

State of California
The Resources Agency
Department of Fish and Game

FIVE-YEAR STATUS REPORT

BALD EAGLE

by

Ronald M. Jurek
Wildlife Management Division
Nongame Bird and Mammal Section

1988

Prepared pursuant to California Fish and Game Code Section 2077, relating to five-year reviews of endangered and threatened species of plants and animals.

FIVE-YEAR STATUS REPORT

- I. COMMON NAME: Bald Eagle
SCIENTIFIC NAME: Haliaeetus leucocephalus
CURRENT CLASSIFICATION: California List: Endangered
Federal List: Endangered

II. RECOMMENDED ACTION:

Retain Endangered classification on the California list; following the 1990 breeding season, consider reclassifying this species to Threatened if population survey data from 1985 to 1990 indicate that the number of breeding pairs has continued to increase.

III. SUMMARY OF REASONS FOR RECOMMENDED ACTION:

The status of the Bald Eagle has been improving in California and throughout most of the rest of the nation for more than a decade, and the number of breeding pairs in California has been slowly increasing. However, the species is still not near the recovery level established by the interagency Pacific States Bald Eagle Recovery Team. The breeding population is still restricted to only a small portion of its historical range in California, re-occupancy by new breeding pairs in former range is occurring slowly, and the reproductive rate is only slightly above that needed to sustain a stable population. Also, environmental contamination continues to depress reproductive success of part of the breeding population, causes of most known mortalities of immature and adult birds are human-related, and the majority of breeding and wintering habitats are heavily influenced by recreational and economic activities.

The Pacific Bald Eagle Recovery Plan (USFWS 1986a) contains recommended criteria for reclassification of the species on the federal list. Federal delisting (removal of the Bald Eagle from the federal listings of Endangered and Threatened species) would occur on a region-wide (seven-state) basis, but criteria for that action are not likely to be met in the next five years. However, recognizing that the breeding population in the western states has been steadily increasing, the plan recommends that an interim step of federal reclassification to Threatened status be considered separately for each of the five states (including California) where the Bald Eagle is classified as Endangered. Under this plan, the Bald Eagle population in California would be considered for federal reclassification to Threatened if the breeding population size were to continue to increase annually from 1985 to 1990.

At the time of this federal review, the State should also consider reclassifying the Bald Eagle to the Threatened category on California's list.

SUPPORTING INFORMATION

IV. NATURE AND DEGREE OF THREAT:

Habitat loss is the most significant long-term threat to this species. The existing and potential breeding areas, wintering areas, and foraging areas available to Bald Eagles in California generally are in close association with areas of human activity. Most nesting territories, feeding perches, night roosting areas, and aquatic foraging areas are located in areas subject to logging, mining, recreational use, and residential and commercial development; uncontrolled, these activities seriously disrupt eagle breeding and foraging behavior and destroy eagle habitat. Boating activities, recreation on land near shorelines, foot or vehicle trespass in eagle management areas, and other human activities in such areas frequently disturb nesting, roosting or foraging Bald Eagles, causing nesting failures or otherwise reducing the suitability of the areas as eagle habitat. Additionally, where potential nesting and perching trees and other nesting habitat features exist in suitable but unoccupied habitats, tree cutting and other land-use changes limit the ability of the species to reoccupy former range.

Necropsies performed by the National Wildlife Health Laboratory on 29 Bald Eagles from California indicate that leading causes of direct mortality include electrocution, illegal shooting, and lead poisoning, together accounting for 69% of known causes of mortality in the State from 1962 to July 1985 (USFWS 1986b). Other mortality causes included poisoning, trauma, and disease.

Organochlorine contamination has been a significant factor affecting Bald Eagle mortality and reproduction rates in California. Reproduction rates have increased since use of DDT was restricted in 1972, but there is continuing contamination from past DDT use and possibly the recent use of dicofol, which inadvertently has resulted in adding DDT-compounds to the environment (Risebrough and Jarman 1985). Recent reproductive failures in the Channel Islands Bald Eagle population probably is the result of DDT contamination. More studies are needed to determine whether other environmental contaminants are affecting breeding success of Bald Eagles in the State.

Although agricultural uses of pesticides are closely regulated to avoid accidental poisoning of eagles and other protected species, there have been instances of Bald Eagle poisonings in recent years, such as from strychnine. Another known cause of poisoning is an organophosphate insecticide, famphur, used in treating cattle for warble flies. Lead poisoning has been documented as an important source of mortality in Bald Eagles in wintering areas where eagles have fed on waterfowl shot with lead pellets. Recent federal restrictions that require use of steel shot instead of lead shot for waterfowl hunting have been implemented partially because of eagle mortality.

Shooting of Bald Eagles has long been an important source of mortality statewide. In the 1930s, more than 200 eagles, mostly Bald Eagles, were killed by shooting from aircraft in Tehama and Glenn county rangelands (Dale 1936). Illegal shooting of eagles has continued despite passage of the federal Bald Eagle Act in 1940 and other protective legislation.

The classification of the Bald Eagle as an Endangered species in California is based primarily on the status and vulnerability of the remnant breeding population. Fewer than 70 breeding pairs currently occupy territories each year, and typically about one-third of the pairs fail to raise young owing to a variety of factors. These include adverse weather conditions, nest collapse, egg breakage or death because of environmental contaminants, and human disturbances that cause adults to abandon their nest; however, most causes of nesting failures are unknown.

Other threats cause failure of breeding pairs to attempt nesting in established territories or prevent new pairs from forming territories in unoccupied habitats. These include human disturbances that discourage breeding pairs from carrying through with nesting attempts early in the breeding season; natural or human-caused degradation of breeding site characteristics or forage conditions, both in existing and in potential habitats; death of breeders or potential breeders; and, possibly, adverse behavioral and physiological effects of environmental contaminants on adults. Again, causes for failure of pairs to occupy established or potentially suitable habitats are usually unknown.

Lack of certain habitat features, such as suitable nest trees, adequate forage, or other elements in otherwise apparently suitable breeding habitat may hinder the successful establishment of new breeding territories in current and potential range (Detrich and Garcelon 1986).

Most wintering Bald Eagles depend on food resources in or near manmade or altered habitats, such as reservoirs or managed wetlands. Eagle use of these feeding areas may be threatened by the management of those areas and resources, including shoreline development, intensive recreation, fish population eradication, livestock practices, and environmental contamination.

Full protection was provided to Bald Eagles by the 1940 federal Bald Eagle Protection Act. They have been protected as endangered species under federal endangered species acts since 1967, with a revised listing in 1978. They have been similarly protected under California endangered species acts since 1971, with a revised listing in 1980.

V. HISTORICAL AND CURRENT DISTRIBUTION:

Historical

Bald Eagles formerly bred statewide except in the southern California deserts. They nested from the Modoc Plateau in the northeast corner of the State, south along the western slope of the Sierra Nevada and west through the Cascade Mountains, in the Central Valley, along the entire coastal zone, and on the Channel Islands (Detrich 1986). The historical winter range was probably statewide in areas with large concentrations of waterbirds, abundant fish, or large herds of ungulates on open range.

In the late 19th and early 20th centuries, habitat loss, mortality, and disturbances reduced Bald Eagle breeding and winter range. Historical records indicate that the last nesting occurred in the 1930s along the central California coast, along most of the north coast, and in the southern Sierra Nevada; and in the late '40s-early '50s on the Channel Islands and southern coast (Detrich 1986). By the early 1970s, the species no longer nested on the coast, nor inland from Lake Tahoe southward. From 1972 to 1982, the known breeding range was limited to just eight counties in the interior mountainous areas in the northern one-quarter of the State.

Current

The current breeding range in California is the northern one-third of the State and Santa Catalina Island off southern California. The range extends southward from the Oregon border to Lake County in the North Coast Range, to El Dorado County in the Sierra Nevada, and to southern Shasta County in the Sacramento Valley. No mainland breeding areas are known to exist within 40 km (25 mi) of the coastline.

The State's breeding population increased during the 1970s and 1980s, and by the early '80s, a gradual expansion of the breeding range had become apparent. From 1983 to 1988, new breeding territories were discovered within the 1982 range and beyond its borders, including sites in five additional counties of northern California. The most significant distributional change has been the southward extension of the range. This has occurred mainly in the Sierra Nevada, where nesting sites are now found as far south as El Dorado County, nearly 70 miles beyond the 1982 range limit. Between 1985 and 1988, four new breeding territories were discovered in the area from southern Plumas County to El Dorado County. During this period of increasing population size, most new breeding territories in the State, and all new territories in the southern expansion area of the range, have become established around reservoirs. Thus, the presence of manmade water impoundments is a major factor in the recovery of this species in California.

Efforts are under way to restore former breeding populations by translocating eaglets to artificial nest platforms in currently unoccupied habitat. Hopefully, fledged birds will return when mature and nest in currently unoccupied breeding habitat. One eagle reintroduction effort that began in 1980 has resulted in the establishment of a small population that resides year-round on Santa Catalina Island, Los Angeles County. Although the population is not yet reproducing, several breeding pairs have made nesting attempts since 1984. A second reintroduction program began in 1987 on the coast of Monterey County.

The current distribution of Bald Eagles in winter (October through early April) is essentially all of California below timberline, except most of the desert areas. In the Mojave-Colorado desert region, the only significant wintering area is the Colorado River. They are rare on the Channel Islands, except on Santa Catalina, where the introduced population is resident year-round. The occurrence of wintering Bald Eagles in the State is closely associated with the presence of lakes and reservoirs, and to a lesser extent, rivers and rangelands.

VI. HISTORICAL AND CURRENT ABUNDANCE

The size of the breeding and wintering populations in the State before European settlement is unknown. The breeding population then apparently was substantially larger than it is now, because past reports indicated that breeding pairs were common over a much larger range and in a greater variety of habitats than in recent decades. In 1935, during a period when public concerns were growing about the population decline of Bald Eagle nationally, a national group, the Emergency Conservation Committee, estimated that California had 200 breeding pairs, but that information was undocumented (Detrich 1986).

The breeding population declined from the 1800s until recent decades. In the first half of the 20th Century, construction of reservoirs eliminated some breeding habitats but also created new ones. How these changes affected numbers of Bald Eagle breeding pairs is unknown. After World War II, the eagle population declined rapidly throughout the nation because of increasing industrial growth and human population growth, combined with environmental contamination of eagle food by DDT use on crops and forests (Sprunt et al. 1973). California's breeding population possibly reached its lowest level in the late 1950s or early 1960s (Lehman 1983).

Increased protection was afforded by endangered species legislation in the late '60s and early '70s. Also, DDT use was greatly restricted throughout the nation in 1972. Because of these and other protective measures, the Bald Eagle breeding population rebounded during the '70s and '80s.

The Department began inventorying Bald Eagle breeding territories in 1970, and the first systematic survey was undertaken in 1973 (Thelander 1973). This led to establishment of a multi-agency program of annual breeding season surveys, which provided relatively thorough statewide coverage of the status of the breeding population by the late '70s.

At least 26 different breeding territories supported breeding pairs of eagles during one or more years in the period 1971-1975; this increased to 56 during 1976-1980; 72 in 1981-1985; and 83 in 1986-1988. The number of breeding pairs occupying territories each year is another measure of population trend; this is being used to track the breeding populations in the western states covered under the Pacific Bald Eagle Recovery Plan; for California, as for the other states, the breeding population is increasing (Table 1).

There are no data on the historical size or trend of the wintering population of Bald Eagles in the State. The first statewide survey effort was made in January 1979 as part of the nationwide Mid-Winter Bald Eagle Survey, sponsored by the National Wildlife Federation. The winter surveys are not comprehensive censuses, and, in California, they have not been conducted in a consistent manner each year. Weather variations also greatly affect survey results. Thus, the survey has only limited value in assessing statewide population trends. The

surveys indicate that mid-winter (mid-January) populations of Bald Eagles in California may vary greatly from year to year, some years exceeding 1,000 individuals (Detrich 1981, Detrich 1982; Jurek, Hom, and Roberts 1986; and DFG files) (Table 2). Typically half or more of the wintering Bald Eagles in California are found in the Klamath Basin, one of the largest wintering concentrations in the nation.

TABLE 1. PRODUCTIVITY OF BALD EAGLES NESTING IN CALIFORNIA, 1977-1987

Year	No. of Territories Occupied*	Percent of Occupied Terr. Failing*	Young Produced	Young per Occupied Territory*
1977	31	34	30	1.03
1978	29	59	16	0.58
1979	41	34	33	0.87
1980	44	32	51	1.16
1981	49	20	60	1.22
1982	43	32	44	1.07
1983	57	28	59	1.09
1984	64	32	69	1.13
1985	63	40	58	0.95
1986	67	30	68	1.08
1987	67	34	65	1.00
Mean		34		1.01

(* Based on those occupied territories with complete information on nesting success. A territory is "occupied" in a season if there is a known or inferred presence of a mated, territorial pair of potential breeders (Lehman 1983)).

TABLE 2. CALIFORNIA MID-WINTER BALD EAGLE POPULATION SURVEY, 1979-1988

Survey Year	No. of Wintering Bald Eagles Counted
1979	862
1980	758
1981	710
1982	787
1983-85	--- No surveys
1986	598
1987	514
1988	1344

VII. SPECIES DESCRIPTION AND BIOLOGY

The adult Bald Eagle has a dark brown body and wings, with a bright white head and tail. Sexes are identical in coloration, but females are typically larger than males. Breeding individuals in California and the southern United States tend to be smaller than those in Alaska, with size generally increasing in breeding populations from south to north. Formerly, two subspecies of Bald Eagles were named on the basis of size differences, but the demarcation line was arbitrarily established. Most ornithologists no longer accept the distinction of "Northern" and "Southern" bald eagles, nor do Federal and California endangered species listings.

Wingspans range from about 2 to 2-1/2 m (6-1/2 to 8 ft), and weights range from about 3-1/2 to 6-1/2 kg (8 to 14 lb). Plumage of fledged young is mostly brown, blotched irregularly with white or buff; as the immature birds approach maturity, at 4 or 5 years of age, the head, neck, and tail become progressively whiter over several annual molts.

In California, some pairs lay eggs in late February, rarely earlier, and most pairs lay in March or April; late nesters lay eggs in early May. One or two, and occasionally three, eggs are laid in a clutch. Incubation time is approximately 5 weeks, and nestlings remain in the nest approximately 11 weeks. On average, one-third of the breeding pairs that attempt to nest each year fail to produce offspring. Nestlings fledge primarily in June and July, rarely in late August. Typically, about half of the successful breeding pairs each year produce one fledgling, and the other half produce two; nests with three fledglings are extremely rare, occurring in the California population an average of about once each year. Annual and regional variations in the nesting cycle may be affected by latitude, elevation, climate, disturbances, individual characteristics of breeders, and other factors.

Recent telemetry studies indicate that after fledging, young eagles remain in the vicinity of the nesting territory from three to six weeks before dispersing, when many of the young birds embark on a direct flight northward to western Canada and Alaska (Jackman, Thelander, and Hunt 1987).

Pair bonds may form years before a pair of birds produces their first eggs. Breeding pairs remain together from season to season, defending the same breeding territory each year. There are now sufficient numbers of unpaired adult and subadult birds "floating" in the breeding population in much of the range to quickly replace breeding birds that die, as well as to form some new territories each year in previously unoccupied habitats.

The State's breeding population is resident year-round in most of the breeding range, where the winter climate is relatively mild. At high elevation nesting sites subject to annual freezing of water bodies, breeding pairs apparently do not remain during the entire winter. By mid-October, migratory eagles from states and provinces to the north and

northeast of California begin arriving. Eagles arrive at most wintering areas in the State by December. Winter concentration areas are typically used traditionally, but the number of birds present at any time period may vary daily, seasonally, and annually. Such shifts are influenced by local movements of the wintering individuals and groups in response to local disturbances, changing food availability, and continent-wide changes in winter distribution pattern. The winter populations remain through March or early April, well into the nesting season of resident breeders in California.

Bald Eagles are opportunistic in their foraging. Major food sources include fish, waterbirds, and mammal carrion. Eagles fly low over water to grasp live fish or floating dead fish near the water surface. The eagles also land on frozen water bodies or on shores to feed on dead or dying fish and waterbirds. They feed on the carcasses of mammals of any size, including dead cattle on rangelands, deer killed on roads, or dead ground squirrels on agricultural land. They are even known to kill meadow mice in the Klamath Basin when agricultural fields are flooded and the abundant mice are vulnerable. Bald Eagles will feed at dumps, but this has not been a common occurrence in California.

VIII. HABITAT REQUIREMENTS

Bald Eagle nesting territories in California are located primarily in ponderosa pine/mixed conifer forest. Lehman (1979) found that 71% of nest trees were ponderosa pine (*Pinus ponderosa*), 16% were sugar pine (*P. lambertiana*), 5% were incense cedar (*Calocedrus decurrens*), and 8% were other conifer species. In recent years, several new breeding pairs of Bald Eagles have nested in tree species not reported by Lehman (1979), including sycamore (*Plantanus sp.*), a Channel Islands oak (probably *Quercus tomentella*) and Catalina cherry (*Prunus ilicifolia*), and digger pine (*P. sabiniana*).

Lehman (1979) found that 81% of nest trees were over 30 m (100 ft) tall and that 95% were dominant or co-dominant trees of the surrounding timber stand. Eagle nests are large and are typically built on stout branches near the tops of trees.

The nest trees usually provide the eagles with an unobstructed view of the associated water body. Lehman (1979) found that most (73%) nests were within 0.8 km (0.5 mi) of a water body, 89% within 1.6 km (1 mi), and all within 3.2 km (2 mi). Approximately 70% of the nests were near reservoirs, 18% near natural lakes, 6% near hydroelectric developments on rivers, and 6% along free-flowing rivers.

Most Bald Eagle nesting territories are found in an elevation range of about 300 m to 1,800 m (1,000 to 6,000 ft), but nesting can be expected to occur from near sea level to over 2,100 m (7,000 ft). The highest elevation nest reported by Lehman (1979) was 2,256 m (7,400 ft).

Bald Eagles formerly nested on rocky cliffs and pinnacles along the coast (Detrich and Garcelon 1986) and on the Channel Islands (Kiff 1980), as well as in trees, including the coast redwood (*Sequoia sempervirens*).

Most nesting territories have more than one nest, and sometimes as many as five alternate nests, the pair varying the use among them from one year to another (Lehman 1983). Snags and dead-topped live trees provide important perch sites for eagles in the nesting territory. Nearby trees may provide protection to the birds in the nest by screening human disturbances and may provide protection of nest trees from wind damage.

Long-term suitability of nesting territories depends on maintenance of existing nesting trees, provision for growth of replacement nest trees, and management of other site characteristics (Lehman 1979, 1980). Timber management frequently is compatible with Bald Eagle nesting habitat, and in many cases is a necessary aspect of proper long-term maintenance of Bald Eagle breeding territories (Lehman 1980, 1983).

During the breeding season, nesting sites must be protected from human disturbance, a factor that may cause desertion or other serious disruption of breeding attempts. Disturbances could cause the failure of eggs to be laid, or the death of eggs if flushed adults leave the nest unattended too long. Breeding adults are generally most sensitive to disturbances during nest-building, courtship, egg-laying, and incubation periods (Mathisen 1968, Fraser 1981). Later in the nesting cycle, disturbances that keep adults from properly attending the nest could cause death of chicks from exposure to elements or from predation, or physical weakness of chicks from missed feedings. Disturbances of older nestlings could cause them to jump from the nest prematurely.

In wintering habitats, eagles require perch sites near feeding areas and tend to use the highest perch available. Certain favored tree limbs may be used frequently by the birds. Snags, trees, and rocks that provide a good view of the surrounding feeding area are good perches. Artificial perch structures may be important in areas where natural perches are lacking (Steenhof 1978). Human disturbance on land and on water that disrupts eagle activity reduces the suitability of these winter habitats.

Bald Eagles traditionally congregate in specific forest stands near feeding areas during the night in many parts of the State, especially in the northernmost counties. These communal night roost stands typically contain old-growth trees; snags and dead-topped trees are used in addition to large living trees with open branching structure. Stands are normally in areas isolated from human disturbance (Keister and Anthony 1983, Keister et al. 1987).

Eagles feed on a variety of prey; fish and waterbirds are generally the main food items in most of the State, but the important food sources vary greatly depending on location and season. Carrion may be quite important in some areas, especially in winter. Spawning areas of salmon and other species of fish are major sources of eagle food during certain seasons of the year in northern parts of the State. During the breeding season, most pairs depend on warm-water and nongame fish in reservoirs, lakes, and rivers, although waterbirds are well represented in the diets of many pairs.

IX. CURRENT AND RECOMMENDED MANAGEMENT

The California Bald Eagle Working Team advises agencies and researchers regarding management and research and provides guidance for eagle conservation activities. This group, established in 1974, is composed of representatives of State and federal agencies and private industry.

Most Bald Eagle nesting territories are located on lands administered by U.S. Forest Service. Also, Bureau of Land Management, Pacific Gas and Electric Company, National Park Service, and California Department of Parks and Recreation manage lands supporting eagle nest sites. Nest territory plans have been developed by agency biologists for most breeding territories in accordance with guidelines established by the working team. The plans assist agencies in identifying potential impacts of proposed activities in nesting areas, establishing protection guidelines, and implementing habitat enhancement projects.

Most other territories are on private timber lands. Protective measures are addressed routinely in Timber Harvest Plans and environmental impact reviews. Special rules to protect Bald Eagle nest sites on private timber lands were adopted by the State Board of Forestry in 1983.

For nesting sites, communal night roosts, feeding perches, foraging areas, and other important eagle habitats, protection and management guidance is also provided in Forest Service Forest Plans, in other agency planning documents, in Federal Endangered Species Act Section 7 consultations regarding federal lands or actions, and in California Endangered Species Act consultations for State-sponsored actions.

Statewide nesting surveys were initiated in the 1970s. All recently active territories are routinely surveyed annually by land and wildlife management agency biologists following standard guidelines. Usually, nest territories are checked at least three times during the nesting season to document occupancy, breeding success, and management needs. Standardized survey reports are maintained in Department files.

Annual mid-winter surveys of the State's wintering eagle population have been conducted as part of the nationwide survey effort; surveys were made in 1979-82 and 1986-88.

Numerous special studies have been made by the Department of Fish and Game, U.S. Forest Service, Bureau of Land Management, Pacific Gas and Electric Company, and other state and federal agencies to document Bald Eagle status in California and to address habitat management and protection needs. These have included banding and telemetry studies, habitat characteristics investigations, contaminant analyses, long-term ecological studies, and development of management techniques.

In California, few Bald Eagle habitat areas have been acquired by state and federal agencies. However, some Department of Fish and Game wildlife areas were acquired partially because of their significance as Bald Eagle habitat; these include Butte Valley Wildlife Area, Siskiyou County; Wilson Valley WLA, Lake County; Cinder Flat WLA, Shasta County; and Ash Creek WLA, Modoc and Lassen counties. The Three Sisters

communal roosting area in Siskiyou County was acquired by The National Wildlife Federation to protect it from development; the land was subsequently acquired by USFS. The current priority for acquisition by the Department is the Caldwell-Cougar communal roost in Siskiyou County.

Sick and injured Bald Eagles are routinely placed in authorized rehabilitation facilities, such as the one at U. C. Davis, in order to return as many birds as possible to the wild. Dead eagles are routinely autopsied by USFWS Wildlife Health Laboratory or by Department of Fish and Game to determine causes of mortality and to analyze tissues for contaminants.

Occasionally, biologists have had to shore up nests that were in danger of falling out of trees, or in some cases to replace fallen nests, in order to maintain eagle use of certain key nest trees.

California is part of the seven-state planning area covered under the Pacific Bald Eagle Recovery Plan (USFWS 1986). The plan encompasses all aspects of research, management, public education needs, and agency responsibilities. The goal of the plan is to restore the species to non-endangered, non-threatened status and establishes criteria for recovery levels. The plan recommends that reclassification of this species in California to threatened status on the federal list "could be considered...if the number of nesting pairs continues to increase annually from 1985 to 1990." However, delisting (removing the species from Threatened and Endangered classification) under the federal act would be done on a region-wide (seven-state) basis, under four criteria:

1. There should be a minimum of 800 pairs nesting in the region.
2. Pairs should be producing an annual average of at least 1.0 fledged young per pair, with an average success rate per occupied site of not less than 65% over a 5-year period.
3. Population recovery goals should be met in at least 80% of the management zones with nesting potential, as described in the plan.
4. There should be no persistent, long-term decline in any winter aggregation of more than 100 birds.

The federal delisting criteria apply to the entire seven-state region, so there are no specific criteria for each state. Additionally, the plan's goals for numbers of habitat management areas and numbers of breeding pairs are established by geographic management zones, not by state boundaries. Of the 47 management zones established in the Pacific states planning area, 15 are included totally or partially in California; 10 of these have breeding population goals for California. If all zone goals were met, California would have approximately 140 breeding pairs. However, under recovery plan guidelines, federal delisting criteria could be met for the region even if not all of California's zone goals were achieved.

Delisting criteria for Bald Eagles on the California Endangered and Threatened species list have not yet been established.

Future management and research of Bald Eagle populations in California will be directed by the recovery plan, local forest and management area plans, and the California Bald Eagle Working Team. The working team is

preparing a document to assist California agencies in their implementation of the recovery plan.

Ongoing programs will include surveying breeding and wintering populations, identifying essential habitats, restoring breeding populations in selected historical habitats, rehabilitating injured and sick eagles, monitoring mortalities and mortality factors, and investigating contaminant problems. Efforts to protect Bald Eagles and their habitats will continue through Department cooperation with other agencies and organizations in timber harvest and other environmental review procedures, including endangered species consultations, and in law enforcement actions. The Department of Fish and Game will continue to provide a representative on the working group.

Continuing efforts will be made to provide informational material to the general public, such as through publication of agency magazines and newsletters and through media coverage of research, management and rehabilitation programs. Organized boat tours in wintering areas are becoming popular and provide a valuable public education service; these will be encouraged as long as proper precautions are taken to avoid disturbance to birds.

The Channel Islands population restoration effort will continue to be monitored, and the Monterey County reintroduction program will be continued. Proposals for additional reintroduction areas on the northern Channel Islands and at Point Reyes will be reviewed by the Working Team. In the past all translocated eaglets have come from wild nests in California, Washington and British Columbia, but a captive breeding population that is now being established at the San Francisco Zoo will provide an additional source of eaglets for future reintroduction programs.

X. INFORMATION SOURCES

Dale, F. H. 1936. Eagle "control" in northern California. *The Condor* 38:208-210.

Detrich, P. J. 1981. Results of the California winter Bald Eagle survey, 1979-1981. U.S. Fish and Wildlife Service, Endangered Species Office, Sacramento, CA.

Detrich, P. J. 1982. Results of the California winter Bald Eagle survey, 1982. U.S. Fish and Wildlife Service, Endangered Species Office, Sacramento, CA.

Detrich, P. J. 1986. The status and distribution of the Bald Eagle in California. M. S. Thesis, Calif. State Univ., Chico. 101 pp.

Detrich, P. J., and D. K. Garcelon. 1986. Criteria and habitat evaluation for Bald Eagle reintroduction in coastal California. Institute for Wildlife Studies, contract final report (C-1307) to Calif. Department of Fish and Game, Sacramento. 32 pp.

- Fraser, J. 1983. Spacing of nest sites and foraging areas of Bald Eagles. Page 18 in Anthony et al. (eds.). Proc. Workshop on Habitat Management for Nesting and Roosting Bald Eagles in the Western United States. Oregon State Univ., Corvallis.
- Jackman, R., C. G. Thelander, and W. G. Hunt. 1987. Compatibility of Bald Eagles with PG and E facilities and operations. BioSystems Analysis, Inc., interim report to Pacific Gas and Electric Company. 55 pp.
- Jurek, R. M., D. M. Hom, and C. Roberts. 1986. California mid-winter Bald Eagle survey, January 1986. Calif. Department of Fish and Game, unpubl. report. 5pp.
- Keister, G. P., Jr., and R. G. Anthony. 1983. Characteristics of Bald Eagle Communal roosts in the Klamath Basin, Oregon and California. J. Wildl. Manage. 47(4):1072-1079.
- Keister, G. P., Jr., R. G. Anthony, and E. J. O'Neill. 1987. Use of Communal roosts and foraging areas by Bald Eagles wintering in the Klamath Basin. J. Wildl. Manage. 51(2):415-420.
- Kiff, L. 1980. Historical changes in resident populations of California Islands raptors. Pages 651-673 in Power, D. M. (ed.) The California Islands: Proceedings of a multidisciplinary symposium. Santa Barbara Mus. of Nat. Hist., Santa Barbara, CA.
- Lehman, R. N. 1979. A survey of selected habitat features of 95 Bald Eagle nest sites in California. Calif. Dep. Fish and Game, Wildl. Manage. Branch Admin. Rep. 79-1. 23 pp.
- Lehman, R. N., D. E. Craigie, P. L. Collins, and R. S. Griffen. 1980. An analysis of habitat requirements and site selection criteria for nesting Bald Eagles in California. Wilderness Res. Inst. report to U.S. Forest Service, San Francisco, CA.
- Lehman, R. N. 1983. Breeding status and management of Bald Eagles in California--1981. Calif. Dep. Fish and Game Wildl. Manage. Br. Admin. Rep. 83-1.
- Mathisen, J. E. 1968. Effects of human disturbance on nesting of Bald Eagles. J. Wildl. Manage. 32:1-6.
- Risebrough, R. W., and W. M. Jarman. 1985. Organochlorine contaminants in California Bald Eagles: origins and potential effects on reproduction. Biosystems Analysis, Inc. report to Pacific Gas and Electric Company, Appendix I-A of Pit 3,4, and 5 Project, Bald Eagle and Fish Study.
- Sprunt, A., IV, W. B. Robertson, Jr., S. Postupalsky, R. J. Hensel, C. E. Knoder, and F. J. Ligas. 1973. Comparative productivity of six Bald Eagle populations. Trans. N. Am. Wildl. Nat. Res. Conf. 38:96-105.

Steenhof, K. 1978. Management of wintering Bald Eagles. Contract No. 14-16-0006-77-030 for Eastern Energy and Land Use Team, U.S. Fish and Wildlife Service, Biological Services Program. 10 pp.

Thelander, C. G. 1973. Bald Eagle reproduction in California, 1972-1973. California Department of Fish and Game, Wildl. Manage. Br. Admin. Rep. No. 73-5. 17 pp.

U.S. Fish and Wildlife Service. 1986a. Pacific Bald Eagle Recovery Plan. U.S. Fish and Wildlife Service, Portland, OR. 163 pp.

U.S. Fish and Wildlife Service. 1986b. Bald Eagle mortality in California - 1963 to July 10, 1985. Attachment to letter of May 7, 1986 from Nat. Wildl. Health Laboratory to Calif. Dep. Fish and Game.

XI. REPORT PREPARED BY:

Ronald M. Jurek, Wildlife Biologist
Endangered Birds and Mammals Section
Wildlife Management Division
California Department of Fish and Game
August 5, 1988

XII. REVIEWED BY:

Terry Brumley
U.S. Forest Service
Shasta-Trinity National Forest
2400 Washington Avenue
Redding, CA 96001

Dean Carrier
U.S. Forest Service
Box 1424
Weaverville, CA 96093

Phil Detrich
ECOS, Inc.
1600 Sacramento Inn Way, Suite 236
Sacramento, CA 95815

Dave Garcelon
Institute for Wildlife Studies
P.O. Box 127
Arcata, CA 95521

David L. Harlow
Sacramento Endangered Species Office
U.S. Fish and Wildlife Service
2800 Cottage Way, Rm. E-1823
Sacramento, CA 95825

Ron Jackman
BioSystems Analysis, Inc.
P.O. Box 776
Fall River Mills, CA 96028

J. Mark Jenkins
Department of Engineering Research
Pacific Gas and Electric Company
3400 Crow Canyon Road
San Ramon, CA 94583

Lloyd Kiff
Western Foundation of Vertebrate Zoology
1100 Glendon Ave.
Los Angeles, CA 90024

Bob Lehman
Bureau of Land Management
Folsom Resource Area
63 Natoma Street
Folsom, CA 95630

Ed Littrell
California Dept. of Fish & Game
1701 Nimbus #F
Rancho Cordova, CA 95670

Richard R. Olendorff
Bureau of Land Management
California State Office
2800 Cottage Way
Sacramento, CA 95825

David O. Smith
Shasta Wildlife Unit
California Department of Fish and Game
601 Locust Street
Redding, CA 95001