State of California

THE RESOURCES AGENCY

Department of Fish and Game

United States Department of The Interior
Bureau of Land Management
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THE STATUS OF THE SWAINSON'S HAWK IN CALIFORNIA, 1979[1/]

By

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Photo by Peter H. Bloom.

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ABSTRACT

During the spring and summer of 1979 the California Department of Fish and Game and the Bureau of Land Management conducted a statewide Swainson's Hawk (Buteo swainsoni) survey encompassing both public and private lands. The primary objective of this study was to document the distribution and abundance of the species. Data on reproductive success, food habits, habitat requirements, and pesticide levels in addled eggs were also collected.

The results document a significant and perhaps continuing decline in Swainson's Hawk numbers throughout most of California. Reasons for this decline are unclear, but habitat destruction definitely has been a contributing factor. Factors associated with the wintering grounds (e.g., pesticides) need further investigation. The current known population is 110 pairs with an estimated population of 375 pairs. Estimates of the historical population size range from 4,284 to 17,136 pairs. A minimum 91 percent decline is inferred, and the species is recommended for inclusion on the California Department of Fish and Game's Rare and Endangered Species List and the Bureau of Land Management's Sensitive Species List.

RECOMMENDATIONS

1. Include the Swainson's Hawk on the California Department of Fish and Game's Endangered Species List.

2. Include the Swainson's Hawk on the Bureau of Land Management's Sensitive Species List.

3. Conduct annual monitoring surveys to determine direction of population trends.

4. Promote legislation for the protection of existing riparian zones (particularly in the Central Valley), and increase mitigation for current and past riparian losses.

5. Determine wintering grounds and migration routes used by Swainson's Hawks.

6. Conduct pesticide analyses of Swainson's Hawk eggs and tissues to determine if levels are high enough to cause reproductive failure or other problems.

7. Increase public awareness concerning the importance of riparian zones and oak trees as wildlife habitat (perhaps, stimulate public involvement by providing free oak and cottonwood trees for planting on property boundaries of private lands).

8. Evaluate dense juniper woodlands on public lands in the Great Basin Region of the State to determine the feasibility of returning this habitat to its original condition (grasslands with occasional old junipers).

9. Conduct a study in the Central Valley to determine the effects of crop conversions on Swainson's Hawks and their prey.

10. If necessary, provide economic incentives to farmers for the continued growing or expansion of crops that are beneficial to the Swainson's Hawk and its prey.

11. Plant cottonwood trees (and fence, if necessary) at spring developments on public lands in appropriate habitat.

INTRODUCTION

The status of the Swainson's Hawk (Buteo swainsoni) in California has been the subject of considerable speculation on the part of agency wildlife biologists, professional ornithologists, and bird watchers. All parties concerned with the welfare of the species agree that a decline has occurred. However, documentation of the extent and locations of the decline were lacking. Need for the present study came in response to directives in the California Department of Fish and Game's (CDFG) "Plan for California Raptors" (Mallette and Schlorff 1978). This plan lists the Swainson's Hawk as a species needing immediate study to determine it's status.

In addition, the Bureau of Land Management (BLM) required information to evaluate the species for possible inclusion on its Sensitive Species List. To facilitate this evaluation and to meet one of the objectives of the "Plan for California Raptors," these two agencies cooperatively funded the present study.

The study design included several objectives secondary to the major goals of documenting abundance and distribution of the Swainson's Hawk. These include: 1) determination of reproductive success; 2) documentation of habitat preferences of breeding Swainson's Hawks both now and, to the extent possible, historically; 3) identification and discussion of factors that may affect existing pairs; and 4) development of habitat and species management recommendations aimed at stabilizing and increasing Swainson's Hawk numbers to ensure that they are not extirpated from the State of California.

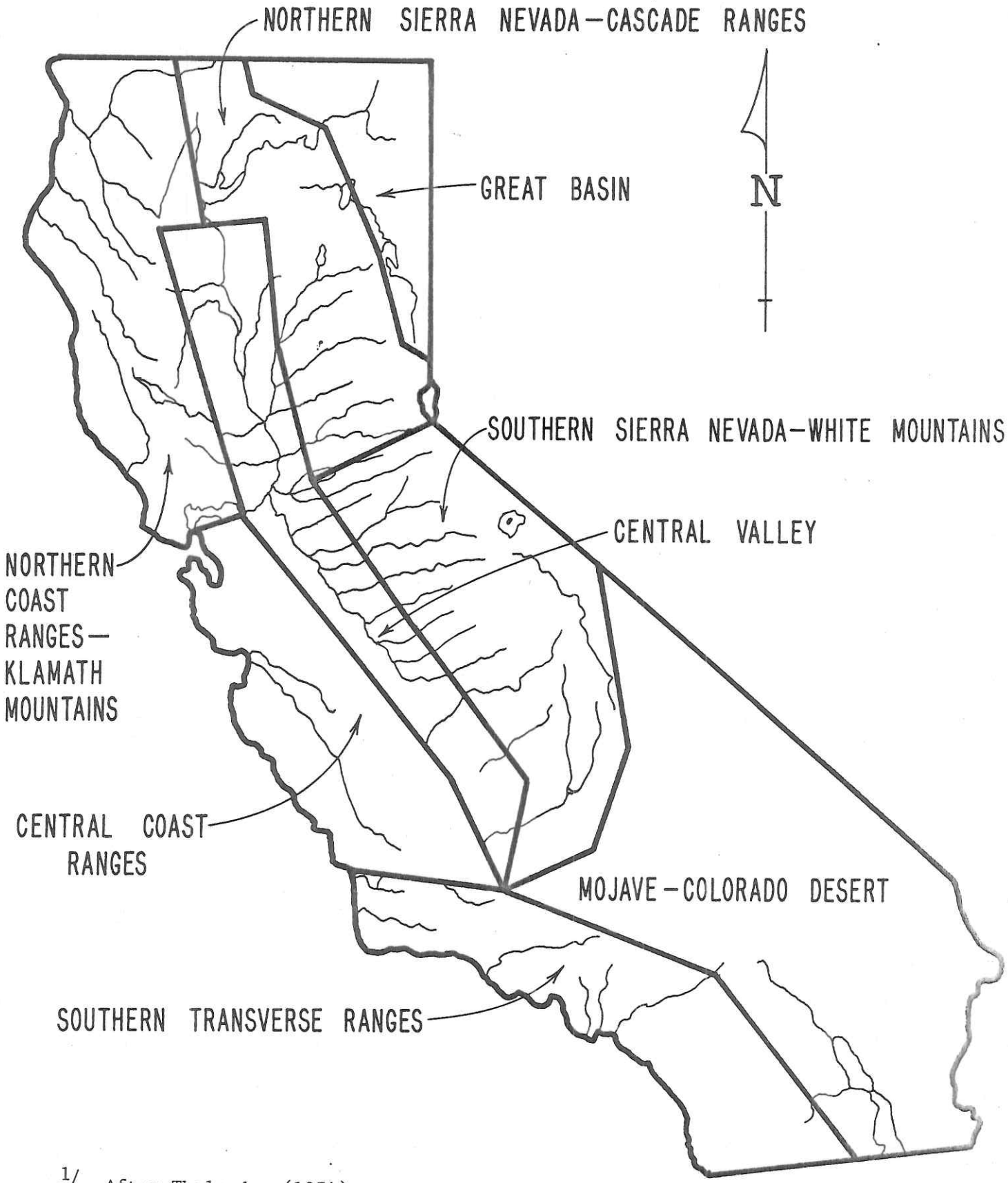
TIMING AND STUDY AREA

Owing to the extensive migration of the Swainson's Hawk to South America (Brown and Amadon 1968, Smith 1973, Browning 1974), spring arrival in California does not occur until early March. The species is thus a relatively late nester. For this reason field work was not initiated until April 23 when most Swainson's Hawks in the southern part of their range should have been incubating or at least have established territories. Field observations concluded on August 8 when virtually all young Swainson's Hawks had fledged. Earliest fledging dates were approximately July 10. Thus, some young had been flying longer than four weeks by the time field work terminated. Because of the increased number of birds and the highly conspicuous and vociferous nature of the young, territories were often more readily identified during this time than during the incubation or brooding periods.

The study area was essentially the entire State of California (Figure 1), except for the Northern Coast Ranges, Klamath Mountains, and most of the Sierra Nevada Mountains where it was assumed that there were no nesting Swainson's Hawks (Figure 2). Field work began in San Diego and Imperial Counties and progressed northward with occassional sorties into other areas of the State to ascertain nesting dates and check on recently active pairs. The study culminated in the Central Valley. Some overlap of time in different regions was necessary to ascertain productivity and feeding habits and to band young (Table 1).

FIGURE 1

Map of California Showing Eight Major Geographical Regions[1/]



1/ After Thelander (1974).

FIGURE 2

SWAINSON'S HAWK NEST SITES
Historical Distribution and Location

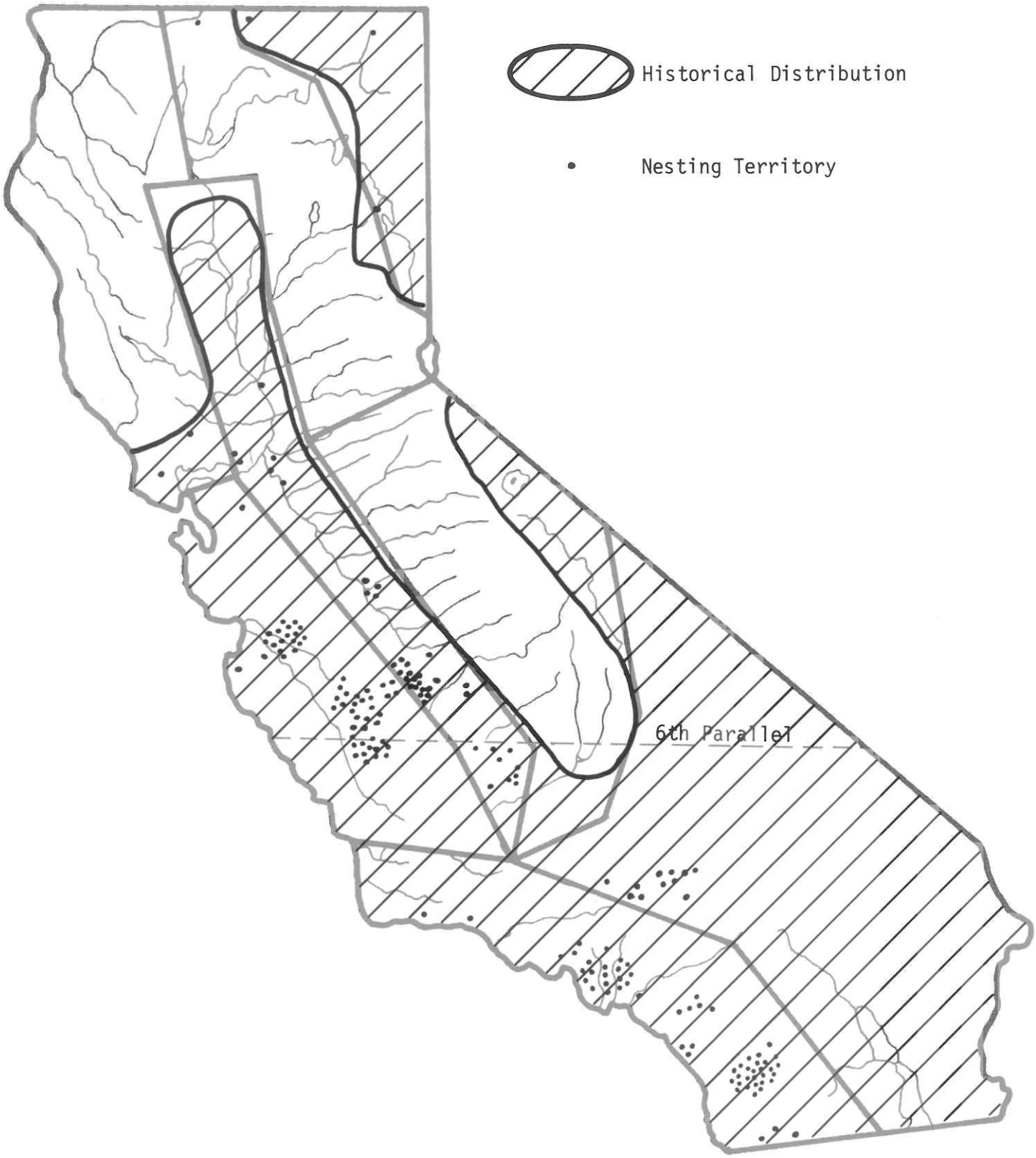


Table 1. Timing and duration of field surveys for Swainson's Hawks nesting in California, 1979.

Region	Dates	Total Days
South Transverse Ranges	Apr. 23 - July 16	8
Mojave Colorado Desert	Apr. 25 - June 14	13
Central Coast Ranges	May 9 - June 21	6
Central Valley	June 18 - Aug. 8	21
Southern Sierra Nevada, White Mountains	May 9 - July 7	5
Northern Sierra Nevada, Cascade Ranges	July 20 - July 21	2
Great Basin	May 25 - June 11	12

METHODS

Prior to starting the field studies, I searched for historical information on Swainson's Hawks in the major ornithological journals. Museum records concerning zoological information were examined at the Western Foundation of Vertebrate Zoology, U.C. Berkeley Museum of Vertebrate Zoology, California Academy of Sciences, San Bernardino County Museum, and the Santa Barbara Museum of Natural History. These five museums are the only institutions known to house egg collections from Swainson's Hawks that nested in California.

Observations of nesting Swainson's Hawks were made from the period of egg laying in late April through the post-fledging period in early to mid-August. A nesting territory was defined as the location where at least one adult Swainson's Hawk was observed, even if the nest was not found. Later, during the post-fledging period, this definition was expanded to include recently fledged nestlings.

Attempts were made early in the study to locate all nesting territories. To determine the efficacy of using the presence of one adult as an indicator of a nest location, the first 24 territories found were intensively searched. All yielded nest sites. Throughout the study a concerted effort was made to locate the actual nest site, since reproductive data, food habits information, and documentation of the habitat in the vicinity of the nest were also desirable.

I collected infertile or addled eggs found in the nests and banded nestlings.

During the latter part of the study more emphasis was placed on locating adults or recently fledged young because locating the exact nest site was often too time consuming, and I wanted to avoid premature fledging of the young. Thus, in early July, when more time was needed to document abundance and distribution, thorough searching for actual nest sites was abandoned in favor of using sightings of adults and young to indicate that a nesting territory was present.

Generally, nest trees that appeared safe were climbed only once to ascertain reproductive success, band nestlings, and gather prey remains.

Although museum egg collections are unquestionably an important source of rare historical data, one must be cautious of making inferences about past population levels based on their content alone. The collections were made infrequently over a long span of time and were gathered in many different localities. In most instances rigorous research intent was lacking, though some collectors did use good scientific methodology and published their data. For example, 132 egg sets (presumably representing approximately 132 territories) were collected during a 68-year period (1880-1948), while 110 territories were found during this 4½ month study alone. Superficially, it might appear as though there was a minimal decrease in the number of territories. However, in most instances there were never more than six egg sets taken (i.e. six territories observed) in any one year. These obviously do not represent the entire population, and most territories went unrecorded. In spite of their limited utility in determing population levels, egg collections are valuable in demonstrating decreases in the species' historic range. Together with information from personal communications and literature sources, valid assumptions concerning the historic range and population size of the species can be made.

Data obtainable from museum skins were not utilized because the species is so highly migratory, and many individuals are still moving until at least June 4 in California (flock of 50 reported by McCaskie 1978). For this reason I excluded this potential data source. Also, any reference to the collecting location of a specimen as a potential nesting area would only be speculation.

Requests for recent information on Swainson's Hawk sightings were circulated via several journals and were sent to appropriate government offices, academic institutions, and certain members of the general public.

Field surveys were conducted by car and on foot. All observations were made with 7 x 35 binoculars, a 25x spotting scope, and the unaided eye. Areas where Swainson's Hawks nested historically or that showed good potential habitat were surveyed by driving.

RESULTS

Historical Distribution, Abundance, and Habitat Utilization

Historically, the distribution of Swainson's Hawks in California (Figure 2) was much larger than it is today. The species was known to nest throughout the State, except in the Sierra Nevada Mountains, Northern Coast Ranges (exclusive of southern end), and the Klamath Mountains. In addition, some of the interior regions of the Mojave and Colorado deserts probably never had any breeding activity due to the limited number of suitable nest trees.

While Swainson's Hawks generally nested in trees on large plains, they also utilized canyon and hill country. The apparent conditions for nesting in this terrain seemed to be adequate prey, open grasslands, and occasional trees that were suitable for nesting. Single or isolated clusters of trees in vast grasslands were used most frequently (McMillan pers. comm. 1979).

The four most frequently used species of nest trees derived from data in egg collections (Appendix A) were cottonwood (Populus sp.) 48.7 percent (N=60), oak (Quercus sp.) 20.3 percent (N=25), sycamore (Platanus racemosa) 16.3 percent (N=20), and willow (Salix sp.) 8.1 percent (N=10). Other nest trees included pine (Pinus sp.), mesquite (Prosopis glandulosa), Joshua tree (Yucca brevifolia), and locust (Robinia sp.) Since many of these trees were more prevalent in one region than in another, their importance varied regionally. Only nest sites in trees have been recorded from California.

Cottonwoods made up 70.6 percent (N=24) of 34 nest trees recorded in the Central Valley, while in the southern transverse ranges there was a relatively even division of 46 nests between cottonwoods, 41.3 percent (N=19), sycamores, 30.4 percent (N=14), and oaks 28.3 percent (N=13).

Studies involving the estimate of historical population size generally suffer from such problems as poor documentation of the species status historically and insufficient data. However, in a study such as this, without some estimate (or range) of historic population levels, the magnitudes of decline cannot be fully appraised. To arrive at an estimate I utilized the available historical data (including egg collections, personal communications, and references in the literature) on the species and its habitat preferences.

To estimate historic population levels I surveyed an area of the Klamath Basin (a study area within the Great Basin region) which appeared to represent pristine Swainson's Hawk nesting habitat. This estimate yielded a density index of 36 pairs per 100 square miles. It is felt that the habitat found currently within the Klamath Basin closely approximates that which existed historically.

The Klamath Basin was the most intensively surveyed study area in the State. Using the historical density index derived for the Klamath Basin, I calculated estimates for other regions by multiplying the Klamath Basin density by the number of square miles suitable for nesting Swainson's Hawks in each region (total = 47,600 square miles, Table 2). Calculations that involved the 36 pairs per 100 square miles figure yielded estimated maximum population sizes. Minimum population estimates were obtained by assuming a breeding density of only 25 percent (9 pairs per 100 square miles) of the Klamath Basin population. Based on my experience and observation of habitat availability and knowledge of densities of Swainson's Hawks obtained in this study and others in the literature, I assumed that a minimum Statewide density could best be expressed as 25% of the Klamath Basin density. The amount of potential nesting habitat available historically (47,600 square miles) was obtained by field surveys and examination of topographical maps and the literature. Figures derived using the above methodology yielded a range of from 4,284 pairs to 17,136 pairs (Table 2).

Table 2. Historic population estimates of Swainson's Hawks in California.

Region	Historical Range (sq. mi.)	Minimum[1] Population (9 pairs/ 100 sq. mi.)	Maximum[2] Population (36 pairs/ 100 sq. mi.)
Southern Transverse Ranges	8,800	792	3,168
Mojave Colorado Desert	3,000	270	1,080
Northern Coast Range Klamath Mountains	800	72	288
Central Coast Ranges	11,000	990	3,960
Southern Sierra Nevada White Mountains	1,200	108	432
Northern Sierra Nevada Cascades Range	800	72	288
Great Basin	3,600	324	1,296
Central Valley	18,400	1,656	6,624
Totals	47,600	4,284	17,136

[1] The figure of 9 pairs/100 sq. mi. represents 25 percent of the known maximum potential for the State and is used here as a hypothetical minimum historical breeding density.

[2] The figure of 36 pairs/100 sq. mi. was the breeding density calculated for the Klamath Basin. It is used here as a reference of the minimum potential maximum density (other regions may support higher densities, e.g., Central Valley).

Southern Transverse Ranges

Swainson's Hawks nested throughout the Southern Transverse region and were apparently quite common. Sharp (1902) reported the Swainson's Hawk as "the most abundant" of the breeding hawks in the vicinity of Escondido, San Diego County. A combined total of 62 egg sets were collected from the Southern Transverse Ranges; of these, 34 were from San Diego County. Within this region I surveyed all of Orange County and large portions of San Diego and Riverside counties between 1970 and 1978. No nesting Swainson's Hawks were observed during this time. Swainson's Hawks also were frequent nesters in the San Fernando Valley of Los Angeles County (Appendix A and B). The dominant tree species for the region were California coast live oaks (Q. agrifolia), cottonwoods, and sycamores.

Mojave/Colorado Desert

Due to limited nesting habitat, the Swainson's Hawk was restricted to the distribution of the Joshua Tree, the Mojave Yucca (Yucca schidigera) and possibly desert riparian habitats. Historical records are confined to the Victorville, Lancaster, Palmdale, and Adelanto vicinities (Appendix A and B).

Historically, the range of the Joshua Tree was larger, especially in Antelope Valley. As the tree's range decreased, Swainson's Hawk numbers probably decreased proportionately.

Central Coast Ranges

The Swainson Hawk was an abundant nesting raptor in this region. A total of 26 egg sets were collected (Appendix A), and McMillan (pers. comm. 1979) provided localities for 30 additional territories (Appendix B). The latest nestings were recorded in 1977 (Walton 1978). None were observed by Walton in 1978. Traditionally, the Swainson's Hawk used both oak trees and cottonwoods in this region. Many of the historical cottonwood riparian zones have been eliminated due to lowered water tables, limited reproduction, and grazing of livestock.

Southern Sierra Nevada/White Mountains

No records of historical nesting attempts were found for this area; however, recent scattered nesting attempts have been reported (Appendix B). Thus, it is presumed that Swainson's Hawks nested in the region historically. The Owens, Bridgeport, and Coleville Valleys probably all supported breeding Swainson's Hawks. The Owens Valley, in particular, may have supported a large population.

Central Valley

The Central Valley probably supported the highest nesting densities of Swainson's Hawks. A total of 35 egg sets were collected from throughout the Central Valley. The most frequently utilized nest trees were cottonwoods and willows. The habitat of the mid to late Nineteenth Century was quite different from that of today. According to Smith (1977) 775,000 acres of riparian habitat existed in 1850 in the Sacramento Valley alone. By 1977 this had been reduced to less than 12,000 acres (Smith 1977). Canal systems and irrigation were less extensive than they are today, and much of the country was still native vegetation or pastures. Consequently, considerably more nesting and foraging habitat was available for Swainson's Hawks.

Northern Coast Ranges/Klamath Mountains

The majority of this region was historically unproductive for nesting Swainson's Hawks owing to the extensive coniferous forests. However, the southern portion did have nesting Swainson's Hawks in the vicinity of Petaluma and Berryessa (Appendix A and B).

Northern Sierra Nevada Cascade Ranges

Only one Swainson's Hawk territory (Shasta Valley) is known from this region (Appendix B). However, other locations, such as the area near Fall River Mills, also may have supported breeding pairs.

Great Basin

Only a limited number of historical nest observations have been documented in the Great Basin Region. One was located at Honey Lake (Lassen County) and the

other in Modoc County (Appendix A and B). Historically, nesting densities in this region were probably quite high. Grinnell et. al. (1930) made several observations of Swainson's Hawks between 1918 and 1929. These birds were observed during the breeding season in the vicinities of Ravendale, Grasshopper Valley, Termo, eastern Madeline Plains, and northwest of Susanville. At some of these locations pairs were observed implying that they may have been nesting.

Reduction in Swainson's Hawk numbers in the Great Basin is due to loss of open habitat as a result of grazing and fire suppression. Where once there were large plateaus of grassland and occasional old junipers (Juniperus occidentalis) there are now juniper forests (Burkhardt and Tisdale 1976). Since Swainson's Hawks will not attempt to nest in densely wooded regions, these areas presently are unsuitable as nesting habitat.

1979 Distribution, Abundance, and Habitat Utilization

During the 1979 season, I collected data on 110 nesting territories (Table 3). The distribution of nest locations is shown on Figure 3. Of the 110 territories, 25 were reported by cooperators responding to requests for data. I verified 16 of these territories; all others were noted by reliable observers.

Territories of Swainson's Hawks were found from Chico in the Sacramento Valley to 25 miles south of Fresno in the southern part of the San Joaquin Valley. The birds were most common in the Davis, Sacramento, and Stockton areas with numbers decreasing steadily both north and south (Table 3).

Table 3. Estimates of regional breeding populations of Swainson's Hawks in California, 1979.

Region	Known Breeding Population (Pairs)	Estimated Breeding Population (Pairs)
Southern Transverse Ranges	0	0
Mojave/Colorado Desert	3	10
Northern Coast Range Klamath Mountains	0	5
Central Coast Ranges	1	10
Southern Sierra Range White Mountains	1	5
North Sierra Nevada Cascades Range	1	5
Great Basin	33	60
Central Valley (see sub-regional estimates below)		
Bakersfield-Fresno	3	20
Fresno-Merced	10	45

cont'd.

Table 3 cont'd.

Region	Known Breeding Population (Pairs)	Estimated Breeding Population (Pairs)
Merced-Stockton	10	60
Stockton-Sacramento	21	75
Sacramento-Marysville	21	55
Marysville-Chico	6	25
TOTAL	110	375

As would be expected, land ownership of nest locations was quite variable throughout the State. Approximately 64 percent (N=70) of the nest locations were on private land (Table 4); this was particularly true in the Central Valley. In the Great Basin Region about one-half (N=15) of the nests were on private property; the remainder were located on lands administered by the Bureau of Land Management and U.S. Forest Service. One territory was located on San Luis National Wildlife Refuge which is administered by the U.S. Fish and Wildlife service.

Table 4. Land ownership status and Swainson's Hawk territory locations.

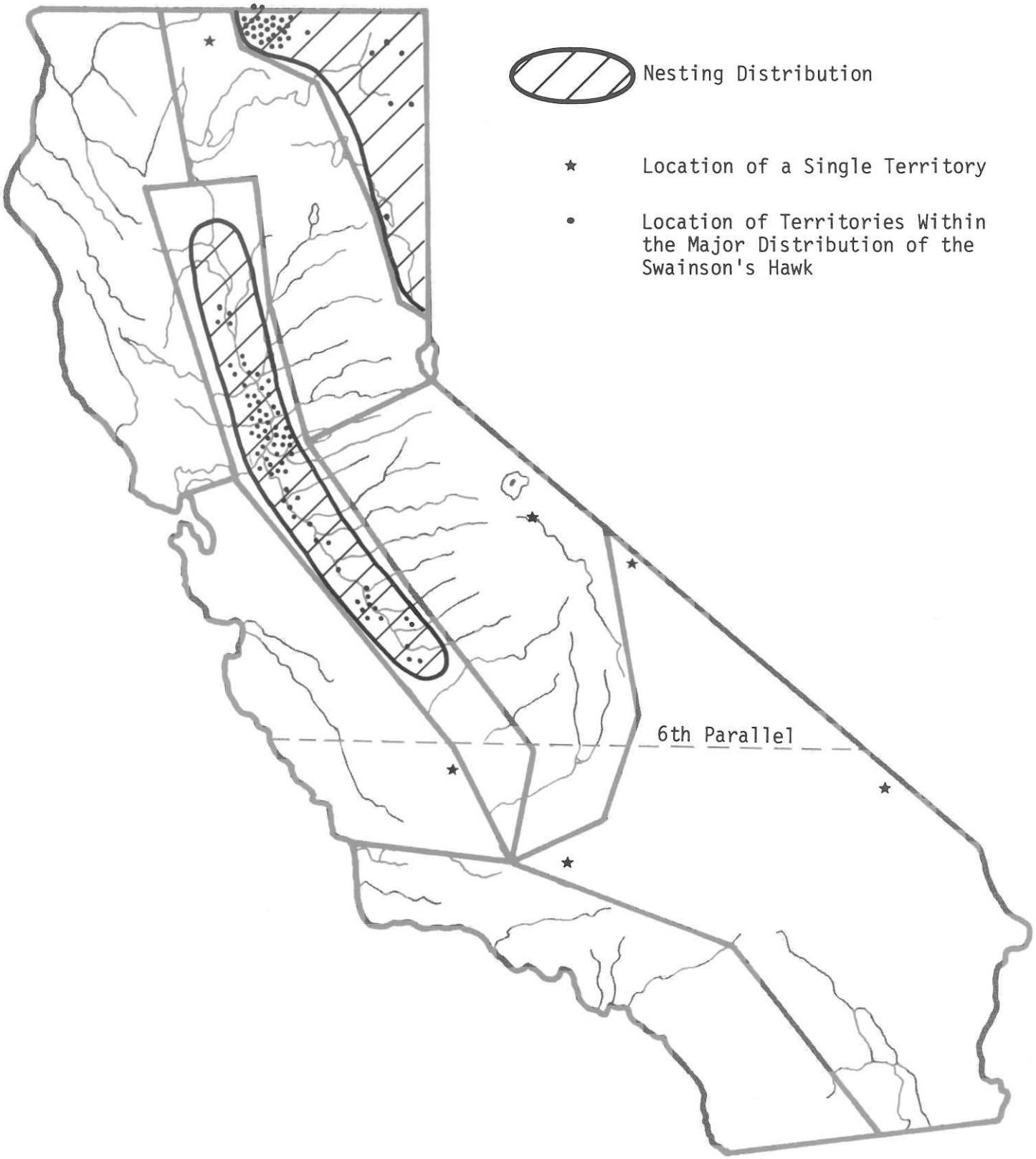
Region	Private	Bureau of Land Management	Forest Service	Fish and Wildlife Service
South Coast	0	0	0	0
Mojave Colorado Desert	3[1/]	0	0	0
Central Coast Ranges	1	0	0	0
North Coast Range Klamath Mountains	0	0	0	0
South Sierra Nevada Cascades Range	1	0	0	0
North Sierra Nevada Cascades Range	1	0	0	0
Great Basin	15	10	8	0
Central Valley	70[2/]	0	0	1

1/ Two of the three are adjacent to public land (BLM).

2/ An unknown number of the pairs found in the Central Valley may be nesting on a variety of different government lands (Flood Control Districts, State

FIGURE 3

SWAINSON'S HAWK TERRITORIES
1979 Distribution and Locations



Department of Water Resources, etc.) where nests are built in trees along levees. Status of land ownership (government or private) was not determined in such cases. However, a minimum of 30 of the 70 territories identified were on private land.

Studies of nesting densities require intensive survey work to correctly ascertain the number of breeding pairs. For most regions of the State this was not possible. However, an area in the Klamath Basin was intensively surveyed since the amount of potential habitat was restricted to approximately 50 square miles. Boundaries of this area were drawn around the limits of Swainson's Hawk habitat. The closest known pair outside of this unit was nine miles away. Density figures calculated from areas using this type of boundary yield "crude densities" (Odum and Kuenzler 1955). Crude densities are calculated from the amount of habitat utilized by the raptors, rather than calculating only the amount of land encompassed within the area of several nest sites.

Seventeen Swainson's Hawk territories were found within the 47.25 square mile Klamath Basin Area (35.7/100 sq. mi., Table 5). Nests were located for 16 of 17 pairs. In addition, one sub adult (1978 fledgling) and one adult were observed on the study area. These unpaired birds were not used in calculating nesting density. The nesting density in this portion of the Klamath Basin in California is the highest ever recorded for Swainson's Hawks (Table 5).

Unfortunately, no other comparable nesting concentrations of this size could be studied as thoroughly during this study. In Yolo County, vegetation along a stretch of slough 0.7 miles long supported three nesting pairs. However, this was not typical in the Central Valley; it simply reflects densities which could exist given adequate nesting habitat and good foraging areas. Some portions of the major rivers contained excellent nesting habitat (riparian) but there was relatively poor hunting habitat nearby, resulting in lower densities of approximately one pair per four miles of river.

The highest concentration of nesting Swainson's Hawks was found in the Klamath Basin of the Great Basin Region and the Central Valley. Thirty-three and 71 territories were found in each region, respectively (Table 3). Swainson's Hawks were scarce in all other parts of the state. Only three territories were found below the line which forms the boundaries between San Luis Obispo Monterey, Kings-Kern, and Inyo-San Bernardino Counties (Figure 3).

Regional population estimates were derived by surveying large areas of land and evaluating the potential nesting and foraging habitat. Smaller areas within each region were systematically searched for nesting pairs. Due to time constraints some areas could not be intensively searched; thus, estimates were made by extrapolating from known nesting densities in surveyed areas to unsurveyed regions with similar habitats. Approximately four times the amount of habitat actually surveyed may be available for nesting Swainson's Hawks in the Central Valley. Elsewhere in the State this figure drops to 2.5. Thus, I estimate 280 pairs (4.0 times the number actually observed) for the Central Valley and 95 pairs (2.5 times number actually observed) elsewhere. This gives a total population estimated at 375 pairs for the State.

Table 5. Comparison's of Swainson's Hawk nesting densitites in other areas.

Area	Total Pairs	Pairs per 100 square miles
Washington (Fitzner 1978) 570 sq. mile study area	17	3.0
Colorado (Olendorff 1974) 1,000 sq. mile study area	68	6.8
Wyoming (Dunkle 1977) 161 sq. mile study area	55	34.2
California - This study Klamath Basin 47.25 sq. mile study area	17	35.7

In California during 1979, Swainson's Hawks nested almost exclusively in large, sparsely vegetated flatlands characterized by valleys, plateaus, broad flood plains, and large expanses of desert. Only three territories were found in low rolling hills, and none were found nesting in the mountains, except for certain large valleys. Elevations of Swainson's Hawk nests varied from approximately sea level to about 7,100 feet.

Grasslands, sagebrush, alfalfa, and hay fields are most frequently used as hunting habitats. Single trees or riparian areas are preferred for nesting. None were found nesting in densely wooded areas unless they were adjacent to sparsely vegetated plains or certain agricultural areas.

Swainson's Hawks in the Central Valley exhibit a strong tendency (83%) toward nesting within one mile of riparian zones (Table 6). The great majority of nest trees are in valley oaks (Q. lobata) and cottonwoods (P. fremonti). Nest heights here varied from approximately 25 to 65 feet. Riparian zones with numerous large oaks and occasional cottonwoods or sycamores seemed to have the highest nesting densities. Although riparian zones were used most frequently, Swainson's Hawks seemed to occupy riparian areas adjacent to or within easy flying distance of alfalfa and hay fields. Presumably such crops as cotton, corn, and safflower, do not support available microtine rodent populations, a major food source for California Swainson's Hawks (Table 7).

In the Great Basin Region of California, 97 percent (N=29) of the nests were in junipers (Table 6). The height of these nests varied from about 8 to 20 feet. Only one pair was found nesting in close proximity to a riparian zone in the Great Basin.

Composition of the croplands adjacent to nesting areas appear to influence whether a pair of Swainson's Hawks will attempt to nest or is successful in fledging young. During this study there was a strong tendency for Swainson's Hawks in the Central Valley to nest in association with alfalfa, hay, or wheat. Nesting pairs were also commonly associated with natural and disturbed grasslands or pastures.

Table 6. Habitat utilization by Swainson's Hawks, 1979.

Region	Tree Type[1]	Dominant Habitat	Within 1 Mile of Riparian Zone
Great Basin	Juniper (29)[2] Cottonwood (1)	Agriculture (8)[3] Sage (8) Grassland (17)	Yes (1)[4] No (32)
Central Valley	Cottonwood (6) Oak (13) Willow (1) Eucalyptus (1) (Eucalyptus sp.)	Agriculture (68) Grassland (3)	Yes (59) No (12)
Mojave-Colorado Desert	Joshua Tree (2)	Joshua Tree (2)	No (2)
N. Sierra Nevada Cascade Range	Locust (1)	Agriculture (1)	No (1)

1/ Includes only those trees where the actual nest was identified.

2/ Sample size of nest trees observed.

3/ Sample size of territories observed.

4/ Sample size of nest trees observed.

Food Habits

Food habits data for the Swainson's Hawk were collected by climbing nest trees once and examining all prey remains (Table 7). Prey was identified at the nest site. During 1979, the California vole (Microtus californicus) was the most frequently observed prey species. The California vole and Belding's ground squirrel (Spermophilus beldingi), made up 66 percent of the total prey consumed. Mammals accounted for 77 percent of the prey observed. Birds and reptiles composed 18 percent and 5 percent of the prey items, respectively.

Table 7. Swainson's Hawk food habits data collected in 1979.

Great Basin	Number	Percent
California vole (Microtus californicus)	16	36.4
Belding's ground squirrel (Spermophilus beldingi)	9	20.5
Unidentified shrew	1	2.3
Unidentified mammal	2	4.5
Ring-necked Pheasant (Phasianus colchicus)	1	2.3
Western Meadowlark (Sturnella neglecta)	2	4.5
Horned Lark (Eremophila alpestris)	2	4.5
Unidentified passerine bird	1	2.3
Western whiptail (Cnemidophorus tigris)	1	2.3
Unidentified snake	1	2.3

cont'd.

Table 7 cont'd.

Central Valley	Number	Percent
California vole	4	9.1
Ring-necked Pheasant	1	2.3
Unidentified passerine bird	1	2.3
Mojave Colorado Desert		
Unidentified kangaroo rat (*Dipodomys* sp.)	2	4.5
TOTAL	44	100.1

Reproductive Success

Clutch and brood size data were collected for 31 of the 110 territories found. Most nests were examined only once; none were checked when an adult was incubating. Thus, clutch size was determined by adding the number of addled eggs to the total number of young to obtain a minimum estimate of eggs laid. For this reason data may be biased on the low side, since loss of eggs or young may have gone undetected. Of the nests examined, the average number of eggs per nest was 2.58 and ranged from 1 to 4 (Table 8). Mean brood size (young at fledging, Postupalsky 1974) was expressed as the number of young per productive nest, and was 2.27 for a sample of 26 nests. The range was 1 to 4.

Nest success was defined as the percentage of nests that fledged at least one young (large downies were assumed to have fledged). During 1979, 57 territories were observed throughout the State to determine nesting success. Of these, 89.5 percent (51) were successful. This figure is probably biased on the high side since any nests that failed early in the season were not detected.

Although no attempt was made to count all young from each territory, a total of at least 104 young were observed alive and presumably fledged. These included young observed in nest trees not climbed. They were not used in calculations of reproductive success since accurate brood size counts could only be determined by climbing. Swainson's Hawks fledged from about July 10 to August 20.

Table 8. Swainson's Hawk reproductive data, 1979.[1/]

Region	No. of nests	No. of eggs	Aver. no. eggs/nest[2/]	Min. no. of eggs laid That Hatched	No. young Observed	No. young found dead
Central Valley	8	19	2.38	17 (89%)	10	0
Mojave Desert	1	3	3.00	2 (67%)	2	0
Great Basin	22	58	2.64	53 (91%)	52	7 (13.5%)
TOTAL	31	80	2.58	72 (90%)	64	7 (10.9%)

1/ Data are included only from those nest sites that were examined by climbing the nest tree. The average number of eggs per nest is a minimum derived from the number of addled eggs added to the brood size.

2/ Because of the methods used to search for nests, this more closely approximates the average number of young per successful nest rather than number of young per territory or pair. The extent of early nest failures cannot be determined in this type of extensive study.

Banding

Sixty-four nestling Swainson Hawks were banded during this study. To date no recoveries of Swainson's Hawks banded in California from this, or any other study, have been received from outside the State. As a result, no information exists on the wintering grounds of Swainson's that breed or are fledged in California. However, it is possible that Swainson's Hawks from California are wintering in Argentina since several recoveries of Swainson's Hawks banded elsewhere in North America have been reported from that country (Bird Banding Laboratory, pers. comm. 1979).

DISCUSSION

Results of this study indicate that the Swainson's Hawk population in California has suffered a statewide decline (Table 9). Although the historical data presented do not reveal statewide historic population levels, they do show regional extirpation of nesting pairs from the Southern Transverse Ranges and the Central Coast Ranges. The number of nesting pairs in both regions has dropped catastrophically from historical times. Breeding densities in the Central Coast Ranges were once much higher (McMillan pers. comm. 1979). Walton (1978) may have recorded the last successful breeding attempts in the region.

The large numbers of nesting attempts observed this year in the Central Valley and Great Basin Regions might appear to represent population increases; in fact, they represent the substantial effort expended during this survey to locate as many pairs as possible. As discussed earlier, historic observations tended to be casual and infrequent sampling rather than intensive field surveys.

Table 9. Numbers of historical, recent, and current nestings of Swainson's Hawks in California.

Region	Historical Nestings (1880-1969)	Recent Nestings (1970-1978	Current Nestings and Territories (1979)
Southern Transverse Ranges	63	0	0
Mojave/Colorado Desert	7	7	3
Northern Coast Range Klamath Mountains	2	0	0
Central Coast Range	54	4	1
Southern Sierra Nevada White Mountains	0	8	1
Northern Sierra Nevada Cascades Range	1	0	1
Great Basin	5	10	33
Central Valley	41	13	71
Totals	173	42	110

The central theme of most historical reporters was that the Swainson's Hawk was so ubiquitous that it did not warrant special attention. Comments such as "the most abundant" by Sharp (1902) in the Southern Transverse Ranges and "common in spring, summer and fall from the foothills to the ocean" (Willett 1912) hint at extraordinarily large populations. The species was even considered common on Santa Catalina Island (Willett 1912). However, no quantitive studies involving population size or nesting densities were completed, leaving us to wonder just how many Swainson's Hawks there actually were.

Given the amount of habitat historically available in California (47,600 sq. mi., Table 2) and the current (observed) nesting density reported here (Table 5), I estimate (using the methods previously discussed) that there were between 4,284 and 17,136 breeding pairs in the State (Table 2). The actual size is probably between these two numbers, but if the smaller historic population estimate (4,212 pairs) is compared with the numbers found in 1979 (375 pairs), a 91.2 percent statewide decline is evident. Declines of this magnitude have already been documented for the Peregrine Falcon (Falco peregrinus) in California. According to Herman et al. (1970) and Thelander (1976, 1978), 90 percent of the Peregrine population that existed in California prior to 1945 had been eliminated by 1970. The decline was attributed primarily to pesticide-induced eggshell thinning and embryonic mortality. Although Henny and Kaiser (1979) have documented relatively low pesticide loads in the eggs of Swainson's Hawks nesting in Oregon and Washington, California eggs have yet to be analyzed (Risebrough and Bloom unpubl.).

One obvious reason for the decline of Swainson's Hawks might be habitat destruction, particularly in the Central Valley and Coastal Southern California. However, conditions in some regions, such as the Central Coast and portions of the Southern Transverse and Mojave and Colorado Desert Regions, suggest that other limiting factors may be involved.

A significant amount of historical documentation is available, particularly for the Central Valley, Central Coast Ranges, and Southern Transverse Ranges (Appendix A and B). Information provided by McMillan (pers. comm. 1979, Appendix B) for the Central Coast Ranges indicates that the region was commonly utilized by nesting Swainson's Hawks in the past but is vacant today without extensive habitat destruction. In addition, data acquired from historic egg collections show that the distribution of the Swainson's Hawk is significantly reduced in the above three regions, and that much of the former habitat is available, but currently unoccupied.

Studies done elsewhere in North America by Fyfe in Canada (1977), Olendorff in Colorado (1975), Fitzner in Washington (1978), and Dunkle in Wyoming (1977) have not revealed any indications of population declines. However, none of these studies specifically addressed the problem of population decline. Fyfe (1977) actually concluded that the species was stable or increasing. Only in Nevada (Oakleaf 1975, Oakleaf and Klebenow 1975, Oakleaf and Lucas 1976, Herron and Lucas 1978) has the problem of population decline been studied as a primary objective. The results of the Nevada study showed that Swainson's Hawks have been eliminated in several geographical areas of Nevada and the species was rare elsewhere.

Habitat destruction, although a serious threat to the remaining population, does not appear to be the complete answer. An alternative hypothesis for the decline is that birds are perhaps being eliminated by pesticide poisoning (Risebrough and Bloom unpubl.) or by shooting during migration or on their wintering grounds. Other non-migratory congeners, such as the Red-tailed Hawk (Buteo jamaicensis), in parts of its range, and Red-shouldered Hawk (Buteo lineatus), appear to be doing well in California (Bloom unpubl.) except for areas of complete localized habitat destruction. Because the Swainson's Hawk migrates in large flocks, many individuals with the same geographical origin may migrate together. Entire populations, then, may be subject to the same hazards, particularly if the same migratory corridors and nesting areas are used each year and cumulative pesticide affects are experienced. Pesticides are a genuine threat to Swainson's Hawks, particularly since predation on small birds in some regions of the state is higher than generally assumed (pers. obs.). Of special interest is the geographical closeness of the Nevada population with the California population and the fact that both have experienced declines. The use of differential wintering grounds and flyways by populations elsewhere may explain their stability while the California and Nevada declines are so marked.

Pesticide residues from addled Swainson's Hawk eggs collected during this study are currently being analyzed. Even with heavy pesticide use in the Central Valley, the strong dependence of the species on short-lived rodents, such as the California vole (Table 6), suggests that if pesticides are affecting the Swainson's Hawk, they are not being accumulated in California. More important potential sources of pesticide poisoning may be birds or insects (Odonata, Orthoptera) consumed during the post-fledging period or on the flyways and wintering grounds where pesticide use is still unregulated.

The shooting of hawks has been documented with some frequency. Evaluation of 90 band recoveries of Swainson's Hawks banded in the United States reveals that 53 percent (N=48) were shot. Coupled with the number of birds "found dead" the total (N=74) equals 82 percent. Correspondence with a bander in Canada concerning a Swainson's Hawk band recovery near Bogota, Columbia, of a bird banded in Canada, hints at the potential seriousness of this problem. "Said birds come around every year from the ten October...the birds are caught in the evening hours by the peasants who shoot them and use lamps... they kill as many as 70 or more" (translation).

Although it is probably not the primary cause, habitat destruction still may be a significant factor in the decline of the Swainson's Hawk in California, particularly in the Central Valley. Loss of habitat is related to the conversion of natural habitat and pastures to truck crops. In the Central Valley, loss of nesting habitat (primarily in riparian zones), is being affected by activities of the Water and Power Resources Service (formerly Bureau of Reclamation) and U.S. Army Corps of Engineers, and State, county, and local flood control agencies and districts. Channelization of rivers and creeks, coupled with bank protection measures, is eliminating the already scarce riparian habitat. Bank stabilization with its accompaning clear-cutting of riparian habitat (particularily large trees important to nesting Swainson's Hawks such as Cottonwoods) was observed on several occasions during this study on portions of the Sacramento River within 0.25 miles of nesting Swainson's Hawks. Often, miles of bank were observed to be completely denuded of riparian forest. No mitigation was apparent for this habitat loss. In fact, most banks were burned to eliminate the regrowth of vegetation.

Another form of nesting habitat loss is related to the inability of valley oak populations to perpetuate themselves in the Central Valley. Remnant individual oaks and entire stands exist in many of the farming areas and are often surrounded by planted crops. Regeneration is impossible under these circumstances and the older oaks are gradually dying out. Plowing beneath the trees ensures the removal of replacements; the remaining oak trees survive at the discretion of the landowner. Thus, economic considerations in the future can dictate whether the oak trees are cut or remain. For example, a large grove of oaks (20 or more ranging in size from 3 to 4 feet in diameter) in the middle of a corn field was replaced with a crop of tomatoes. Reasons for tree removal might include reduction of water loss, fuel for heating, or simply the removal of obstacles to field preparation.

Loss of foraging habitat in the Central Valley is of equal significance. As previously mentioned, the presence of specific crops, such as alfalfa, wheat, and hay, frequently determines whether the Swainson's Hawk will successfully nest in an area. If economic factors dictate that other crops such as cotton or orchards are more profitable, available foraging habitat will continue to decrease and Swainson's Hawks will decline proportionately.

A less pronounced type of habitat displacement is that caused by grazing and fire suppression in the Great Basin Region (Lassen, Modoc, and Siskiyou Counties). Many of the once sparsely vegetated plateaus and plains, which presumably were historically occupied by the Swainson's Hawk, are vacant today. Junipers have invaded these areas to the extent that they are now dense forests no longer suitable for nesting by Swainson's Hawks.

Management Implications

To achieve the goal of establishing a stable or increasing population, the Swainson's Hawk should be included on the California Department of Fish and Game's Rare and Endangered Species List and the Bureau of Land Management's Sensitive Species List. Acknowledging this need will help ensure that the above recommendations are considered and will maximize the protection of the existing population. Placing the Swainson's Hawk on the CDFG's Rare or Endangered Species List or the BLM's Sensitive Species List will do the following: 1) Ensure that future management will be aimed directly at stabilizing and increasing the population; 2) Impose severe penalties for shooting or harassing a Swainson's Hawk or disturbing its nest. Not listing the Swainson's Hawk as endangered or sensitive would imply that the species is doing as well as the Red-tailed Hawk or American Kestrel (Falco sparverius). The data provided in this report show the Swainson's Hawk to be drastically reduced in both numbers and former distribution. The species therefore, is a candidate for the State Endangered Species List.

Because the distribution and abundance of the Swainson's Hawks has been so drastically altered, it is important that they be monitored in the future in order to establish long-term trends. This might be accomplished by a study similar to the present one with emphasis on the Central Valley. Monitoring territories found in this study for occupancy, and increasing the accuracy of the Central Valley estimate would be primary goals. Secondary goals would include banding young to determine wintering grounds and collecting eggs for analysis of pesticide levels. To establish a population trend, these sites should be monitored yearly or every 2 years for a period of at least six years with occasional checks thereafter.

Because of the Central Valley population size and distribution, it probably functions as the nucleus of recruitment into areas historically occupied by Swainson's Hawks. Continued reduction of this population could possibly affect others throughout the State (with the possible exception of the Klamath Basin). Therefore, this population should be monitored periodically to determine statewide trends. Peripheral or remnant territories below 36° North Latitude (approx. equal to 6th parallel, Figure 3) and in Inyo and Mono counties can also serve as easily monitored indicators of trends for California and can alert biologists to the need for evaluation of the Central Valley population.

Central Valley populations can be best protected by: 1) Providing habitat compensation at a ratio greater than 1:1 to mitigate for both current and historic destruction; 2) Initiating an effort to increase public awareness (particularly of the agricultural community) of the importance of riparian zones and oak trees to nesting Swainson's Hawks (as an example, the State or Federal Governments could provide cottonwood and/or oak trees to cooperating farmers to be planted on property lines or the boundaries between crop lands); and 3) Providing incentives to farmers to encourage retention of trees and growing of crops that are beneficial to the Swainson's Hawk. These incentives might include tax breaks, or subsidies similar to those provided by the Soil Conservation Service for the continued production or expansion of alfalfa or hay crops. Obviously, this would be productive only if the alfalfa or hay crops were adjacent to suitable nesting habitat.

In some areas of the Great Basin Region, densely forested juniper woodlands

should be selectively cut to recreate original habitat. Parent trees, easily identified by their large size, together with certain trees of intermediate age, should be left standing. This would create the low density juniper grassland habitat required for nesting and foraging by Swainson's Hawks. The timber could then be used for fence posts or firewood.

Great Basin nesting habitat might also be increased by fencing certain spring developments to protect them from cattle (Olendorff and Stoddart 1974) and planting cottonwood trees. Because much of this region is public land, management costs of this type could be assumed by Federal Range Improvement Programs.

Swainson's Hawks that nest in the Mojave-Colorado Desert Region can be best managed by protecting the remaining Joshua trees, Mojave yuccas, and desert riparian habitats.

Management options for increasing or re-establishing populations of Swainson's Hawks might involve captive breeding techniques. Captive-reared progeny could be used to augment wild populations by placing eggs or young in Swainson's Hawk nests, cross-fostering Swainson's Hawk young in Red-tailed Hawk nests, or controlled-release (hacking) of captive-reared juvenile Swainson's Hawks.

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LITERATURE CITED

Brown, L., and D. Amadon. 1968. Eagles, Hawks, and Falcons of the World. McGraw-Hill, New York.

Browning, M. R. 1974. Comment on the winter distribution of the Swainson's Hawk (Buteo swainsoni) in North America. Amer. Birds 28: 865-867.

Burkhardt W. J., and E. W. Tisdale. 1976. Causes of juniper invasion in southwest Idaho. Ecology 57(3): 472-484.

Dunkle, S. W. 1977. Swainson's Hawks on the Laramie Plains, Wyoming. Auk 94: 65-71.

Fitzner, R. E. 1978. Behavioral Ecology of the Swainson's Hawk (Buteo swainsoni) in Washington. Ph. D. Thesis. Washington State University, Pullman. 194 pp.

Fyfe, R. W. 1977. Reintroducing endangered birds to the wild: a review. In: Endangered Birds: Management Techniques for Preserving Threatened Species. S.A. Temple (ed.). University of Wisconsin Press, Madison. pp. 323-329.

Grinnell, J., J. Dixon, and J. M. Linsdale. 1930. Vertebrate Natural History of Lassen Peak Region. Univ. Calif. Publ. Zool. 35: 188-189.

Henny, C. J., and T. E. Kaiser. 1979. Organochlorine and mercury residues in Swainson's Hawk eggs from the Pacific Northwest. Murrelet 60: 2-5.

Herman S. G., M. N. Kirven, and R. W. Risebrough. 1970. Peregrine Falcon decline in California. Audubon Field Notes 24(4): 609-613.

Herron, G. B., and P. B. Lucas. 1978. Population surveys, species distribution, and key habitats of selected nongame species. Nev. Dept. Fish and Game, Job Performance Rep. Proj. W-53-R, Study 1, Jobs 1 and 2.

Mallette, R. D., and R. W. Schlorff. 1978. A Plan for California raptors. Calif. Dept. Fish and Game, Sacramento, Calif. 42 pp.

McCaskie, G. 1978. Southern Pacific Coast Region. Amer. Birds 32(5): 1054.

Oakleaf, R. J. 1975. Population surveys, species distribution, and key habitats of selected nongame species. Nev. Dept. of Fish and Game, Job Performance Report, Proj. W-53-R, Study I, Jobs 1 and 2.

_____., and D. A. Klenbenow. 1975. Changes of avifauna populations of the lower Truckee River. Nev. Dept. of Fish and Game, Special Rep. Proj. W-53-R.

_____., and P. Lucas. 1976. Population surveys, species distribution, and key habitats of selected nongame species. Nev. Dept. of Fish and Game, Job Performance Report, Proj. W-53-R, Study 1, Jobs 1 and 2.

Odum. E. P., and E. P. Kuenzler. 1955. Measurement of territories and home range size in birds. Auk. 72: 128-137.

Olendorff, R. R. 1975. Population status of large raptors in northwestern Colorado, 1970-1972. In: Murphy, J. R., C. M. White, and B. E. Harrell (eds.). Population Status of Raptors. Raptor Res. Rep. No. 3: 185-205.

_____., and J. W. Stoddart, Jr. 1974. Potential for management of raptor populations in Western Grasslands. Raptor Res. Report No. 2: 47-88.

Postupalsky, S. 1974. Raptor reproductive success: some problems with methods, criteria, and terminology. Raptor Res. Report No. 2/21-31.

Sharp, C. S. 1902. Nesting of Swainson Hawk. Condor 4: 116-118.

Smith, F. 1977. Short review of the status of riparian forests in California. In: Stet, A. (ed.). Riparian forests in California: their ecology and conservation. Inst. of Ecology Publ. 15. Univ. of Calif., Davis.

Smith, N. 1973. Spectacular Buteo migration over Panama Canal Zone. Amer. Birds 27: 305.

Thelander, C. G. 1974. Nesting territory utilization by Golden Eagles (Aquila chrysaetos) in California during 1974. Calif. Dept. Fish and Game Admin. Rep. No. 74-7. Sacramento, California.

_____. 1976. Distribution and reproductive success of Peregrine Falcons in California during 1975 and 1976. Calif. Dept. Fish & Game, Wildl. Manage. Branch Admin. Rep. 76-3. 11 pp.

_____. 1978. Status of Peregrine Falcons in California - past and present. In: Proceedings of the National Audubon Society Symposium on the Current Status of Peregrine Falcon Populations in North America. National Audubon Society, Tiburon, Calif.

Walton, B. J. 1978. Nesting of Swainson's Hawk in San Luis Obispo County, California in 1977. Western Birds 9: 82.

Willett, G. 1912. Birds of the Pacific Slope of southern California. Pac. Coast Avifauna 7: 47.

Appendix A

HISTORIC NEST LOCATIONS (EGG COLLECTIONS) OF THE SWAINSON"S HAWK IN CALIFORNIA

Contra Costa County

Date	Location	Clutch Size	Tree Type	Collector	Source*
05/09/15	Bixler	3	Cottonwood	Wells	W.F.V.Z.
04/22/98	Mt. Diablo	3	White Oak	Moses	S.B.C.M.

Fresno County

Date	Location	Clutch Size	Tree Type	Collector	Source
04/27/34	Cantua Creek	2	Cottonwood	DeGroot	W.F.V.Z.
04/27/34	Cantua Creek	3	Cottonwood	DeGroot	W.F.V.Z.
04/27/34	Cantua Creek	3	Cottonwood	DeGroot	W.F.V.Z.
04/27/34	Cantua Creek	2	Cottonwood	DeGroot	W.F.V.Z.
04/27/34	Cantua Creek	3	Cottonwood	DeGroot	W.F.V.Z.
04/29/12	1 ½ mi. E. of Newhope schoolhouse	3	Willow	Tyler	W.F.V.Z.
04/10/14	Conejo	2	Poplar	Hudson	W.F.V.Z.
05/01/26	Cantua Creek District	2	Cottonwood	Tyler	W.F.V.Z.
04/30/32	Mouth of Big Panoche Creek	2	Cottonwood	Tyler	W.F.V.Z.
04/30/32	Mouth of Big Panoche Creek	2	Cottonwood	Tyler	W.F.V.Z.
05/01/26	Cantua District	3	Cottonwood	Tyler	W.F.V.Z.
04/30/25	Panoche Creek	2	Cottonwood	Tyler	W.F.V.Z.
04/17/26	Cantua Creek District	2	Cottonwood	Tyler	W.F.V.Z.
05/03/24	Cantua District	2	Cottonwood	Tyler	W.F.V.Z.

* Abbreviations for museums mentioned in the text.

Appendix A (cont'd)

HISTORIC NEST LOCATIONS (EGG COLLECTIONS) OF
THE SWAINSON'S HAWK IN CALIFORNIA

Fresno County (cont'd)

Date	Location	Clutch Size	Tree Type	Collector	Source
05/07/38	Big Panoche	2	Cottonwood	Tyler	W.F.V.Z.
04/22/24	Cantua Creek District	2	Cottonwood	Tyler	W.F.V.Z.
04/30/07	10 mi. N. of Wheatville (Newhope)	4	Cottonwood	Tyler	W.F.V.Z.
04/20/28	Cantua Creek District	2	Cottonwood	Tyler	W.F.V.Z.
04/30/13	Helms (Newhope)	2	Willow	Tyler	W.F.V.Z.
04/30/25	Cantua Creek District	2	Cottonwood	Tyler	W.F.V.Z.
05/03/24	Cantua Creek District	3	Cottonwood	Tyler	W.F.V.Z.

Kern County

Date	Location	Clutch Size	Tree Type	Collector	Source
05/04/41	Near Coalinga	2	Cottonwood	Carriger	W.F.V.Z.
05/04/41	Near Coalinga	2	Cottonwood	Carriger	W.F.V.Z.
04/10/32	E. of Lost Hills	2	Cottonwood	Marshall	W.F.V.Z.
05/03/36	Buena Vista Lake	3	Willow	Badger	W.F.V.Z.
05/04/19	Buena Vista Lake	2	Mesquite Bush	White	W.F.V.Z.
04/10/32	S. of Lost Hills	3	?	Marshall	W.F.V.Z.
04/30/35	Bakersfield	2	?	Baumgarot	W.F.V.Z.
04/29/32	Cottontail Swamp	3	Cottonwood	Marshall	S.B.M.N.H.
04/29/32	Cottontail Swamp	3	Cottonwood	Marshall	S.B.M.N.H.

Appendix A (cont'd)

HISTORIC NEST LOCATIONS (EGG COLLECTIONS) OF
THE SWAINSON'S HAWK IN CALIFORNIA

Lassen County

Date	Location	Clutch Size	Tree Type	Collector	Source
05/06/37	Honey Lake	3	Pine	Andresen	W.F.V.Z.

Los Angeles County

Date	Location	Clutch Size	Tree Type	Collector	Source
04/23/96	Soldiers Home	3	Sycamore	Chambers	W.F.V.Z.
04/20/96	Santa Monica	3	Sycamore	Chambers	W.F.V.Z.
04/24/98	Encino Ranch	3	Oak	Jay	W.F.V.Z.
05/03/96	Encino Ranch	2	Oak	Jay	W.F.V.Z.
05/?	Near Palmdale	3	?	?	W.F.V.Z.
05/19/90	Encino	2	Oak	Shields	W.F.V.Z.
05/11/96	Santa Monica	2	?	Chambers	W.F.V.Z.
05/07/93	San Fernando Valley	2	Oak	Gaylord	W.F.V.Z.
05/14/98	2 mi. W. of Newhall	3	Black Oak	Simmons	W.F.V.Z.
05/12/98	Chatsworth Park	3	Sycamore	Simmons	W.F.V.Z.
05/12/98	San Fernando	3	Sycamore	Simmons	W.F.V.Z.
05/08/98	Encino Ranch	3	Live Oak	Jay	W.F.V.Z.
04/24/98	Encino Ranch	3	Live Oak	Jay	W.F.V.Z.
04/10/80	San Gabriel	3	Oak	Ingersoll	W.F.V.Z.
05/13/99	Encino Ranch	2	Live Oak	Jay	W.F.V.Z.
04/27/04	Soldiers Home	2	Sycamore	Chambers	W.F.V.Z.
04/24/00	San Fernando Valley	2	Live Oak	Marcom	W.F.V.Z.

Appendix A (cont'd)

HISTORIC NEST LOCATIONS (EGG COLLECTIONS) OF
THE SWAINSON"S HAWK IN CALIFORNIA

Los Angeles County (con't)

Date	Location	Clutch Size	Tree Type	Collector	Source
03/15/92	Santa Monica	2	Sycamore	Howard	W.F.V.Z.
05/08/27	Near Palmdale	3	Yucca Palm	Pierce	W.F.V.Z.
06/01/96	Santa Monica	1	Sycamore	Chambers	W.F.V.Z.
03/24/95	Church Canyon	2	Sycamore	Chambers	W.F.V.Z.
04/30/99	Encino Ranch	2	Oak	Jay	W.F.V.Z.

Merced County

Date	Location	Clutch Size	Tree Type	Collector	Source
05/31/09	Merced County	1+1 yg.	Willow	Beck	C.A.S.
04/29/00	Chowchilla*	4	Willow	Mailliard	C.A.S.
04/29/00	Chowchilla*	3	Willow	Mailliard	C.A.S.
04/29/00	Chowchilla*	2	Willow	Mailliard	C.A.S.

Monterey County

Date	Location	Clutch Size	Tree Type	Collector	Source
04/06/15	6 mi. S. of Salinas	3	Sycamore	Heath	U.C.B., M.V.Z.

Riverside County

Date	Location	Clutch Size	Tree Type	Collector	Source
05/20/17	Santa Ana River Bottom, Near Corona	2	Cottonwood	H.A.E.	W.F.V.Z.
05/20/17	Santa Ana River Bottom, Near Corona	2	Cottonwood	Pierce	W.F.V.Z.

* Chowchilla is actually located in Madera County but the original data from the collector stated Merced County.

Appendix A (cont'd)

HISTORIC NEST LOCATIONS (EGG COLLECTIONS) OF
THE SWAINSON"S HAWK IN CALIFORNIA

Riverside County (cont'd)

Date	Location	Clutch Size	Tree Type	Collector	Source
04/25/15	Santa Ana River Bottom, Near Corona	4	Willow	Pierce	W.F.V.Z.
04/20/19	Near Norco	3	Cottonwood	Reis	S.B.C.M.
05/03/96	Riverside	2	Cottonwood	Heller	S.B.C.M.
05/02/48	Temecula	1	Cottonwood	Cardiff	S.B.C.M.

San Benito County

Date	Location	Clutch Size	Tree Type	Collector	Source
05/20/96	Pacines	2	White Oak	Kelly	C.A.S.
05/21/99	Pacines	2	White Oak	Mailliard	C.A.S.
05/01/03	Pacines	3	White Oak	Kelly	C.A.S.
05/08/96	Pacines	2	White Oak	Kelly	C.A.S.
05/02/17	San Juan	2	Cottonwood	Truesdale	U.C.B., M.V.Z.
04/24/99	Pacines	2	Live Oak	Mailliard	U.C.B., M.V.Z.

San Bernardino County

Date	Location	Clutch Size	Tree Type	Collector	Source
05/14/39	Near Adelanto	3	Joshua Tree	Dixon	W.F.V.Z.
05/18/46	10 mi. N. of Adelanto	2	Joshua Tree	Payton	W.F.V.Z.
05/10/30	Near Chino	2	Cottonwood	Pierce	W.F.V.Z.
05/14/16	Near Chino	2	Cottonwood	Pierce	W.F.V.Z.

Appendix A (cont'd)

HISTORIC NEST LOCATIONS (EGG COLLECTIONS) OF
THE SWAINSON"S HAWK IN CALIFORNIA

San Bernardino County (cont'd)

Date	Location	Clutch Size	Tree Type	Collector	Source
06/18/16	Near Victorville	2	Yucca Palm	Pierce	W.F.V.Z.
05/?	Mojave Desert Near Victorville	2	?	Pierce	W.F.V.Z.
04/28/00	Yucaipa	3	?	Gary	W.F.V.Z.
05/08/32	9 mi. N.E. of Victorville	2	Joshua Tree	Bradford	S.B.C.M.
05/10/20	Near Chino	3	Cottonwood	Pierce	W.F.V.Z.

San Diego County

Date	Location	Clutch Size	Tree Type	Collector	Source
04/12/08	Escondido, Dobe Canyon	2	Sycamore	Sharp	W.F.V.Z.
05/18/02	San Pasqual	2	Cottonwood	Sharp	W.F.V.Z.
04/25/08	San Pasqual	2	Sycamore	Sharp	W.F.V.Z.
04/12/08	San Pasqual	3	Sycamore	Sharp	W.F.V.Z.
05/12/01	San Pasqual	3	Cottonwood	Sharp	W.F.V.Z.
05/05/01	Bernardo (on river)	2	Cottonwood	Sharp	W.F.V.Z.
05/09/09	Bernardo	3	Cottonwood	Sharp	W.F.V.Z.
05/13/09	San Pasqual	3	Sycamore	Sharp	W.F.V.Z.
05/07/17	San Pasqual	2	?	Johnson	W.F.V.Z.
05/12/07	Bernardo	2	Cottonwood	Sharp	W.F.V.Z.
06/14/88	Nueva	2	Live Oak	Ingersoll	W.F.V.Z.
04/30/23	Jamul	3	Sycamore	Buruhaur	W.F.V.Z.

Appendix A (cont'd)

HISTORIC NEST LOCATIONS (EGG COLLECTIONS) OF
THE SWAINSON'S HAWK IN CALIFORNIA

San Diego County (cont'd)

Date	Location	Clutch Size	Tree Type	Collector	Source
04/25/20	Janacha	2	Sycamore	Ingersoll	W.F.V.Z.
04/20/33	Santa Margarita Ranch	3	Sycamore	Harrison	W.F.V.Z.
05/09/33	3 mi. N.E. of Bonsall	3	Cottonwood	Harrison	W.F.V.Z.
04/27/13	2 mi. above Bonsall	3	Sycamore	Carpenter	W.F.V.Z.
04/18/09	San Pasqual River	2	Cottonwood	Carpenter	W.F.V.Z.
04/24/04	San Pasqual River	3	Cottonwood	Carpenter	W.F.V.Z.
04/25/19	4 mi. above Bonsall	2	Cottonwood	Carpenter	W.F.V.Z.
05/10/03	San Pasqual River	2	Cottonwood	Carpenter	W.F.V.Z.
04/29/17	Sycamore Canyon, Santa Margarita Ranch	2	Sycamore	Carpenter	W.F.V.Z.
04/21/17	San Pasqual	3	Cottonwood	Carpenter	W.F.V.Z.
04/25/26	San Pasqual Valley	3	Cottonwood	Carpenter	W.F.V.Z.
05/26/07	San Pasqual River	2	Cottonwood	Carpenter	W.F.V.Z.
05/03/03	Escondido	4	Live Oak	Carpenter	W.F.V.Z.
05/02/19	Sycamore Canyon, 5 mi. N of Oceanside	3	Sycamore	Carpenter	W.F.V.Z.
05/04/02	San Pasqual	3	Cottonwood	Carpenter	W.F.V.Z.

Appendix A (cont'd)

HISTORIC NEST LOCATIONS (EGG COLLECTIONS) OF
THE SWAINSON'S HAWK IN CALIFORNIA

San Diego County (cont'd)

Date	Location	Clutch Size	Tree Type	Collector	Source
05/13/00	San Pasqual	3	Cottonwood	Carpenter	W.F.V.Z.
04/15/06	San Pasqual	2	Sycamore	Carpenter	W.F.V.Z.
05/16/09	San Pasqual River	2	Cottonwood	Carpenter	W.F.V.Z.
03/25/02	San Luis Rey	2	Cottonwood	Carpenter	W.F.V.Z.
04/27/02	San Pasqual	2	Cottonwood	Carpenter	W.F.V.Z.
04/25/20	Jamul Ranch	3	?	Sechrist	S.B.C.M.
06/01/02	Bernardo	2	Cottonwood	Sharp	U.C.B., M.V.Z.

San Joaquin County

Date	Location	Clutch Size	Tree Type	Collector	Source
04/26/24	8 mi. N.W. of Stockton, McDade field	4	White Oak	Sampson	W.F.V.Z.

San Luis Obispo County

Date	Location	Clutch Size	Tree Type	Collector	Source
05/01/30	Shandon	3	White Oak	Truesdale	W.F.V.Z.
05/02/28	San Juan	3	Cottonwood	Truesdale	W.F.V.Z.
04/28/13	Cholame	3	White Oak	Truesdale	W.F.V.Z.
05/01/24	San Juan	3	Locust Tree	Truesdale	W.F.V.Z.
04/22/?	Cholame	2	Willow	Truesdale	W.F.V.Z.
04/13/28	?	2	Cottonwood	Truesdale	W.F.V.Z.
05/03/29	San Juan	2	Willow	Truesdale	W.F.V.Z.

Appendix A (cont'd)

HISTORIC NEST LOCATIONS (EGG COLLECTIONS) OF
THE SWAINSON'S HAWK IN CALIFORNIA

San Luis Obispo County (cont'd)

Date	Location	Clutch Size	Tree Type	Collector	Source
05/14/22	San Juan	2	Cottonwood	Truesdale	W.F.V.Z.
05/03/20	San Juan	2	Cottonwood	Truesdale	W.F.V.Z.
05/09/18	San Juan	2	Cottonwood	Truesdale	C.A.S.
06/05/17	Shandon	2	Cottonwood	Truesdale	C.A.S.
05/05/15	Cholame	3	Oak	Truesdale	U.C.B., M.V.Z.

Santa Clara County

Date	Location	Clutch Size	Tree Type	Collector	Source
04/21/94	Berryessa	3	Live Oak	Beck	U.C.B., M.V.Z.

Stanislaus County

Date	Location	Clutch Size	Tree Type	Collector	Source
04/26/36	Puerto Canyon	3	Cottonwood	Sampson	W.F.V.Z.
05/08/19	1 mi. S. of LaGrange	2	Live Blue Oak	Grinnell	U.C.B., M.V.Z.

Yuba County

Date	Location	Clutch Size	Tree Type	Collector	Source
05/13/06	Sheep Dip, Near Hammonton	2	Oak	Bolander	U.C.B., M.V.Z.

Appendix B

MISCELLANEOUS DATA ON RECENT AND HISTORICAL
SWAINSON'S HAWK NEST LOCATIONS

Fresno County

Date	Location	Tree	Source
April 23, 1956	Near Fresno	?	Minturn
May 4, 1956	Near Fresno	?	Minturn

Inyo County

Date	Location	Tree	Source
1974	Near Big Pine	Cottonwood	Heindel
1975	Near Big Pine	Cottonwood	Heindel
1976	Near Big Pine	Cottonwood	Heindel
1977	Near Big Pine	Cottonwood	Heindel
1971	Owens Valley	Cottonwood	American Birds

Kern County

Date	Location	Tree	Source
1950	Temblor Range	Walnut Tree	McMillan
Used until 1965	Temblor Range	Cottonwood	McMillan
Used until 1963	6 mi. E. of Cholame	Oak	McMillan
Used until 1961	Cottonwood Canyon	Cottonwood	McMillan
Used off and on until 1959	5 mi. W. of Kecks Corner	Eucalyptus	McMillan
Historically active until 1958	Bitterwater Creek	Cottonwood	McMillan
Used off and on until 1955	Barrel Valley	Eucalyptus	McMillan
Used until 1940	Temblor Range, Gillis Canyon	Cottonwood	McMillan
Used until 1945	Temblor Range, Cormack Canyon	Eucalyptus	McMillan
Used until 1970	Cholame Creek	Cottonwood	McMillan
Last active 1975	Cholame Creek	Cottonwood	McMillan
Used off and on until 1945	McMillan Canyon	Blue Oak	McMillan
Historically active until 1925	Shandon	Cottonwood	McMillan

Kings County

Date	Location	Tree	Source
1961	Cholame Valley	Oak	McMillan

Appendix B (cont'd)

MISCELLANEOUS DATA ON RECENT AND HISTORICAL
SWAINSON'S HAWK NEST LOCATIONS

Lassen County

Date	Location	Tree	Source
1976	Near Termo	Juniper	Bloom
1977	Near Termo	Juniper	Bloom
1977	Near Milford	Locust	Bloom
1977	Near Milford	Cottonwood	Bloom
1978	Near Karlo	Juniper	Bloom
1978	Near Milford	Locust	Bloom
1978	Near Milford	Cottonwood	Bloom

Los Angeles County

Date	Location	Tree	Source
1978	Near Lancaster	Cottonwood	Garrett

Merced County

Date	Location	Tree	Source
1969	San Luis N.W.R.	?	Wilbur
1970	San Luis N.W.R.	?	Wilbur
1972	San Luis N.W.R.	?	Wilbur

Modoc County

Date	Location	Tree	Source
1977	Near Adin	Ponderosa Pine	Bloom
1978	Near Adin	Ponderosa Pine	Bloom
1978	Near Lookout	Juniper	Bloom
??	Modoc County	?	Bent
04/15/72	Near Alturas	Juniper	Beeman

Mono County

Date	Location	Tree	Source
1977	Arcularius Ranch	?	Hubbell
1978	Arcularius Ranch	?	Hubbell
05/29/70	Oasis	Cottonwood	Binford

Appendix B (cont'd)

MISCELLANEOUS DATA ON RECENT AND HISTORICAL
SWAINSON'S HAWK NEST LOCATIONS

Sacramento County

Date	Location	Tree	Source
05/??/67	Near Courtland	?	Sac. Audubon Society
05/19/62	Near Folsom	Black Oak	Beeman

San Bernardino County

Date	Location	Tree	Source
05/14/48	2 mi. N-NE of Cima	Joshua	Johnson
1978	Lanfair Valley	Joshua	Cardiff

San Joaquin County

Date	Location	Tree	Source
08/15/70	6 mi. NE of Manteca	?	Cogswell
05/22/76	Caswell State Park	?	Cogswell

San Luis Obispo County

Date	Location	Tree	Source
Used off and on until 1960	San Juan Valley	Cottonwood	McMillan
Used off and on until 1960	Holland Canyon	Cottonwood	McMillan
1930-1933	Wilkinson Canyon	Oak	McMillan
Approximately 1933	San Juan Creek	Oak	McMillan
Used at least twice until 1944	San Juan Creek	Oak	McMillan
Off and on until 1950	Temblor Range	Cottonwood	McMillan
Used until 1955	Carrizo Plains	Cottonwood	McMillan
Used off and on 20+ years	Carrizo Plains	Cottonwood	McMillan
Used many years	Carrizo Plains	Cottonwood	McMillan
1960	Cholame Valley	Blue Oak	McMillan
06/05/61	Cholame Valley	Blue Oak	McMillan
05/??/69	Cholame	Blue Oak	McMillan
1960	3 mi. N.E. of Cholame	Cottonwood	McMillan
1946 and 1947	2 mi. E. of Shandon	Eucalyptus	McMillan
Used off and on until 1940	San Juan Valley	Valley Oak	McMillan
Used off and on until 1930-1950	San Juan Valley	Blue Oak	McMillan

Appendix B (cont'd)

MISCELLANEOUS DATA ON RECENT AND HISTORICAL
SWAINSON'S HAWK NEST LOCATIONS

Santa Barbara County

Date	Location	Tree	Source
??	Santa Barbara	?	Bent

Siskiyou County

Date	Location	Tree	Source
1952	Tulelake Region	?	Steel
??	Shasta Valley	?	Bent

Sonoma County

Date	Location	Tree	Source
??	Peteluma	?	Bent

Ventura County

Date	Location	Tree	Source
??	Santa Paula	?	Bent

Yolo County

Date	Location	Tree	Source
06/11/72	Near Davis	Black Oak	Beeman
06/20/76	Near Davis	Valley Oak	Beeman
06/??/78	Near Davis	Willow	Beeman
07/??/78	Near Davis	Valley Oak	Beeman

Miscellaneous Central Valley Locations

Date	Location	Tree	Source
1976	Sacramento-Davis Area	?	American Birds
1976	Sacramento-Davis Area	?	American Birds
1976	Sacramento-Davis Area	?	American Birds
1976	Sacramento-Davis Area	?	American Birds
1976	Sacramento-Davis Area	?	American Birds
1976	Sacramento-Davis Area	?	American Birds
1975	Central Valley	?	American Birds
1975	Central Valley	?	American Birds
1975	Central Valley	?	American Birds
1975	Central Valley	?	American Birds
1975	Central Valley	?	American Birds

Appendix C

1979 SWAINSON'S HAWK TERRITORIES[1/]

Colusa County

Date	Location	Nest Tree[2/]
06/24/79	Sacramento River Near Grimes	Cottonwood
07/05/79	Sacramento River Near Sycamore	?
07/05/79	Sacramento River Near Sycamore	Valley Oak

Fresno County

Date	Location	Nest Tree
07/31/79	Near Riverdale	Valley Oak
07/31/79	Fresno Slough, 20 miles S.W. of Fresno	?
07/31/79	Near Riverdale	?
08/01/79	Mendota Pool, San Joaquin River	?
08/02/79	Firebaugh, San Joaquin River	?
08/02/79	8 mi. N. of Firebaugh, San Joaquin River	?
08/02/79	13 mi. N. of Firebaugh, San Joaquin River	?

Glenn County

Date	Location	Nest Tree
07/24/79	Near Grey Lodge State Wildlife Area	?

Kern County

Date	Location	Nest Tree
08/05/79	Near McKittrick	?

Lassen County

Date	Location	Nest Tree
05/25/79	35 mi. N.E. of Susanville	?
07/07/79	Near Milford	Juniper
07/08/79	Near Karlo	Cottonwood
07/??/79[3/]	Near Adin	Juniper

1/ Descriptions of locations are deliberately brief to reduce harrassment. Exact locations available to responsible investigators by contacting the California Department of Fish and Game, Sacramento.

2/ Includes only those trees where the actual nest was identified.

3/ Cooperator observation; complete date information not provided.

Appendix C (cont'd)

1979 SWAINSON'S HAWK TERRITORIES

Los Angeles County

Date	Location	Nest Tree
05/15/79	Antelope Valley	Joshua

Madera County

Date	Location	Nest Tree
08/01/79	Approximately 15 mi. N. of Fresno	?
08/01/79	Approximately 17 mi. N. of Fresno	?

Merced County

Date	Location	Nest Tree
08/02/79	San Joaquin River	?
08/02/79	San Joaquin River	?
08/02/79	San Joaquin River	?
08/02/79	San Luis National Wildlife Refuge	?
08/02/79	Merced River	?
08/02/79	Merced River	?
08/02/79	Merced River	?

Modoc County

Date	Location	Nest Tree
05/31/79	Near Canby	Juniper
06/05/79	Near Lookout	Juniper
07/??/79	Tablelands	?

Mono County

Date	Location	Nest Tree
06/??/79	Owens River	?
06/??/79	Near Oasis	?

Sacramento County

Date	Location	Nest Tree
06/24/79	Sacramento	Cottonwood
06/29/79	Near Clarksville	?

Appendix C (cont'd)

1979 SWAINSON'S HAWK TERRITORIES

Sacramento County (cont'd)

Date	Location	Nest Tree
06/29/79	Near Sloughhouse	Valley Oak
06/29/79	Near Sloughhouse	?
06/29/79	Near Courtland	Cottonwood
06/29/79	Near Elkgrove	?
07/03/79	Sacramento River, 5 mi. N of Sacramento	?
07/25/79	Cosumnes River, Near Walnut Grove	?
07/25/79	Near Thorton	?
07/25/79	Near Ryde	Cottonwood
07/??/79	Cosumnes River, Near Elkgrove	?

San Bernardino County

Date	Location	Nest Tree
05/03/79	Lanfair Valley	Joshua

San Joaquin County

Date	Location	Nest Tree
07/18/79	Near Stockton	Valley Oak
07/25/79	Near Stockton	?
07/25/79	Near Stockton	?
07/25/79	Near Stockton	?
07/25/79	Near Stockton	?
07/25/79	Near Stockton	?
07/27/79	4 miles N. of Tracy	?
07/27/79	2 miles N. of Tracy	?
07/27/79	San Joaquin River, Near Vernalis	?
07/27/79	San Joaquin River, Near Vernalis	?
07/27/79	San Joaquin River, Near Vernalis	?

Siskiyou County

Date	Location	Nest Tree
06/06/79	Klamath Basin	Juniper
06/06/79	Klamath Basin	Juniper
06/06/79	Klamath Basin	Juniper
06/06/79	Klamath Basin	Juniper
06/06/79	Klamath Basin	Juniper
06/06/79	Klamath Basin	Juniper
06/06/79	Klamath Basin	Juniper

Appendix C (cont'd)

1979 SWAINSON'S HAWK TERRITORIES

Siskiyou County (cont'd)

Date	Location	Nest Tree
06/06/79	Klamath Basin	Juniper
07/11/79	Klamath Basin	Juniper
07/12/79	Klamath Basin	Juniper
07/12/79	Klamath Basin	Juniper
07/12/79	Klamath Basin	Juniper
07/12/79	Klamath Basin	Juniper
07/12/79	Klamath Basin	Juniper
07/12/79	Klamath Basin	Juniper
07/12/79	Klamath Basin	Juniper
07/19/79	Klamath Basin	Juniper
07/19/79	Klamath Basin	Juniper
07/20/79	Klamath Basin	Juniper
07/20/79	Klamath Basin	Juniper
07/20/79	Klamath Basin	Juniper
07/20/79	Klamath Basin	Juniper
07/20/79	Klamath Basin	?
07/21/79	Klamath Basin	Locust

Solano County

Date	Location	Nest Tree
06/26/79	Near Davis	Valley Oak
06/26/79	Near Davis	Valley Oak
07/04/79	Near Davis	?
07/04/79	Near Davis	?

Stanislaus County

Date	Location	Nest Tree
08/02/79	San Joaquin River	?
05/19/79	Caswell State Park	?

Sutter County

Date	Location	Nest Tree
07/03/79	Near Verona	?
07/03/79	Near Kirkville	?
07/24/79	Near Kirkville	?
07/24/79	Near Cranmore	?
07/24/79	Near Cranmore	Cottonwood
07/24/79	Near Meridian	Cottonwood
07/24/79	Near Cranmore	?
08/03/79	Near Robbins	?

Appendix C (cont'd)

1979 SWAINSON'S HAWK TERRITORIES

Yolo County

Date	Location	Nest Tree
06/24/79	Near Davis	Valley Oak
06/26/79	Near Davis	Valley Oak
06/26/79	Near Knights Landing	?
06/26/79	Near Knights Landing	Valley Oak
06/26/79	Near Knights Landing	Willow
06/27/79	Near Woodland	Valley Oak
06/27/79	Near Knights Landing	Valley Oak
06/27/79	Near Knights Landing	?
06/27/79	Near Knights Landing	?
06/27/79	Near Davis	Eucalyptus
06/27/79	Near Davis	Valley Oak
06/27/79	Near Davis	Valley Oak
06/??/79	Near Zamora	?
06/??/79	Near Woodland	?
06/??79	near Dixon	?

State of Oregon*

Date	Location	Nest Tree
07/10/79	Klamath Basin	Juniper
07/10/79	Klamath Basin	Juniper
07/10/79	Klamath Basin	Juniper

* Nests found approximately 1 to 2 miles inside Oregon.