levels of land birds. The primary objective of this monitoring program is to provide, on an annual basis, species and numbers of breeding land birds on Anacapa, San Miguel, and Santa Barbara Islands. Counts are made to provide information on relative abundances of all breeding birds on each of the three islands during breeding and nonbreeding periods each year. With these data, the park resource management staff will be able to detect changes in abundance and/or distributions of land birds which may be influenced by, or are the result of, changes in island resources or management practices.

MONITORING DESIGN CONSIDERATIONS

The degree of resolution necessary to detect potential changes at the population level was a major consideration in establishing a monitoring design for the land birds of the Channel Islands. Absolute densities were initially considered necessary to detect any significant changes in population structure on the islands. However, after working on the islands it became apparent that determination of relative numbers would suffice. A number of factors led to this conclusion, one being the potential impact on sensitive island vegetation from censuses conducted at off-trail locations. In order to determine absolute densities of land birds, a stratified randomized experimental design, with observation stations at off-trail locations, would be required. This particular censusing technique was used during the first year of land bird survey. With the minimal rainfall that the islands receive, walking between the stations disturbs the plant species to the extent that the vegetation does not fully recover until the next growing season. Another factor that contributed to utilizing relative numbers was the very large sample size (number of sightings for each species) necessary to accurately determine species densities. For example, Verner and Ritter (1988) have recently shown that a minimum of 100 detections are necessary to accurately determine bird densities from censusing. There are very few land bird species that occur on the Channel Islands in sufficient numbers to collect 100 detections

within a reasonable time frame. It was, therefore, determined that counts would be conducted only from established trails or at locations that would result in minimal impact. A modified Emlen (1971) technique was selected, one previously utilized by van Riper (1982) in Hawaii. In this manner, birds could be censused from already established trails and thus reduce the impact on vegetation at off-trail locations and minimize time necessary to gather useful census information.

Absolute densities can be calculated from initial censuses that were conducted at stratified random stations over each island, and these numbers can provide a correction factor for trail counts. Each year, trail count data can be multiplied by a correction factor obtained from station counts to provide a relative estimate of densities on each island. It will be necessary to simultaneously conduct station counts with trail counts every five years to ensure that the correction factor remains applicable on each island. Station counts should also be done if two consecutive years of trail counts show a continuing drastic reduction in numbers of any breeding land bird species.

Another monitoring design consideration that must be taken into account is the timing of each census. During years of abnormal precipitation, timing of breeding and nonbreeding censuses may have to be modified. In normal precipitation years, counts should be made during recommended time periods (see schedule for census in Sampling Methods). However, in years of low precipitation, counts may have to be conducted at an earlier date (three to four weeks earlier) in order to ensure that land birds are breeding. Counts during the nonbreeding period should be undertaken no later than one month after the recommended time. Resource management staff conducting censuses should pay close attention to the censusing time tables outlined in this handbook.

There are 56 species of land birds that breed on the Channel Islands; 31 of these species presently breed on the five islands within the park (Diamond and Jones 1980). A few species can not be accurately surveyed with standard bird monitoring techniques. Nocturnal species (i.e. owls), or rare birds that primarily utilize cliff areas (i.e. Peregrine Falcon) would not likely be detected during trail counts. Therefore nocturnal species are not monitored and a special survey methodology will be developed for Peregrine Falcon (to be included in the next revision of the manual). The following 16 species breed on Santa Barbara, Anacapa, and San Miguel Islands and have been selected for monitoring.

Table 1. Breeding Land Bird Species Monitored.

SPECIES	SBI	AI	SMI	GUILD*
Red-tailed Hawk <i>Buteo jamaicensis</i>		x	x	C
Peregrine Falcon <i>Falco peregrinus</i>		x	x	C
American Kestrel <i>Falco sparverius</i>	x	x	x	C
Short-eared Owl <i>Asio flammeus</i>	x			C
Anna's Hummingbird <i>Calypte anna</i>			x	N
Allen's Hummingbird <i>Selasphorus sasin</i>		x	x	N
Black Phoebe <i>Sayornis nigricans</i>			x	I
Horned Lark <i>Eremophila alpestris</i>	x		x	G
Barn Swallow <i>Hirundo rustica</i>		x	x	I
Rock Wren <i>Salpinctes obsoletus</i>		x	x	I
Orange-crowned Warbler <i>Vermivora celata</i>	x	x	x	I
Song Sparrow <i>Melospiza melodia</i>			x	G
Western Meadowlark <i>Sturnella neglecta</i>	x	x	x	I
Lesser Goldfinch <i>Carduelis psaltria</i>			x	G
House Finch <i>Carpodacus mexicanus</i>		x	x	G
European Starling <i>Sturnus vulgaris</i>	x	x	x	I

*Guild codes: C = carnivorous; I = insectivorous;

G = granivorous; N = nectarivorous

SBI = Santa Barbara Is.; AI = Anacapa Is.; SMI = San Miguel Is.

It is not feasible to determine information on the reproductive success of all land bird species breeding on the three monitored islands. Therefore, one species has been selected from each of the major feeding guilds (a group of birds with similar food requirements) for more detailed study. By intensively monitoring one species from each guild, the relative population dynamics of other guild members can also be assessed. For example, if the granivorous Song Sparrow exhibited drastic breeding population reductions, in all likelihood other members of this feeding guild would also be similarly affected. This would, however, depend upon the nature of the perturbation.

As a future component of the land bird monitoring program, intensive observations will be made of selective indicator species throughout the breeding season. The following species have been selected as representatives from the major feeding guilds for long-term monitoring:

- American Kestrel from the carnivorous guild
- Song Sparrow from the granivorous guild
- Orange-crowned Warbler from the insectivorous guild.

Indicator species from each major foraging guild should provide relative information on reproductive phenology and operative environmental constraints on all land bird species of that guild. The species chosen to represent each guild were the most obvious and most easily observed, and should act as indicators for changes in major island resources affecting all members of that guild. In most cases indicator species were chosen from each guild that occur on all three islands, but in one case (the granivore) this was not possible. The Song Sparrow was chosen as the granivore indicator species but that species is now extinct on Santa Barbara Island and does not occur on Anacapa Island. If the park decided to reintroduce the Song Sparrow to Santa Barbara Island, the three indicator species would be present on each of the islands except Anacapa Island.

Population dynamics parameters to be monitored and methods for sampling of indicator species are still being developed. This aspect of the monitoring program will be added to future revisions of this handbook.

MONITORING PROTOCOL

SAMPLING METHODS

The objective of the censusing program is to monitor the number and types of land birds in order to detect changes in abundance and distribution which may influence, or be influenced by, changes in other island resources.

Three different sampling techniques are used to gather information on land birds on Anacapa, San Miguel, and Santa Barbara islands; annual counts are made during breeding and nonbreeding periods from trails and canyons for all breeding birds, intensive observations are made of three key indicator species, and variable circular plots and line transect counts are made every five years.

Annual Census

Materials

Census data sheet (see Appendix A)
Island map with trails
Pencil
Binoculars
Bird field guide

Personnel

A single observer who is capable of identifying island birds by sight and song should be used. To assist the observer, a slide program of photographs and an audio tape cassette of songs have been prepared for island breeding birds and are on file at the park headquarters. An observer unfamiliar with any of the birds should carefully review the slides and tape and conduct practice sessions (i.e. walk through the count area and identify the birds encountered) before attempting actual surveys.

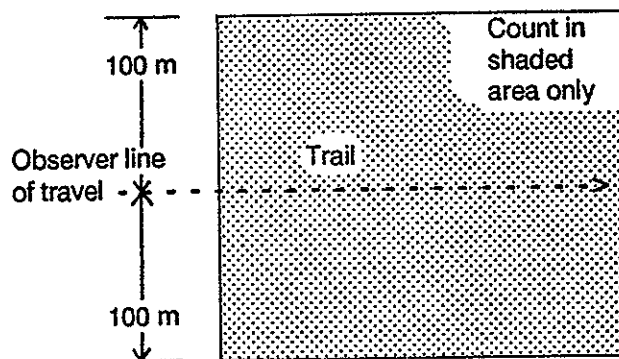
Methods

Censuses on all islands will utilize existing trails and select canyon areas. The observer will walk predesignated routes and count all birds seen or heard (routes are identified for each island). Only species that breed on that island will be counted, although if other species are identified they should be noted. Birds will

be counted when either an aural or visual detection is made, therefore, it is very important that the observer be familiar with the morphology, behavior, and vocalizations of each breeding land bird species. Descriptions of each breeding bird species are included with this handbook. Distribution maps will be prepared for each breeding species, and made available as a separate document.

General Rules for Conducting Census

- Wear earth-tone colors (browns, greens, dark blues, grays). Do not wear bright colors (reds, yellows, whites, etc.).
- Walk each trail at a moderately slow, steady pace. Consecutive counts of the same trail should all take about the same amount of time. Pause only to confirm identification of a bird.
- Record all sightings of breeding species seen or heard within 100 m to either side of the trail. Tally the number of individuals seen for each species. Count only those birds detected in the area directly to the sides of or in front of the observer. Do not count birds detected behind the observer.



- Avoid counting the same bird more than once. For example, if you see a bird fly into a bush ahead of you, list it. As you approach the bush and pass by it, one bird of the same species flies out. It is reasonable to assume this is the same bird, so you would not count it as a sighting when it flew out of the bush. However, unless you can be reasonably certain that you have already counted a particular individual bird (as in this example), consider it a separate sighting.
- Birds may be counted if they are on the ground, in vegetation, or in flight. Flying birds may be

counted at any height, as long as they are within the 100 m lateral counting band.

- Birds may be detected aurally if call notes or song are clearly heard and recognized. Many songs can be heard from great distances (much more than 100 m), so try to visually locate the singing bird to accurately determine the distance. If the bird cannot be seen, try to estimate the distance and list it as a sighting if you are reasonably certain it is within 100 m. If you are not, or do not think so, do not count it.
- Use a separate tally form for each count area (trail). After completing each count, total the number of sightings for each species.
- Nonbreeding species should be listed on the back of the tally sheet. Include species seen during the actual count (if quickly identifiable) or in transit back to the ranger station. Do not spend time tallying the number seen if it interferes with counting breeding species, but a rough estimate may be included at the end of the day.

Remember: The goal is not the largest count possible; but the most accurate count possible. Stick to the methodology outlined above. Do not bend the rules to include more birds because you think that you do not have enough. Do not list a bird unless you are sure of its identification.

The accuracy and integrity of the count can only be maintained by minimizing variations in methodology. This is accomplished by rigorously following the established count procedures.

Census Conditions

Censuses can be conducted only if conditions meet the following criteria:

- Visibility is greater than 400 m
- Wind is 10 knots or less
- It is not raining

- No one has walked the trail within 30 minutes prior to the count
- Only one observer conducts each census (no additional persons may accompany the observer)
- The avian census must be the first priority of the count. If anything else is done in addition (e.g., transporting some materials), it must not in any way detract from the time and attention you are giving the census, nor should it affect the pace at which you cover the census route.

Schedule for Census

Counts should be made during the following recommended time periods. During unusually dry years, counts must be conducted at an earlier date (three to four weeks earlier) in order to ensure that land birds are breeding. Counts during the nonbreeding period should be undertaken no later than one month after the recommended time.

ISLAND	BREEDING CENSUS	NONBREEDING CENSUS
Santa Barbara	Early March	Early to mid October
Anacapa	Mid March	Mid to late October
San Miguel	Late March	Late October to early November

Breeding Birds and Census Locations for Each Island

The following section describes trails and canyons used for annual census counts, as well as the breeding birds that are found on each island. A description of species morphology, behavior, habitat, similar species, and song are provided and are referenced to the slide program and audio tape cassette on file at park headquarters.

SANTA BARBARA ISLAND

Censuses on Santa Barbara Island are conducted from four trails and canyons (see Figure 1). Orange-crowned Warblers are primarily found in Cave, Middle, and Graveyard Canyons and are counted in that area, while other breeding species are counted from the island trails.

Trails Used

Cave, Middle, and Graveyard Canyons: Cave, Middle, and Graveyard Canyons are the three canyons south of the residence area. The primary objective of the counts along the canyons is to determine the number of pairs of Orange-crowned Warblers, based on the singing males heard. Begin the count at official sunrise starting at the steps on the lower Landing Cove Trail. (Time of sunrise and sunset is announced periodically on Channel 1 - the weather station on the marine radio; it is also listed in tide tables.) Walk up from the Landing Cove, watching and listening for warblers, especially in the *Coreopsis*. At the top of the cove, proceed past the quonset hut and follow the east side of the Nature Trail, again listening for singing warblers. At the southeast corner of the nature trail (i.e. above the mouth of Cave Canyon), walk slowly along the north rim of the canyon, listening and scanning the *Coreopsis* on the far side of the Canyon (be careful to avoid the nasty cholla which covers much of the north rim). When a warbler is heard, stop, note its location, and listen for other birds along the length of the canyon. Frequently you will be able to hear two males singing at once and hence be able to determine their relative locations; when you are along the middle stretch of the canyon, you will probably be able to locate all of the males along the entire length of the canyon. Be careful to avoid double-counting any of the singing males.

Continue to the head of the canyon in this manner, then loop around the head of the canyon and walk down to the north side of the mouth of Middle Canyon (try to walk through grassy areas, avoiding the dense patches of boxthorn between the two canyons). From the mouth of Middle Canyon, slowly walk along the north rim toward the head of the canyon, listening for singing birds as described above.

From the head of Middle Canyon, walk to the bluff on the north side of Graveyard Canyon which overlooks the fork in the canyon. Walk west along the north rim on the old trail, then cross the north fork of the canyon to the north side of the south fork. Look and listen for

warblers in the *Coreopsis* in the south fork. Finally, proceed to the large *Coreopsis* stand on the terrace north of the Badlands. Make a slow circuit around the periphery of this stand, again watching and listening for singing warblers. The entire count, from Landing Cove to the *Coreopsis* stand on the Badlands, should take about two hours.

Arch Point Loop: This trail begins at the residence area, goes up to the Saddle, turns north following the upper east slope of North Peak out to Arch Point, then returns to the residence area going through Cliff Canyon and around the head of the Landing Cove (note that this is the direction the trail should be walked - i.e. clockwise). Begin the census along this trail one hour after official sunrise.

Elephant Seal Cove Trail: Begin this trail at sunrise. Start at the Saddle and follow the trail down onto the west terrace and across Webster Point. End the count at the Elephant Seal overlook. Return to the Saddle. Signal Peak loop may be done immediately following.

Signal Peak Loop: Begin this trail at the Saddle, and proceed up to the top of Signal Peak (also walk out to the end of the overlook spur which branches off to the right just after you reach the top of the peak). From the top of the peak, follow the trail down the east slope, through Cat Canyon, along the top of the Southeast Rookery slope, and across the Badlands. End the count at the "Y" where the Signal Peak Trail runs into the Saddle Trail. Begin this count one hour after official sunrise.

Time of Each Count

Cave, Middle, and Graveyard Canyons
Begin at sunrise
Walk rim of canyons 1 3/4 hours
to 2 hours

Arch Point Loop
Begin one hour after sunrise
Walk loop 1 to 1 1/2 hours

Elephant Seal Cove Trail
Begin at sunrise
Saddle to Elephant Seal Cove
and back 45 minutes

Signal Peak Loop
Begin one hour after sunrise
Walk trail 1 to 1 1/2 hours

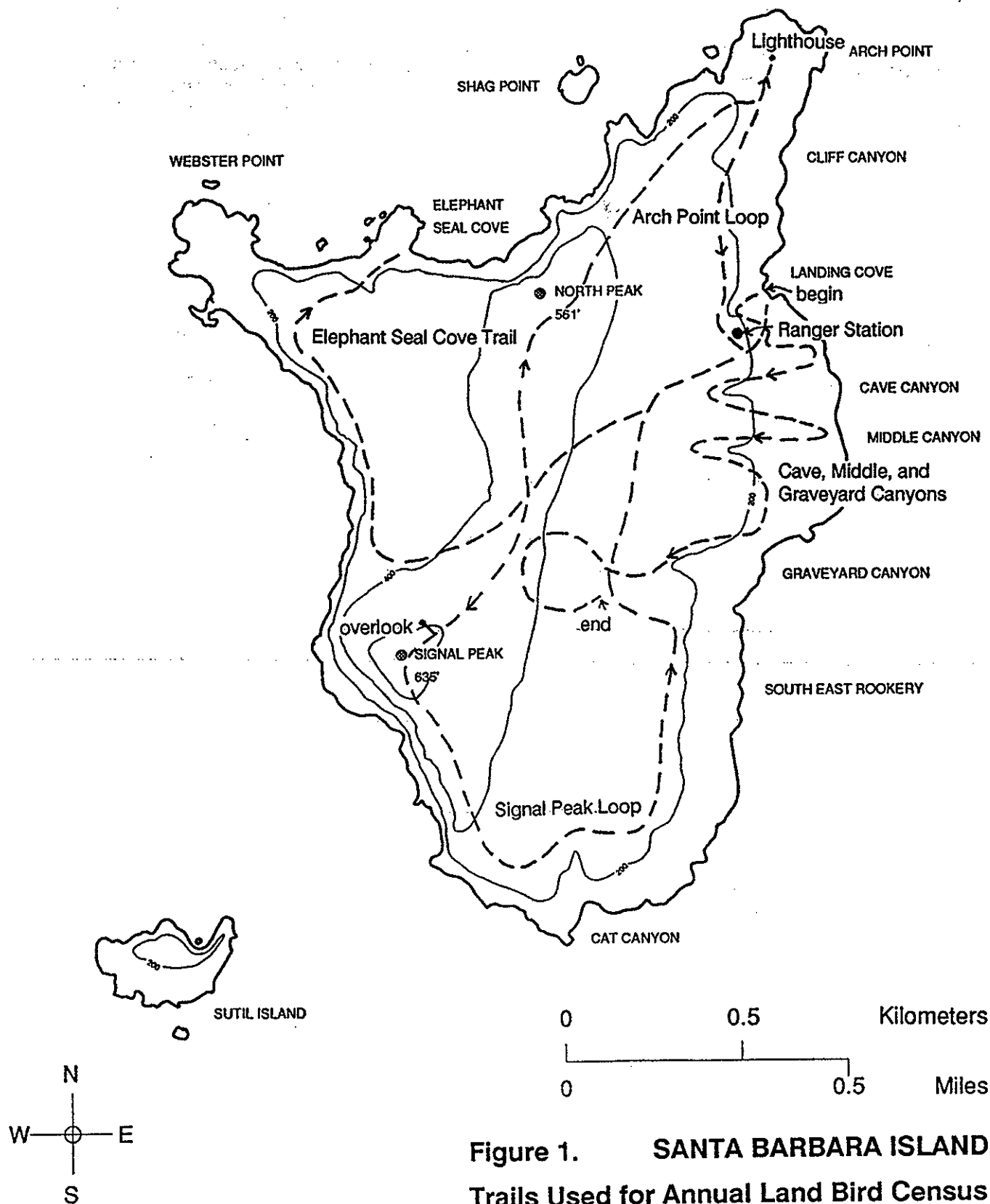


Figure 1. SANTA BARBARA ISLAND
Trails Used for Annual Land Bird Census

Breeding Land Birds - Santa Barbara Island

American Kestrel

Falco sparverius

Morphology: 9-12 in. Typical falcon shape, long pointed wings, long tail, large head, males smaller than females. Rufous-red back and tail, double black stripes on white face. Male has blue-gray wings, female's wings are red-brown. Perched, at a distance, note the upright posture and relatively large head.

Behavior: Kestrels are frequently in the air, soaring and "hovering", facing into the wind on fluttering wings.

Habitat: Kestrels are common on the island, especially around the slopes of Signal Peak and North Peak, and the area from Landing Cove to Cave Canyon. Look for perched birds on *Coreopsis*, on cliff edges, and in the canyons.

Similar Species: Generally, no other birds on the island should be confused with kestrels. Peregrine Falcons occur on the island during the winter, but should be distinguished relatively easily by their dark coloration (blue-gray or brown over the entire upper parts), much larger size, and strong flight on relatively rapid, shallow wing beats.

Song: No true song, but call is a loud, rapid kee-kee-kee.

Short-eared Owl

Asio flammeus

Morphology: This is a large, light brown bird, big-headed and rather long-winged. Perched, note the large, round head and the black patches on the face framing the eyes.

Behavior: This owl flies with deep, "floppy" wing beats.

Habitat: Seen flying back and forth over the grasslands, especially on the east terrace in the vicinity of the canyons and over the east slope of North Peak. An irregular breeder on the island.

Similar Species: The Barn Owl is the only other common large owl; it is rarely seen during the day. It is light brown above, and white or orangish below. The Northern Harrier "quarters" the grassland in the same manner as the Short-eared

Owl, but is larger, slimmer, and long-tailed, without the big head and floppy flight which make the owl so distinctive. Northern Harriers typically glide on wings help up in a shallow "V"

Song: Quiet whooo, repeated several times in succession. Commonly heard call is a raspy keee-yerr.

Horned Lark

Eremophila alpestris

Morphology: 7 in. long. Brown backed. Male has black forehead with black "horns" (not always distinct) and a broad black stripe ("whisker mark") down sides of face. White or yellowish face and throat, with a black bib below throat. Females and immature birds similar to male but duller. In flight, dark tail with white outer feathers may be conspicuous.

Behavior: Horned Larks are ground dwellers and walk or run over the ground while foraging. Commonly in flocks of 5 to 30 birds. Flight is undulating with wings folded tightly to body after each beat, accompanied by flight call or song. Their call notes will often be heard before the birds can be seen.

Habitat: Horned Larks are found in sparsely vegetated areas. They are most numerous in the "moonscape" area, Arch Point, and the top of Signal Peak. They are also frequently seen in the Badlands, the short-grass and eroded areas on the east slope of Signal Peak, around Cat Canyon and the top of the Southeast Slope, and along the trail between the residence area and the Saddle.

Similar Species: The only common ground sparrow - the Savannah Sparrow - generally occurs in tall grass or brushy areas. It is streak-breasted, short-tailed and lacks any of the black markings of the lark. More difficult will be distinguishing pipits and longspurs - both tend to flock with Horned Larks, and both have white outer tail feathers; also like larks, they both walk (sparrows hop). Pipits are slimmer than larks and thin-billed; they are darker brown on their upper parts and have a streaked breast. Longspurs are chunky and have a conical bill (heavier than that of the lark); they are rather plain in winter plumage, looking like pale sparrows. They may have dark, smudgy markings on the head and breast, but will not have the "mask" and "horns" of the lark.

Song: Calls include a high pitched tsee-ee or tsee-titi. The song is a weak twittering pit-wit, wee-pit, pit-wee, wee-pit, accelerating toward the end. Both call and song are given on ground or during flight.

Orange-crowned Warbler *Vermivora celata*

Morphology: 5 in. A small, somewhat drab bird with thin, pointed bill. Sexes alike. Plain, dusky green above, variable yellow underparts with a faintly streaked breast. Dark stripe through eye sometimes visible. Orange-brown crown spot usually not evident in field. The most distinctive thing about Orange-crowned Warblers is their lack of any distinctive marks. They are plain yellowish-green overall without wing bars or an eye ring. At close range, note a faint dark line through the eye, and blurry streaks on the underparts. When the head feathers are raised on a male, the orange crown can be seen, but this is often difficult to see in the field and is, therefore, not a good field identification character.

Behavior: Frequently the birds sing from the cover of *Coreopsis*. When seen they are usually searching around *Coreopsis* branches and making short rapid flights from one *Coreopsis* to another.

Habitat: Orange-crowned Warblers are found primarily in *Coreopsis* in Cave and Middle Canyons during the breeding season. They are occasionally seen in the *Coreopsis* on North Peak, in the Landing Cove, and in Graveyard Canyon.

Similar Species: One other commonly observed bird might be confused with Orange-crowned Warbler. Ruby-crowned Kinglets are smaller, grayish, and have a conspicuous eye ring and wing bars.

Song: Counts for this bird concentrate on singing birds. The song is an even, descending trill, often with an upward inflection at the end; the trill may be sweetly melodic or rather dry.

Western Meadowlark *Sturnella neglecta*

Morphology: Approximately 9 in. long. Dull brown, streaked and spotted above. Note the short

tail with white outer feathers. Throat and breast yellow with distinctive black v-shaped breast band. Crown stripes. Note the flight profile - chunky, with short tail and "pointy front".

Behavior: Meadowlarks fly with bursts of several rapid wing beats alternating with gliding.

Habitat: Meadowlarks may be seen anywhere on the island; they are especially common in the grasslands of the east terrace.

Similar Species: Should not be confused with any other bird on the island (except, perhaps with the starling for birds seen flying at a great distance).

Song: Their song is a characteristic sound on the island - a loud, clear jumble of flute-like notes.

European Starling *Sturnus vulgaris*

Morphology: 8-9 in. long. A dark, chunky bird with a short tail and long, slender bill. In winter, dark body feathers are tipped with white. Adult in breeding plumage is iridescent black with a yellow bill. In flight, wings appear pointed (triangular).

Behavior: They are usually seen in flocks of up to 60 birds, but note that meadowlarks may also gather in flocks during the winter.

Habitat: Starlings may be seen anywhere on the island. They are frequently seen around some of the *Coreopsis* stands on the east terrace, and around Arch Point.

Similar Species: Other blackbirds are slimmer, longer tailed and more evenly black colored (lacking the iridescence of fine speckling that the Starling may show). They do not have characteristic "triangle" wings and short tail that are so distinctive in the starling in flight. If not seen well, flying birds at a distance may be mistaken for meadowlarks.

Song: Utters a variety of squeaky chattered, warbles, and twitters. Also imitates calls or songs of other species.

ANACAPA ISLAND

Census is limited to East Anacapa Island because of access difficulties and potential disturbance of the endangered California Brown Pelican on West Anacapa Island. Figure 2 indicates the routes of the trail census. The entire island is censused in one day using two major trail systems.

Trail Used

The East Anacapa Island census starts at the gate to the lighthouse, with the observer slowly walking to the ranger residence. At the bunkhouse, turn upslope and travel around the helicopter pad, proceeding down toward the campground and turning left at that trail junction. Continue along this trail, staying to the left at the fork, until you reach the western tip of the island (Inspiration Point). Turn here and follow the north loop of this trail down through the gull colony. Retrace the path to the campground (do not recount the section of trail you already covered), then turn left (north) and follow the Cathedral Cove trail. Where the Cathedral Cove trail meets the main trail, turn left and walk back to the residence area ending the count at the bunkhouse.

Time of Each Count

Begin at dawn	
Walk trail	1 to 1 1/2 hours

Breeding Land Birds - Anacapa Island

Red-tailed Hawk *Buteo jamaicensis*

Morphology: 19-25 in. long, wingspan 50 in. Large hawk with broad, fairly rounded wings and short, broad tail. Adults are dark brown above, white below with brown streaks on lower neck. Characteristic broad band of dark streaking across white belly, and chestnut-red on upper side of tail; paler red undertail. Immature birds are similar to adults, but note the gray-brown tail with many dark bands, and the more streaked and spotted underparts, but still showing the conspicuous white chest.

Behavior: Hunts while soaring in sky or hovers along ridges where updrafts hold it aloft. Usually seen in flight, though at times perched along cliffs or ridge tops.

Habitat: Primarily open country and may be seen anywhere on the island. While known to breed on West Anacapa, they do not currently breed on East Anacapa, but may do so in the future.

Similar Species: Possibly confused with Common Raven - similar size, but all black with long, heavy bill and long wedge-shaped tail.

Song: Call is a distinct rasping scream -- kreee.

Peregrine Falcon *Falco peregrinus*

Morphology: 16-20 in. Crow size. Typical falcon shape; long pointed wings, long tail. Males smaller than females. Dark head, back, and top of wings. Adults have barred underparts, immatures streaked. Note the distinctive wide black wedge that extends below eye.

Behavior: Flies with strong, shallow wing beats or soars along cliffs/bluffs. May be seen perched along cliffs.

Habitat: Peregrines breed on steep cliffs, and forage mainly along the island periphery. Occasionally hunt or fly over the island itself.

Similar Species: At a distance may be confused with the American Kestrel, which is much smaller and more colorful.

Song: No true song, seldom heard vocalizing.

Note: Special surveys must be conducted to determine status and numbers of breeding peregrines. However, any peregrines noted during trail counts should be recorded.

American Kestrel *Falco sparverius*

Morphology: 9-12 in. Typical falcon shape, long pointed wings, long tail, short neck, males smaller than females. Rufous-red back and tail, double black stripes on white face. Male has blue-gray wings, females' wings are red-brown.

Behavior: While perched, frequently raises and lowers its tail. Flies with rapid wing beats and short glides. Often hovers in mid-air on rapidly beating wings, flapping or gliding to a new location to hover again.

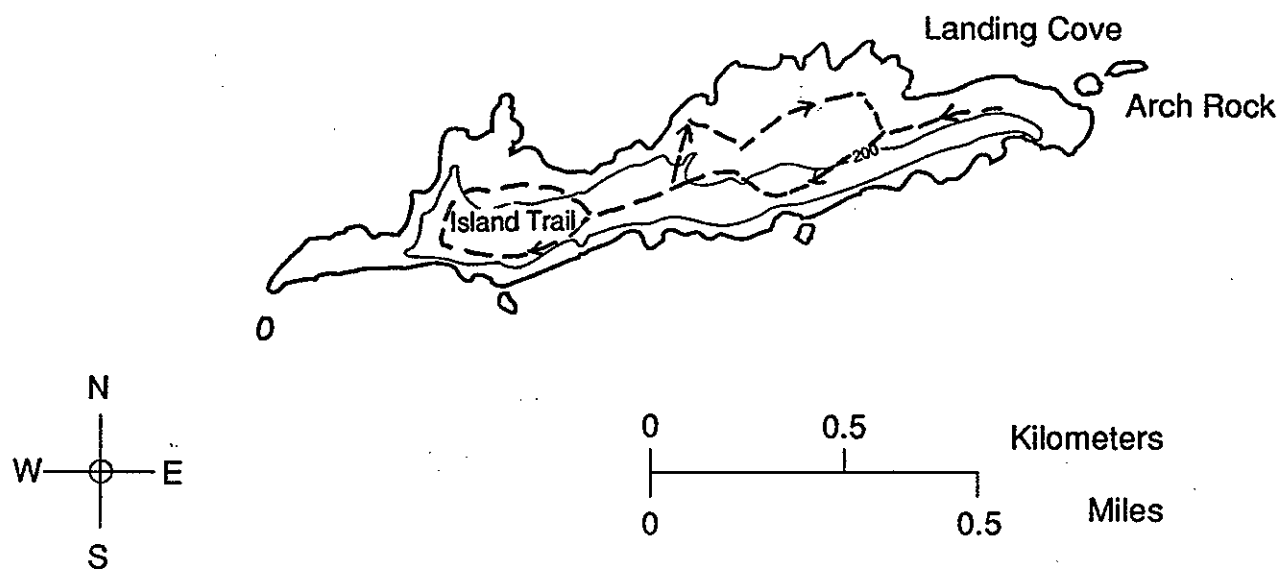


Figure 2. EAST ANACAPA ISLAND
Trails Used for Annual Land Bird Census

Habitat: Kestrels breed on cliffs and canyon walls, but forage and fly over the entire island. Although uncommon, they may be seen on any count.

Similar Species: At a distance may be confused with the Peregrine Falcon, which is a darker and larger falcon, with more shallow wing beats.

Song: No true song, but call is a loud, rapid klee-klee-klee.

Allen's Hummingbird *Selasphorus sasin*

Morphology: 3-1/2 in. Head and back iridescent green, tail mainly reddish-brown; rufous sides. Male has bright orange-red gorget, while female has a few red feathers on throat and mostly white underside.

Behavior: Commonly perches on high exposed twig or branch. Sips nectar from flowers while hovering. Scolds and chases other birds. Male's courtship display flight drops from high above in the arc of a giant pendulum, swooping back and forth several times and repeating.

Habitat: In or around *Coreopsis* or *Baccharis*, or feeding from flowering plants such as Indian paintbrush. Currently breeds on middle Anacapa. It does not breed on East Anacapa at present, but may in the future.

Similar Species: Somewhat similar to Anna's Hummingbird, but distinguished by rufous sides and male's green crown. Very similar to uncommon Rufous Hummingbird; female and young indistinguishable (assume it is an Allen's), male is distinguished by all-green back and crown of Allen's versus the red-brown back of the Rufous.

Song: No true song. In flight, wing beats produce a high, thin whistle. Call is a chup, and chase note is a zeeee-chuppity-chup.

Barn Swallow *Hirundo rustica*

Morphology: 7 in. A slender body with long pointed wings and deeply forked tail (sometimes white spots on tail). Metallic blue-black above, cinnamon underparts.

Behavior: Adept aerialist, catches flying insects in air during swift flight over island or canyons. Twitters during flight.

Habitat: Though it nests in caves and rock crevices, barn swallows may be seen flying anywhere on the island. Common in landing cove and other areas where flying insects are common; they frequently forage over grasslands and shrubby areas.

Similar Species: Cliff Swallow does not have a long, forked tail.

Song: No true song, however utters a twitter, kvik kvik, wit-wit in flight.

Rock Wren *Salpinctes obsoletus*

Morphology: Approximately 6 in. long. Dull gray above, finely streaked white breast. Cinnamon-colored rump. Overall, a pale bird. Note the long, thin bill. White streak over eye.

Behavior: Dodges about among rocky areas. Frequently bobs up and down.

Habitat: Rocky, open areas, especially cliffs. Most likely observed along north- and southwestern edge of island.

Similar Species: House Wren - usually found in areas of thick vegetation. Smaller and darker, has barred sides. The House Wren is shy, flighty, and usually stays concealed in vegetation.

Song: The song is highly variable, but usually a mixture of buzzes and trills. Note the slight similarity to some forms of Song Sparrow calls.

Bewick's Wren *Thryomanes bewickii*

Morphology: 5 in. Chunky with slender, slightly curved bill. Grayish brown above, light below. Distinctive white eyebrow. Long tail edged with white, usually held uptilted.

Behavior: Flicks tail sideways. Highly inquisitive, will often approach observer. Usually stays well concealed in vegetation.

Habitat: Found primarily in densely vegetated areas, particularly along the trail to the lighthouse.

Similar Species: Possibly confused with smaller House Wren or Winter Wren. Both have shorter tails and barring on sides or throat. Only Bewick's Wren has distinctive white eyebrow.

Song: Variable, a loud high thin buzz and warble. Can be very vocal, singing and calling continuously for several minutes at a time.

Orange-crowned Warbler *Vermivora celata*

Morphology: 5 in. A small, somewhat drab bird with thin, pointed bill. Sexes alike. Plain, dusky green above, variable yellow underparts with a faintly streaked breast. Dark stripe through eye sometimes visible. Orange-brown crown spot usually not evident in field.

Behavior: Actively darts about in dense, bushy vegetation. Male often sings from within bush, out of sight. When seen, it is often gleaning insects from branches.

Habitat: Found in areas where lupine, *Coreopsis*, or other shrubs are abundant. Usually seen in *Coreopsis* between residence area and lighthouse, on the hills around Cathedral Cove, and on the west end of the island.

Similar Species: The Ruby-crowned Kinglet is similar in size, although smaller and grayer overall. The kinglet has white wing bars and a white eye ring. Note the lack of green-yellow coloration. Review section on Lesser Goldfinch and note differences.

Song: Call note is a high pitched chip. Song is a distinct trill composed of a series of descending notes.

Song: Has a distinctive call note of a low, throaty explosive chuck. This call note is often the first detection of the bird. Also note a rattling flight call that is commonly heard. The song is a series of gurgling, flute-like notes, accelerating toward the end.

House Finch *Carpodacus mexicanus*

Morphology: 6 in. Sexes differ. Male has brown back and wings, with red (or sometimes orange or yellow) on head, rump, and breast. Note the brown streaked underparts and short, conical bill. Female and juveniles are gray-brown and heavily streaked overall, lacking red.

Behavior: Forage in open areas on plant seeds. Usually give call note in undulating flight.

Habitat: Prefer trees, shrubs, and eaves of buildings for nesting, but forage wherever weed seeds are available. May be seen flying over any part of island; common above helicopter pad and near water-tank building.

Similar Species: Female may possibly be confused with sparrow species (especially when wet from bathing). Compare the unstreaked belly of most sparrows with the extensively streaked House Finch.

Song: Call note is distinctive queet or wheat. Learn to distinguish this from the Horned Lark call note. Song is variable and warbling.

Western Meadowlark *Sturnella neglecta*

Morphology: Approximately 9 in. long, and one of Anacapa's larger land birds. Dull brown, streaked and spotted above. Note the short tail with white outer feathers. Throat and breast yellow with distinctive black v-shaped breast band.

Behavior: Primarily ground dwelling but sometimes seen perched or singing atop bushes or trees. In winter usually seen in flocks. In flight, alternates rapid wing beats and gliding, though flight remains level.

Habitat: Commonly found on all grassy areas of the island.

Similar Species: The European Starling is similar in size and shape, but is a much darker bird (refer to section on the starling).

European Starling *Sturnus vulgaris*

Morphology: 8-9 in. long. A dark, chunky bird with a short tail and long, slender bill. In winter, dark body feathers are tipped with white. Adult in breeding plumage is iridescent black with a yellow bill. In flight, wings appear pointed (triangular).

Behavior: Forages by day in open country, walks with short jerky steps. Usually seen in flocks, though at times singly.

Habitat: Nesting in cavities in canyon walls and cliffs. Starlings may be seen flying or foraging anywhere on the island.

Similar Species: Western Meadowlark is similar size and shape, but is much lighter colored. Black

birds are same size, but have longer tail, more rounded wings and shorter bill.

Song: Utters a variety of squeaks, chatters, warbles, and twitters. Also imitates calls or songs of other species.

SAN MIGUEL ISLAND

Trails Used

There are three basic trail systems used for counts on San Miguel Island. They are described here and mapped in figure 3.

Cross-Island Trail: Begin at the Nidever Creek bridge between the ranger station and the outhouse. Follow the trail, turning right at the junction to the Cabrillo Monument (do not take the small loop up to the actual monument) and on to San Miguel Hill (end day one).

On day two, continue over San Miguel Hill and Green Mountain, down the west slope of Green Mountain, and through the large section of lupine which ends just before the dry lake bed. The end of this lupine patch marks the end of the count.

Harris Point Administrative Trail: A marker indicates the beginning of this route, where the Harris Point administrative trail joins the old jeep trail. Follow the trail north approximately 1600 m to markers that indicate the end of the count.

Willow Canyon: Although not technically a trail, the bottom of Willow Canyon is easily traveled and presents a good route for monitoring unique canyon habitats. Begin censusing at the northwesternmost extension of upper Willow Canyon, approximately 50 m north of where the old fence line crosses the canyon. Follow the bottom of the canyon all the way to the mouth (Willow Cove). Keep to the main canyon, staying to the left at all major junctions.

Time of Each Count

Cross-Island Trail (census over two days)
Begin at dawn
Time to San Miguel Hill 2 hours
Time to end of count 4 1/2 hours
Transit time back to
ranger station 2 1/2 to 3 hours

Harris Point Trail
Begin at dawn
Transit time to beginning
of count 20 minutes
Count time 50 minutes
Transit time back
to ranger station 45 minutes

Willow Canyon
Begin at dawn
Transit time to beginning
of count 20 minutes
Count time 2 1/2 hours
Transit time back to
ranger station 1 1/2 to 2 hours

Breeding Land Birds - San Miguel Island

Red-tailed Hawk *Buteo jamaicensis*

Morphology: 19-25 in. long, wingspan 50 in. Large hawk with broad, fairly rounded wings and short, broad tail. Adults are dark brown above, white below with brown streaks on lower neck. Characteristic broad band of dark streaking across white belly, and chestnut-red on upper side of tail; paler red undertail. Immature birds are similar to adults, but note the gray-brown tail with many dark bands, and the more streaked and spotted underparts, but still showing the conspicuous white chest.

Behavior: Hunts while soaring in sky or hovers along ridges where updrafts hold it aloft. Usually seen in flight, though at times perched along cliffs or ridge tops.

Habitat: Primarily open country and may be seen anywhere on the island.

Similar Species: Possibly confused with: 1) Common Raven - similar size, but all black with long, heavy bill and long wedge-shaped tail; or 2) Northern Harrier - similar size, but body and wings are slimmer and tail longer and slimmer than Red-tailed Hawk. Harrier also has a white rump-patch and owl-like facial disk.

Song: Call is a distinct rasping scream -- kreee.

Peregrine Falcon *Falco peregrinus*

Morphology: 16-20 in. Crow size. Typical falcon shape; long pointed wings, long tail. Males smaller

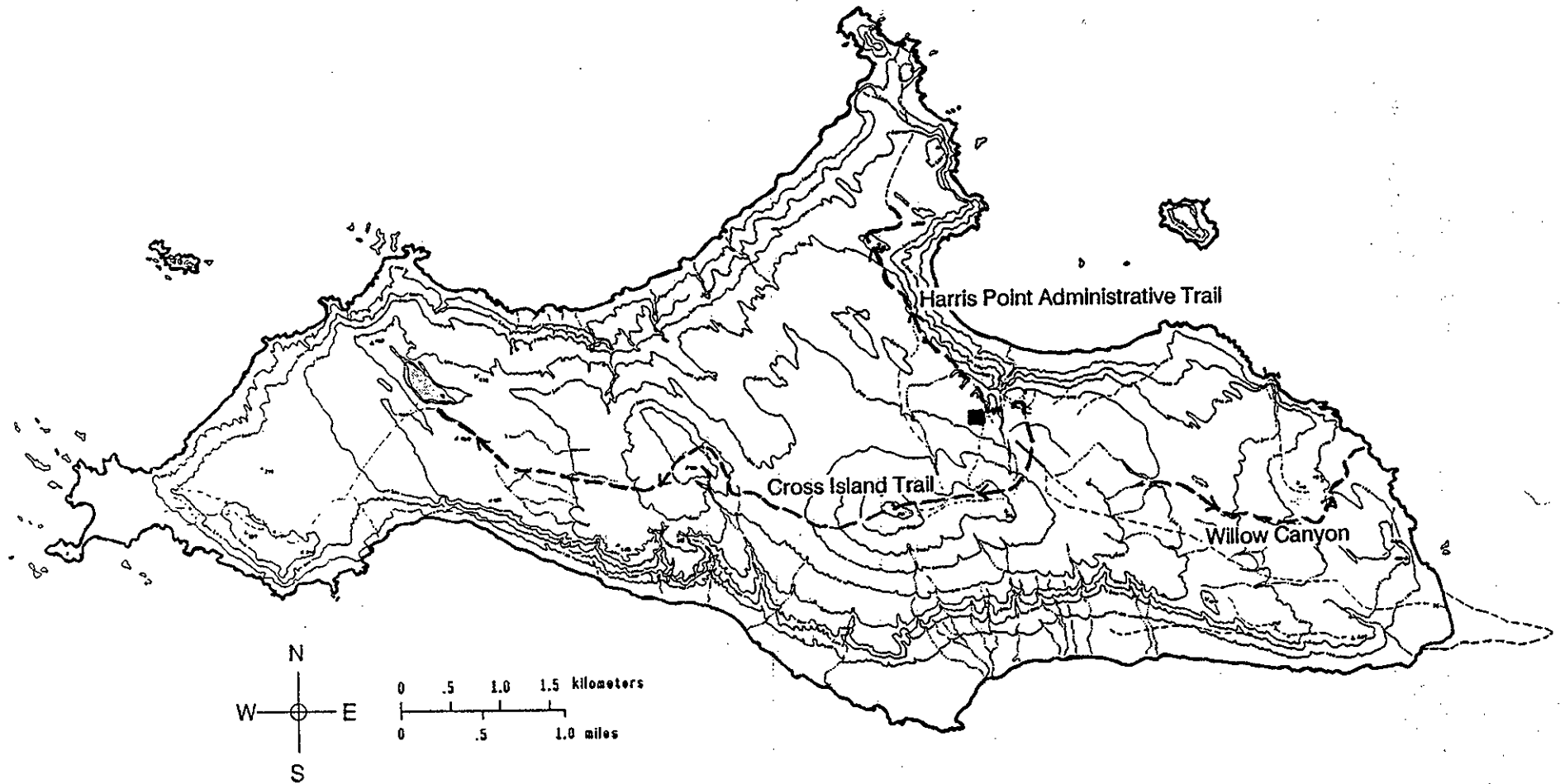


**Figure 3. SAN MIGUEL ISLAND
Trails Used for Annual Land Bird Census**

than females. Dark head, back, and top of wings. Adults have barred underparts, immatures streaked. Note the distinctive wide black wedge that extends below eye.

Behavior: Flies with strong, shallow wing beats or soars along cliffs/bluffs. May be seen perched along cliffs.

Habitat: Peregrines breed on steep cliffs, and forage mainly along the island periphery. Occasionally hunt or fly over the island itself.

Similar Species: At a distance may be confused with the American Kestrel, which is much smaller and more colorful.

Song: No true song, seldom heard vocalizing.

Note: Special surveys must be conducted to determine status and numbers of breeding peregrines. However, any peregrines noted during trail counts should be recorded.

American Kestrel *Falco sparverius*

Morphology: 9-12 in. Typical falcon shape, long pointed wings, long tail, large head, males smaller than females. Rufous-red back and tail, double black stripes on white face. Male has blue-gray wings, female's wings are red-brown.

Behavior: While perched on fence post or shrub, frequently raises and lowers its tail. Flies with rapid wing beats and short glides. Often hovers in midair on rapidly beating wings, flapping or gliding to a new location to hover again.

Habitat: Kestrels breed in cliffs and canyon walls, but forage and fly over the entire island and may be seen on any count.

Similar Species: At a distance may be confused with the Peregrine Falcon, which is a darker and larger falcon, with more shallow wing beats.

Song: No true song, but call is a loud, rapid klee-klee-klee.

Anna's Hummingbird *Calypte anna*

Morphology: 4 in. Tiny, colorful birds, male and female differ. Both are bright metallic green above,

grayish-white below with green on sides. Male has brilliant iridescent red crown and throat patch (gorget), the color extending a little onto the sides of neck. Female is grayish below, lacks red on forehead but throat usually has a few red feathers. Immature birds resemble female, but immature male usually has some red on throat.

Behavior: Often seen perched on prominent twig or branch. Hover at flowers to sip nectar. Often chases other birds or scolds approaching humans. In courtship flights, male mounts upward into sky, then shoots vertically downward at high speed toward perched female, looping upwards and repeating.

Habitat: Commonly found in moist canyons where flowers are abundant. Also forages in flats where island morning glory, paintbrush, or buckwheat are common. Usually seen in Nidever and Willow Canyons.

Similar Species: Similar to Allen's Hummingbird and Costa's Hummingbird. Note that Allen's Hummingbird has rufous wash on sides and rufous tail; male has bright orange-red gorget. Costa's Hummingbird, which is uncommon on the island, has whiter underparts, and the male has a deep violet crown and gorget extending far down the sides of the neck.

Song: Anna's Hummingbird is the only hummingbird to sing - a thin, squeaky warble, uttered from a perch or flight. Both sexes give the common call note, a sharp chick or chirp, often in a rapid series. Often gives twittery, chattering "chase notes". In flight, rapid wing beats produce a hum.

Allen's Hummingbird *Selasphorus sasin*

Morphology: 3-1/2 in. Head and back iridescent green, tail mainly reddish-brown; rufous sides. Male has bright orange-red gorget, while female has a few red feathers on throat and mostly white underside.

Behavior: Commonly perches on high exposed twig or branch. Sips nectar from flowers while hovering. Scolds and chases other birds. Male's courtship display flight drops from high above in the arc of a giant pendulum, swooping back and forth several times and repeating.

Habitat: Similar to Anna's Hummingbird; found in canyons and flats where flowers are abundant. Regularly seen in Willow and Nidever Canyons.

Similar Species: Somewhat similar to Anna's Hummingbird, but distinguished by rufous sides and male's green crown. Very similar to uncommon Rufous Hummingbird; female and young indistinguishable (assume it is an Allen's), male is distinguished by all-green back and crown of Allen's versus the red-brown back of the Rufous.

Song: No true song. In flight, wing beats produce a high, thin whistle. Call is a chup, and chase note is a zeee-chuppity-chup.

Black Phoebe

Sayornis nigricans

Morphology: 6-1/2 in. Black upper parts, tail and breast with white belly. Tail long, bill thin and flattened. Sexes alike.

Behavior: Erect posture when perched; has habit of lowering, then slowly raising tail. Sits atop bushes, fence posts, and makes short flights to catch aerial insects, often returning to same perch. Observer can often hear the bill snap and click when foraging.

Habitat: Seldom far from water, prefers canyon, cliffs and flats where fresh water is found. Usually seen in Willow Canyon, but may forage anywhere.

Similar Species: The Say's Phoebe is similar in size, shape and behavior but differs totally in coloration. Note the overall browner coloration.

Song: Call note, often given in flight, is a tsip or plaintive chee. Song is a repetitious ti wee, ti wee.

Horned Lark

Eremophila alpestris

Morphology: 7 in. long. Brown-backed. Male has black forehead with black "horns" (not always visible) and a broad black stripe ("whisker mark") down sides of face. White or yellowish face and throat, with a black breast band. Females and immature birds similar to male but duller colors. In flight, dark tail with white outer feathers may be conspicuous.

Behavior: Horned Larks are ground dwellers and walk or run over the ground while foraging. Com-

monly in flocks of 5 - 30 birds. Flight is undulating with wings folded tightly to body after each beat, accompanied by flight call or song. Often allow close approach before flight.

Habitat: Prefer open fields, rocky flats and areas of mixed *Astragalus/Malacothrix*/grass. Primarily seen along the cross-island and Harris Point trails, they are sometimes observed in small numbers along Willow Canyon.

Similar Species: The House Finch has similar call note and flight pattern, but is smaller and chunkier. Refer to section on House Finch, and carefully note song differences.

Song: Calls include a high pitched tsee-ee or tsee-titi. The song is a weak twittering pit-wit, wee-pit, pit-wee, wee-pit, accelerating toward the end. Both call and song are given on ground or during flight.

Barn Swallow

Hirundo rustica

Morphology: 7 in. A slender body with long pointed wings and deeply forked tail (white spots on tail). Metallic blue-black above, cinnamon underparts.

Behavior: Adept aerialist, catches flying insects in air during swift flight over fields, streams, canyons, or beaches. Twitters during flight.

Habitat: Although they nest in caves and rock crevices in moist areas, Barn Swallows may be seen flying anywhere on the island. Common in Nidever Canyon and other moist areas where flying insects are common, they occasionally forage over grasslands and shrubby areas.

Similar Species: None

Song: No true song, however utters a twitter, kvik kvik, wit-wit in flight.

Rock Wren

Salpinctes obsoletus

Morphology: Approximately 6 in. long. Dull gray above, finely streaked white breast. Cinnamon-colored rump. Overall a pale bird. Note the long, thin bill. White streak over eye.

Behavior: Dodges about among rocky areas. Frequently bobs up and down.

Habitat: Rocky, open areas, especially canyons, dry washes and cliffs. Found in most canyon areas and in some caliche areas. Most likely observed along Willow Canyon and Harris Point transects.

Similar Species: House Wren - usually found in areas of thick shrubby vegetation. Smaller and darker, has barred sides. Shy and flighty, stays concealed in vegetation.

Song: The song is highly variable, but usually a mixture of buzzes and trills. It is usually an even series of one- or two-syllabled, buzzy notes, all at the same pitch: tew-tew-tew-tew or Chr-ee-chr-ee-chr-ee-chr-ee. Note the slight similarity to some forms of Song Sparrow calls.

Orange-crowned Warbler *Vermivora celata*

Morphology: 5 in. A small, somewhat drab bird with thin, pointed bill. Sexes alike. Plain, dusky green above, variable yellow underparts with a faintly streaked breast. Dark stripe through eye sometimes visible. Orange-brown crown spot usually not evident in field.

Behavior: Actively darts about in dense, bushy vegetation. Male often sings from within bush, out of sight. Often seen gleaning insects from branches.

Habitat: Common in canyons and washes; also found in areas where lupine, *Coreopsis*, or willows are abundant. Usually seen in Nidever and Willow Canyons, as well as lupine areas of the Harris Point and Cross Island trails.

Similar Species: The Ruby-crowned Kinglet is similar in size, though smaller and grayer overall, including the underparts. The kinglet has white wing bars and a white eye ring. Note the lack of green-yellow coloration. Review section on Lesser Goldfinch, noting differences in bill shape and habits.

Song: Call note is a high pitched pit. Song is a distinct series of descending notes.

Song Sparrow *Melospiza melodia*

Morphology: 6 in. Sexes alike. Generally brown above, with brown and rufous streaks and stripes on back and face. Note broad grayish eyebrow

and broad, dark stripe bordering whitish throat. Light breast is heavily streaked, usually with a large central dark breast spot. Long rounded tail, short bill.

Behavior: Often forages on ground and under dense vegetation. May run or hop, retreating into dense cover. Flights usually short (20 m); pumps tail up and down on short flights. Sings loudly from shrubs, fence posts, etc.

Habitat: Song Sparrows like brushy cover with available water, such as canyons. Also in drier habitats where lupine and coyote bush are abundant. Common in Nidever and Willow Canyons, but also found in bushy areas of Cross Island and Harris Point trails.

Similar Species: 1) Savannah Sparrow - An uncommon island visitor. Slightly smaller than the Song Sparrow, it is an overall lighter bird, with a shorter, slightly forked tail and yellowish eyebrow (not gray as in Song Sparrow). 2) Fox Sparrow - A somewhat common winter visitor which is found in the same type of habitat. Larger and darker than the Song Sparrow, it has reddish rump and tail. Underparts heavily marked with triangular spots, may have dark central breast spot. Note the lack of streaking on head and back, and the thick, short bill. 3) Hermit Thrush - A rather common winter visitor. Approximately the same size as the Song Sparrow, but its bill is thinner. Note the reddish tail and lack of streaking on head and back. 4) House Finch - The female House Finch is approximately the same size, but is brown-streaked overall and has a shorter tail. Refer to section on House Finch.

Song: Call notes include a sharp chip or chimp. A nasal eeeeee-eeee is also used. Song of male is variable, a few long bright notes followed by shorter notes, then a trill.

Western Meadowlark *Sturnella neglecta*

Morphology: Approximately 9 in. long, one of San Miguel Island's larger birds. Dull brown, streaked and spotted above. Note the short tail with white outer feathers. Throat and breast yellow with distinctive black v-shaped breast band.

Behavior: Primarily ground dwelling; sometimes seen perched or singing atop bushes or fenceposts. In winter may be seen in flocks of 10-70. In flight, alternates rapid wing beats and gliding, though flight remains level.

Habitat: Commonly found in open grasslands, sometimes in areas of bushes or mixed *Astragalus/Malacothrix*/lupine. Usually observed on cross-island trail and Harris Point Trail, though it may also be seen occasionally along the rim of Willow Canyon.

Similar Species: The European Starling is similar in size and shape, but is a much darker bird (refer to section on the Starling).

Song: Has a distinctive call note of a low, throaty explosive chuck. This call note is often the first detection of the bird. Also note a rattling flight call that is commonly heard. The song is a series of gurgling, flute-like notes, accelerating toward the end.

Lesser Goldfinch *Carduelis psaltria*

Morphology: 4-1/2 in. Small bird with short tail and short, conical bill. Sexes differ. Male is dark greenish above, with bright yellow underparts, black cap, wing (with white wing bar), and tail. White wing patch visible in flight. Female greenish above, dull yellow below, with black wings and tail. Immature birds resemble adult females.

Behavior: Usually seen or heard flying overhead, perched atop coyote bush or feeding on thistle seeds. Usually calls or sings in flight.

Habitat: Prefers nesting in bushy and willow-lined canyons. May be seen in drier flats where thistles are common. Often observed in Nidever and Willow Canyons, but may be found along any trail.

Similar Species: Orange-crowned Warbler has similar green back and yellowish-green underparts, but the bill is much thinner and more pointed and it lacks the black wing, tail and cap. Refer to section on Orange-crowned Warbler.

Song: Call note is a high, plaintive tee-ye. Song is variable series of twitters, trills, and sweeps.

House Finch *Carpodacus mexicanus*

Morphology: 6 in. Sexes differ. Male has brown back and wings, with red on head, rump, and breast. Occasionally male will show orange or yellow instead of red. Note the brown streaked underparts and short, conical bill. Female and juveniles

are gray-brown and heavily streaked overall, lacking red.

Behavior: Forage in open areas on plant seeds. Commonly found bathing in fresh-water pools and springs. Usually give call note in undulating flight.

Habitat: Prefer canyons and cliff areas for nesting, but forage wherever weed seeds are available. May be seen flying over any part of island; common in Willow Canyon.

Similar Species: Female may possibly be confused with Song Sparrow (especially when wet from bathing). Compare the unstreaked belly of the Song Sparrow with the extensively streaked House Finch.

Song: Call note is distinctive queet or wheat. Learn to distinguish this from the Horned Lark call note. Song is variable and warbling.

European Starling *Sturnus vulgaris*

Morphology: 8-9 in. long. A dark, chunky bird with a short tail and long, slender bill. In winter, dark body feathers are tipped with white. Adult in breeding plumage is iridescent black with a yellow bill. In flight, wings appear pointed (triangular).

Behavior: Forages by day in open country, walks with short jerky steps. Usually seen in flocks (10-100), though at times singly. Though bold in cities, they are very shy on San Miguel Island and usually flush from ground at quite a distance and will change flight path to avoid humans.

Habitat: Nesting in cavities in canyon walls and cliffs. Starlings may be seen flying or foraging anywhere on the island.

Similar Species: Western Meadowlark is similar in size and shape, but much lighter colored. Black-birds are same size, but have longer tail, more rounded wings and shorter bill.

Song: Utters a variety of squeaks, chatters, warbles, and twitters. Also may imitate calls or songs of other species.

Census at Stratified Random Stations

Every five years a census is conducted from stratified random stations in order to ensure that the correction factor for absolute densities is still applicable for each island. The variable circular plot technique (Reynolds et al. 1980) is used to document densities of breeding bird species. The variable circular plot counts are conducted at pre-designated stations at random locations along transects over each island. The observer counts all birds heard and seen at each station for a 10 minute period. Stations have been established on three islands (Santa Barbara, Anacapa, and San Miguel) as mapped in Figures 4, 5, and 6.

For station counts, the observer goes to a station, allows one minute for the birds to quiet, then begins counting. The count duration is 10 minutes, during which time all birds are counted. Distance of the bird from the station is also recorded. The observer should turn slowly during the 10-minute count period, taking care not to double count any bird. As with trail counts, only breeding species are recorded, but other species should be noted. All stations are identified by small stakes or iron rebar that has been pounded into the ground.

Indicator Species

The monitoring program for land birds will be expanded in the future to gather specific information on indicator species. While key indicator species from major feeding guilds have been selected for more detailed monitoring (American Kestrel from the carnivorous guild, the Song Sparrow from the granivorous guild, and the Orange-crowned Warbler from the insectivorous guild), methods and data requirements are still under study. Potential information to be gathered includes the number of birds breeding in a specific study area, timing of the onset of breeding, fledging success, and population age structure. Such information will not only provide an indication of the health of the species monitored, but the status of other species in that feeding guild.

DATA MANAGEMENT

Data Input

Trail Count Data Sheets were designed to allow rapid, accurate tallying of the number of birds detected during trail counts (see Appendix A).

Detailed instructions for using the land bird monitoring trail count data sheets are included in Appendix A.

Census forms are collected immediately following each census (twice each year). Data are entered into the Channel Islands National Park data base management system using Fox-Base or dBase III +.

Data Analysis

After data entry, relative numbers are calculated for each island. Conversion factors will then be applied to the data to determine relative densities. Data analysis techniques are still being developed, and this aspect will be added to future revisions of this handbook.

On each fifth year, a detailed analysis is conducted to determine if any changes in one or more of the breeding parameters on any of the three indicator species has occurred.

A regression analysis of census data with climatological parameters should be conducted each year to determine what impact abiotic factors are having on species distribution and numbers.

At the end of each 5-year period, a trend analysis is conducted for each breeding species that has been censused on each of the islands. Species analysis is done separately on each island in order to avoid obfuscating trends by swamping of numbers from the larger islands.

Reporting

Reporting of data is done in two ways, one with tables and written comments, the other with graphs. Trend analyses should yield graphs that are suitable for presentation in the park's annual report series.

Data are orally presented once each year to the entire park staff in order to obtain input from all divisions on potential impacts that they might be causing in regard to shifts in species distributions or numbers on that island.

At the end of each 10-year interval, data are reported in peer reviewed publications. Either the Condor or Western Birds are appropriate outlets for these papers.

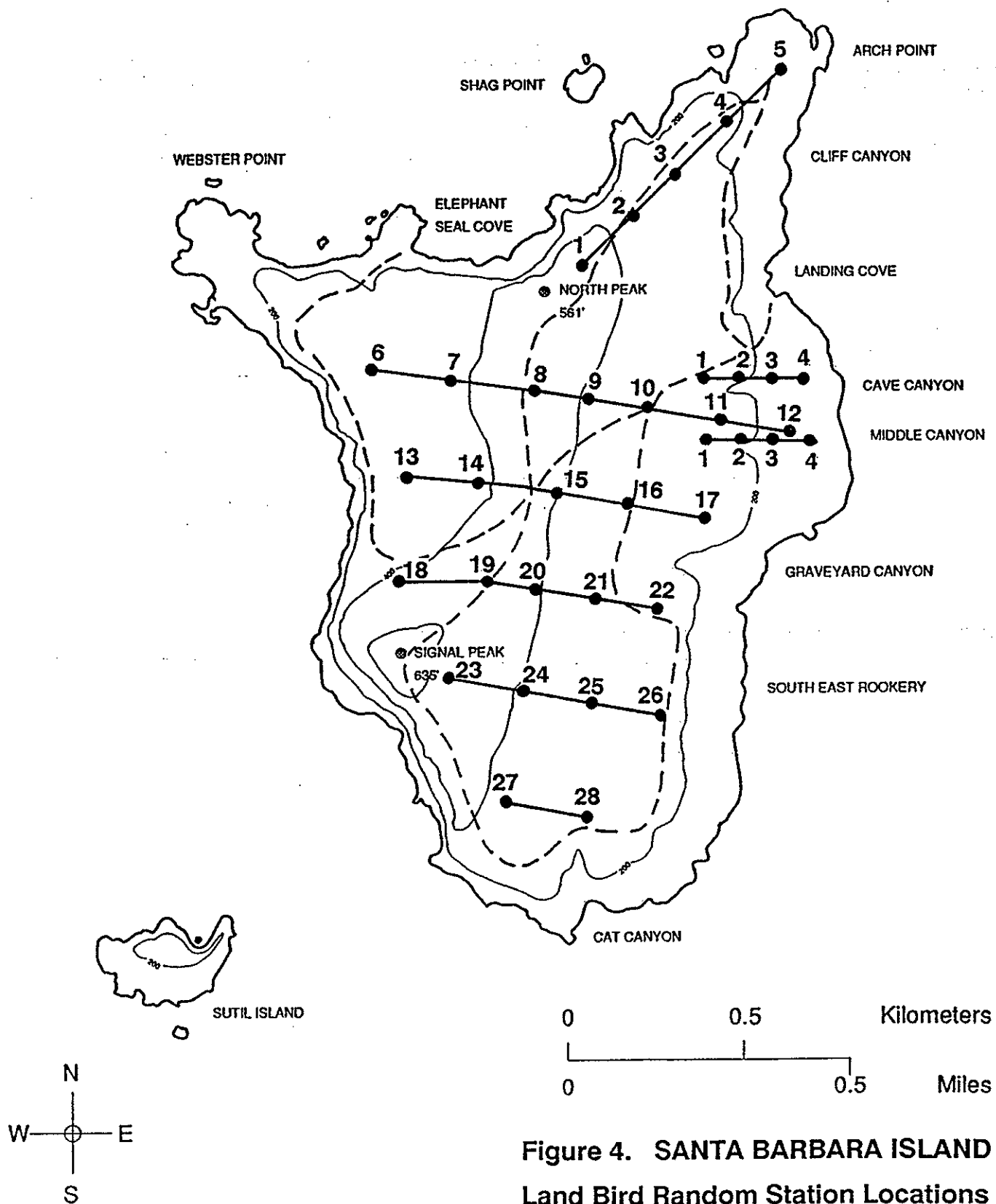


**Figure 4. SANTA BARBARA ISLAND
Land Bird Random Station Locations**

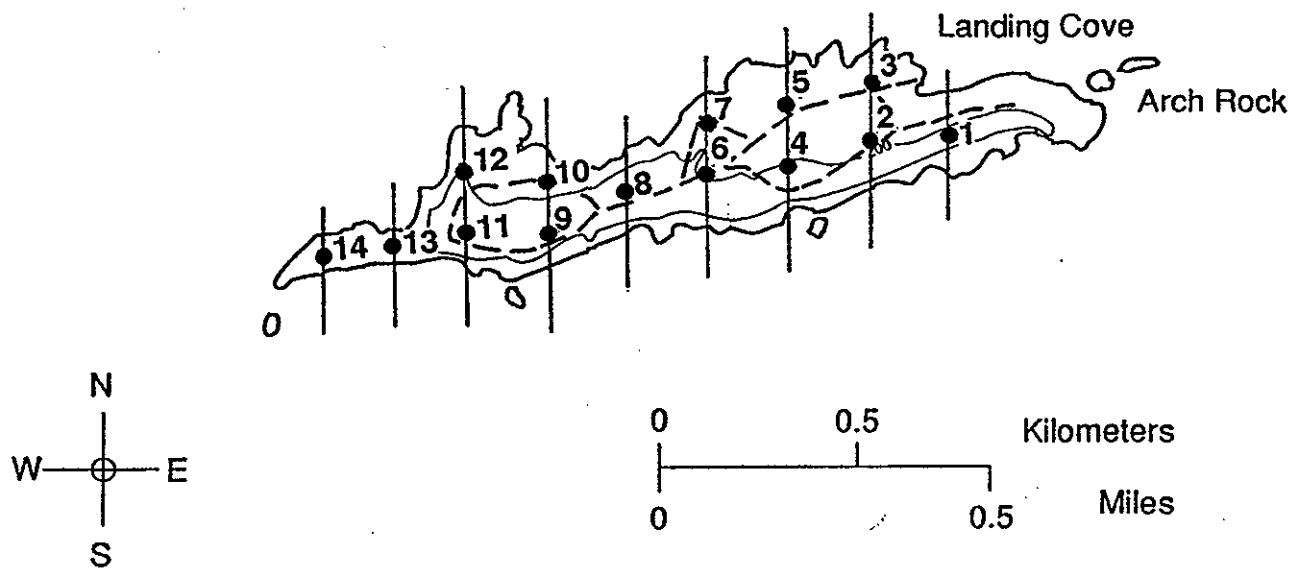


**Figure 5. EAST ANACAPA ISLAND
Land Bird Random Station Locations**

ANACAPA ISLAND CENSUS STATIONS LOCATIONS

- 1 Up path toward lighthouse. Station is on north side of path, 10 m opposite large rock on south side of path.
- 2 Up path toward church. Follow path to sixth water bar uphill from "fire station". Station is 10 m north of bench along side of north path.
- 3 10 to 15 m north of bench along side of north path.
- 4 50 m downhill from lowest point of water collection cistern.
- 5 15 m northeast of the four cement foundation blocks
- 6 Station (stake) is at southeast end of campground, approximately 1 foot on the far side of one of the old railroad ties used as a boundary. The stake is very short - only about 10 cm is exposed.
- 7 About half-way down (10 water bars) down path on east side.
- 8 Next "peak" west of weather station.
- 9 25 m down from the number 9 trail sign.
- 10 15 m up from large drainpipe going under path.
- 11 200 m up from #12.
- 12 200 m W of #10, about 25 m up from path.

(Note: 13 and 14 are not accessible. The terms up or down refer to topography)

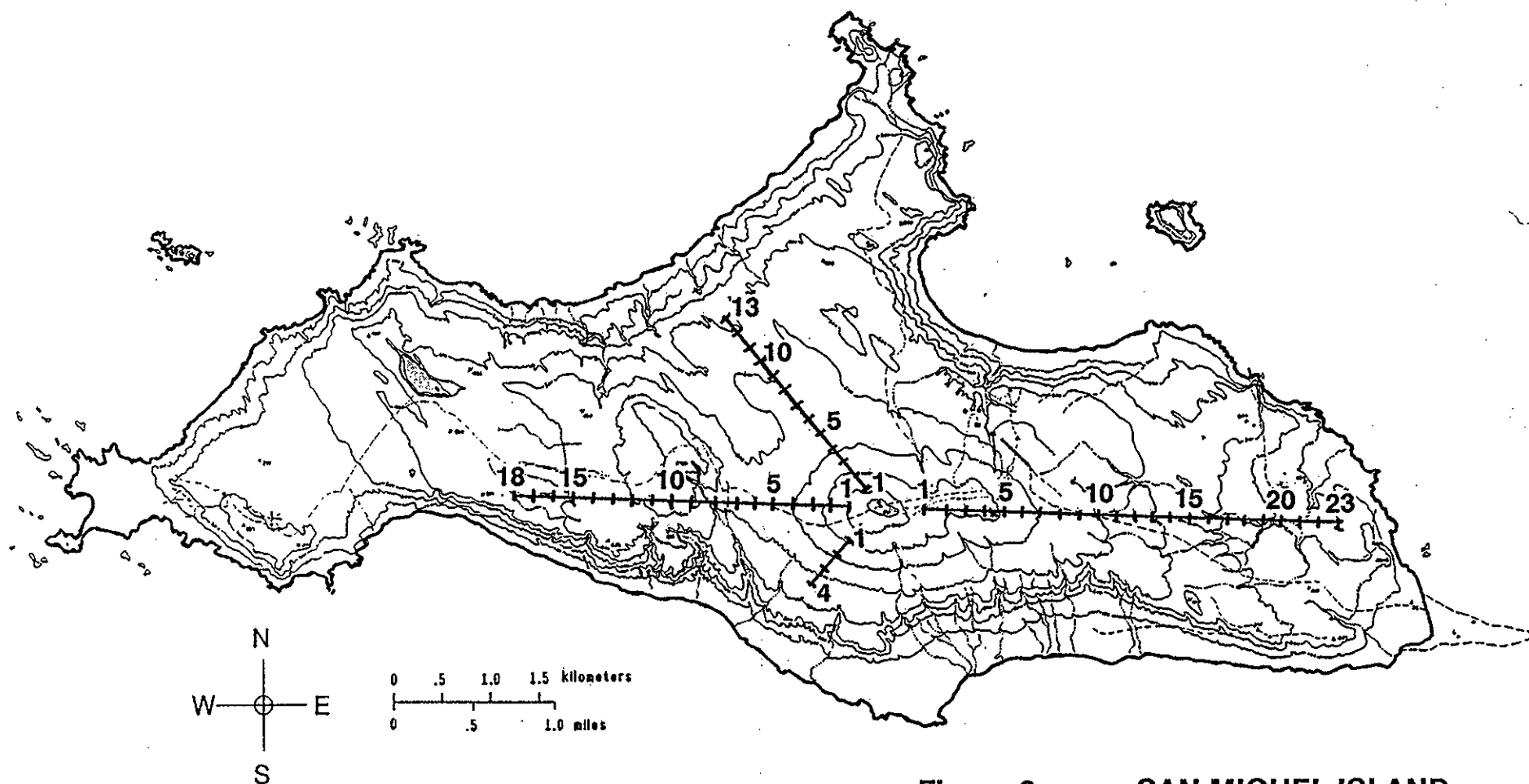


Figure 6. SAN MIGUEL ISLAND
Land Bird Random Station Locations

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APPENDIX A. Land Bird Trail Count Data Sheets

INSTRUCTIONS FOR USE OF MONITORING TRAIL COUNT DATA SHEETS

The Trail Count Data Sheets were designed to allow rapid, accurate tallying of the number of birds detected during trail counts. Each island has a unique data sheet, so it is vital to use the correct one. It is best to use a number 2 or HB lead pencil. Use a separate form for each major part of the island's trail system, as described in the monitoring handbook. Fill out the top portion of the form as indicated below.

- **Census #:** The number (determined sequentially) of the land bird count on that island during that year. For example, 88-01, 88-02, etc.
- **Date:** The date (m/d/yr) that the census is conducted.
- **Time Start:** Record the time that you begin the census for that particular section of trail.
- **Wind:** Estimate the average windspeed at the time you begin the count for that section. If there are strong gusts, indicate them also.
- **Observer:** Print the name of the person conducting the census. Remember, there should only be one person.
- **Time Finish:** Record the time that you end the count for that particular section of trail.
- **Sky:** Estimate the percent cloud cover or, if foggy, the horizontal visibility.
- **Trail:** Write the name of the trail section or survey area.

The remainder of the data sheet contains areas to tally the number of detections for each of the land bird species which are known to breed on the island. As you walk the survey route, place a tally mark (hash mark) in the appropriate dark bordered box for each individual bird that you detect. If you detect a flock, write down the number of individuals in the flock and circle it. Do not use tally marks for flock detections. Large tally areas are provided for common species; smaller boxes for those species with smaller populations. This is based on overall prevalence on the island. Do not worry if numbers detected along a particular survey route do not reflect this.

You should also record any observations of migrant or "visiting" species that are not listed in bordered boxes. These should be listed on the back of the survey form. It is not important to get an actual count of these non-breeding species (detection of breeding species is your main priority), but you may indicate relative or estimated abundance after the survey is over. You may also include comments regarding the species.

When you are finished with the survey, count the number of tallied birds and add any flock detections. Write the total number of individuals detected in the small box to the right of the bird name. These boxes are only provided for species which are likely to be detected many times.

Remember: when finished, record the time in the appropriate space at the top of the form.

LANDBIRD MONITORING

SANTA BARBARA ISLAND

TRAIL COUNT DATA SHEET

CENSUS # _____

DATE _____

TIME START _____

WIND _____

OBSERVER _____

TIME FINISH _____

SKY _____

TRAIL _____

BREEDING SPECIES

WEME	BEWR
EUST	AMKE
OCWA	UNID
ROWR	

EXAMPLE

LANDBIRD MONITORING
TRAIL COUNT DATA SHEET

ANACAPA ISLAND

CENSUS # _____

DATE _____ TIME START _____ WIND _____

OBSERVER _____ TIME FINISH _____ SKY _____

TRAIL _____

BREEDING SPECIES

WEME	BEWR
EUST	HOFI
OCWA	BASW
AMKE	UNIDENTIFIED

EXAMPLE

LANDBIRD MONITORING

SAN MIGUEL ISLAND

TRAIL COUNT DATA SHEET

CENSUS # _____

DATE _____

TIME START _____

WIND _____

OBSERVER _____

TIME FINISH _____

SKY _____

TRAIL _____

BREEDING SPECIES

HOLA		WEME	
HOFI		SOSP	
EUST		OCWA	
ROWR		BASW	
ALHU	ANHU	LEGO	BLPH
AMKE	PEFA	RTHA	

EXAMPLE

SPECIES

COMMENTS

EXAMPLE