

State of California
The Resources Agency
Department of Fish and Game

BALD EAGLE REPRODUCTION IN CALIFORNIA, 1972-1973 ^{1/}

by

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ABSTRACT

During 1973, 31 nesting territories of the southern bald eagle (Haliaeetus leucocephalus leucocephalus) were studied in California. Nineteen pairs were present and 24 young were produced, or 1.26 young per active nest. This level of productivity is considered satisfactory in comparison with other populations. However, of 25 territories observed in both 1972 and 1973, there was a reduction of seven active sites in 1973. Data supports the conclusion that human disturbance mainly recreational activity and logging operations at nesting sites and foraging areas are among the major causes of territory abandonment. Based on an evaluation of human disturbance present at each site, six of the sites active in 1973 are in immediate danger of abandonment. The possibility that abandoned territories will be reoccupied is poor under the existing conditions of recreational activity and logging operations.

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RECOMMENDATIONS

A survey of all known nesting locations of the bald eagle in California has resulted in the following general recommendations. It is hoped that they will be an aid in future decisions affecting the status of this endangered species.

1. All known bald eagle nests be given intensive protection from human intrusions, from March to July, by the appropriate state and federal agencies.
2. Yearly efforts be made to assess the reproductive success of all known nests and attempts be made to locate new nesting territories.
3. A study be undertaken to examine the possibility of pesticidal contamination in bald eagles nesting in California.
4. Current policies regarding commercial logging operations, particularly winter logging, be reviewed. The effects of the removal of trees in the vicinity of bald eagle nests is unknown.
5. Attempts be made to establish all bald eagle nest sites on private lands as sanctuaries and to encourage the owner's cooperation in their protection.
6. Illegal shooting of all raptors be reduced through an increased public awareness campaign.
7. The possibility of artificial manipulations of food supply to enhance prey availability, should be considered.
8. Carefully examine any efforts to alter food supply, particularly the removal of "rough" fish, from lakes and streams near existing bald eagle nest sites.

INTRODUCTION

The southern bald eagle (Haliaeetus leucocephalus leucocephalus) is a rapidly declining species in many areas of North America. These declines are considered to be caused, in part, by adverse conditions directly attributable to man's impact on the environment. Major factors causing a population decline were reproductive failure which was due primarily to pesticidal contamination, loss of suitable habitat, and human disturbance (Stickel, 1966; Hickey, 1969; Sprunt, 1973).

In California the bald eagle occurred as a resident species statewide (Bent, 1937). Nests were reported at various locations along the southern coast which indicate that a substantial southern California population existed in the past.

In the 1920's nests were reported (1) in San Diego County, (2) at Laguna Beach in Orange County, (3) on most of the Channel Islands, (4) in the Zuma Beach area of Los Angeles County, and (5) in a remote canyon in Monterey County. All of these nest sites were abandoned during this period except some on the Channel Islands. The last reported nesting attempt on the Channel Islands occurred in the late 1950's (R. Quigley, pers. comm.).

Many of the lakes and the major rivers of northern California, including those of the Sierra Nevada Mountains and the Coast Ranges, are believed to have supported bald eagles in the past. In some cases they still do. In 1963 the Continental Bald Eagle Survey, conducted by the National Audubon Society, reported only two known nest sites in California (Sprunt, 1963) with "some nesting in northern California" (Sprunt, 1969). The need for a detailed survey of the reproductive status of the bald eagle in California became evident in order that proper management programs could be implemented to protect this endangered species.

The task of describing the effects of man's manipulation of the biota of California would exceed the scope of this report. However, the reader should be aware of the elements of disturbance, directly related to the past and current status of the bald eagle, which are dealt with in this report. They include a long history of artificial manipulations of watersheds, logging operations, conversions of "natural" communities to recreational and residential areas, the increased use of off-road vehicles, and various forms of human harassment including illegal shooting and trapping.

The purpose of this study was to examine the reproductive status of all known bald eagle nest sites in California. Each site was evaluated in terms of human encroachment, mentioned above, as well as other forms of disturbance. This is a study of human disturbance as it relates to bald eagles. A more indepth study is in order to implement some of the recommendations presented and to better understand the needs of bald eagles in California.

METHODS

During the period of April to June of 1973, data were compiled concerning the status of all known nesting bald eagle locations in California. Also, an attempt was made to locate nesting territories previously unreported. Approximately 540 man-hours were spent and 7,400 miles traveled searching for nesting territories and making observations. The basis for this study was a preliminary survey of 25 territories conducted in 1972 by the California Department of Fish and Game (Grenfell, 1973). These 25 sites and 6 previously unreported territories were surveyed during 1973. Twenty-four territories were visited during the reproductive cycle when adult activity would indicate the use of a territory and again when any young produced could be accurately counted. Reproductive data for the remaining seven sites was obtained from U. S. Forest Service biologists. It was assumed that young observed in the very late stages of development were successfully fledged. The minimum number of visits per site was two; however, most active sites were checked up to six times. No attempt was made to climb nest trees to determine clutch size or hatching success.

Fledging success is presented in two categories: (1) Number of young per productive pair; and (2) Number of young for all pairs observed. In addition to production data, information was obtained regarding the area adjacent to each nest tree, land ownership, habitat conditions, food source, number of alternate nests, logging operations, and degree of human disturbance.

On the basis of production data and habitat evaluation, management recommendations were made at both the statewide and the specific nesting territory level.

For purposes of this study the following terms are defined:

Active - A nesting territory which has both adults present.

Inactive - A nesting territory with an absence of adults.

Productive - Active nest which has at least one young present.

Non-Producing - An active nest which produced no young.

Territory - Used interchangeably with "site" throughout the paper.

RESULTS

PRODUCTIVITY

Bald eagle productivity in California during 1972-1973 is shown in Table 1.

TABLE 1. Reproductive Success of Bald Eagles in California, 1972 and 1973.

	<u>1972</u>	<u>1973</u>	<u>1973</u> ^{2/}
Number of territories observed	25	25	31
Number of active territories	20 (80)	13 (52)	19 (61)
Number of territories w/young	8 (32) ^{1/}	10 (40)	15 (48)
Number of inactive territories	4 (16)	12 (48)	12 (39)
Number w/status unknown	1 (4)	0	0
Number of young produced	12	17	24
Number of young per active site	1.20 ^{1/}	1.30	1.26
Number of young per productive site	1.50	1.76	1.60

^{1/} Counts made at only 10 sites

^{2/} Includes 6 previously unreported sites

() percentage

Twenty-five territories were studied both years but productivity data were incomplete for 1972. Thus, a valid comparison of the number of young per productive territory was not possible. However, on the basis of territory activity versus territory inactivity there appears to be a significant difference temporally. During 1972, 20 (80%) of the 25 territories were active. During 1973, only 13 (52%) of the 25 territories were active (Table 2). This represents a 28% decline in the number of active territories from 1972 to 1973. None of the inactive territories for 1972 were reoccupied in 1973. This may indicate: (1) a decrease in the number of breeding adults; (2) utilization of alternate sites which are further away and not located; or (3) possible establishment of new territories by these pairs at locations not yet found. The latter possibility seems unlikely to account for such a large decrease.

There was no geographic pattern to the distribution of active and inactive territories nor was there any pattern to the distribution of productive and non-productive territories (Figure 1). Of the four active yet non-productive territories in 1973, two are semi-remote and two are in areas of intense human activity. Although the lack of production may be due to human disturbance there is no evidence to support this conclusion. The death of one adult was reported at territory 20; the area was considered to receive extreme human disturbance. Territory 20 was the only site which had a lone adult in attendance during 1973.

The distribution of young per site is shown in Table 3. During 1972 and 1973, the percentage of nests with one young was equivalent to the number of nests with two young. In a species which typically lays two eggs, as does the bald eagle, it would be difficult to assess the reproductive status of the population on the basis of the number of young per productive site. Any partial failure resulting in less young per nest with young would be difficult to recognize. Therefore, the number of young per active territory has been used to indicate the effect that non-producing pairs have on the overall production of the population.

TABLE 2. Status and Production of Bald Eagle Territories in California, 1972 and 1973.

Territory No.	Active		Inactive		No. of Young	
	1972	1973	1972	1973	1972	1973
1	X	X			2	1
2	X			X	Unk.	
3	X	X			Unk.	1
4	X	X			1	2
5	X			X	0	
6	X			X	0	
7		X				0
8		X				2
9		X				1
10	X	X			1	2
11	X	X			2	1
12			X	X		
13		X				2
14	X	X			2	2
15	X	X			Unk.	3
16	X	X			Unk.	2
17		X				1
18		X				1
19	X			X	Unk.	
20	X				Unk.	0
21			X	X		
22	X			X	1	
23	X	X			1	2
24	X	X			2	1
25			X	X		
26	X	X			Unk.	0
27	X			X	Unk.	
28			X	X		
29	X			X	Unk.	
30	X	X			Unk.	0
31*				X		
Total	20	19	4	12	12	24

*status unknown in 1972

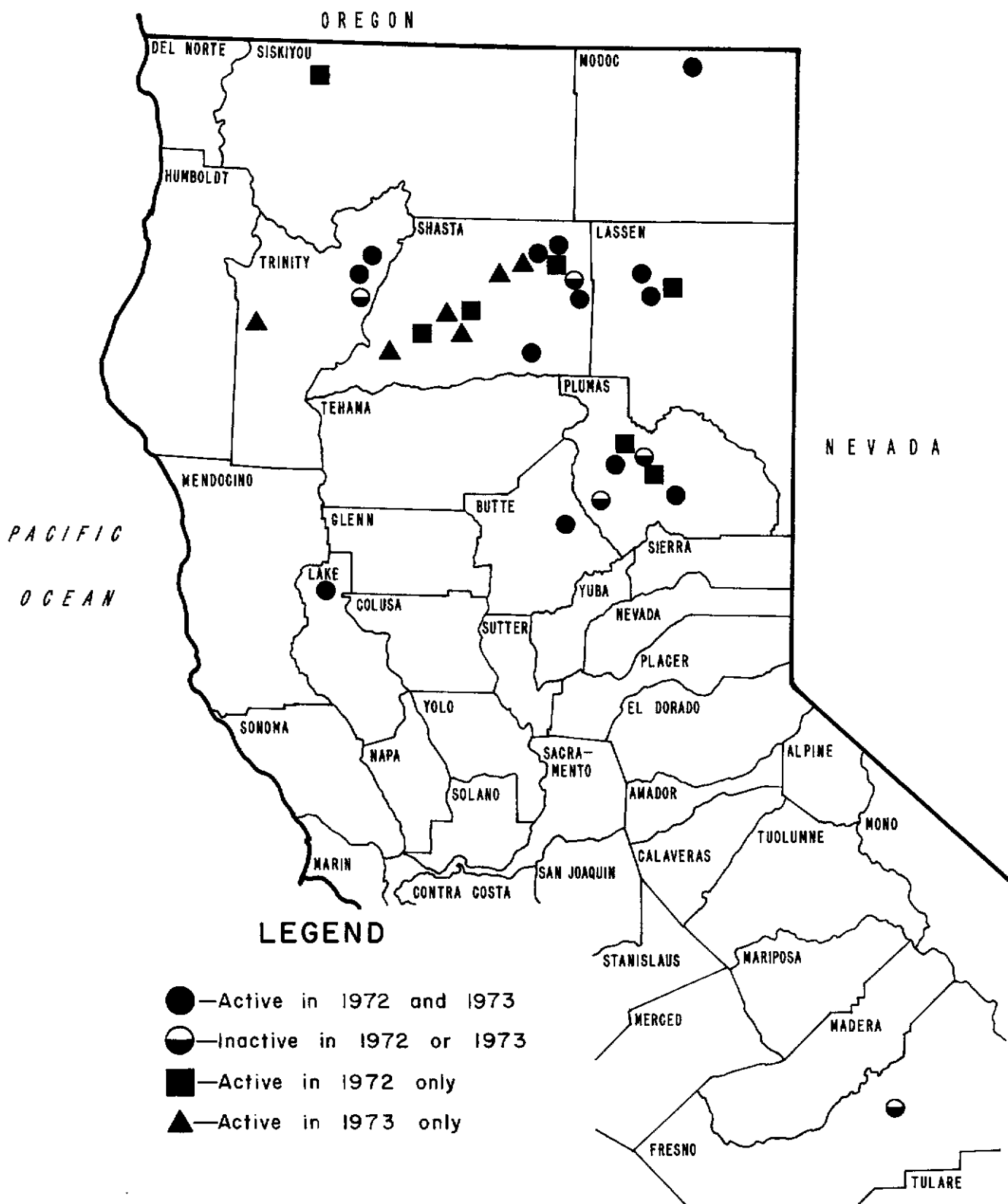


Figure 1. Distribution of bald eagle nesting territories in California, 1972 and 1973.

TABLE 3. Number of Young Bald Eagles per Active Site, 1972 and 1973.

Year	Number of Nest Sites	Young per Nest			
		0	1	2	3
1972 ^{1/}	10	2 (20)	4 (40)	4 (40)	0
1973	19	4 (21)	7 (37)	7 (37)	1 (5)

^{1/} 19 sites reported nesting activity but production recorded for only 10. () percentage

Over a period of nine consecutive years, 1963-1971, bald eagles studied in the Chippewa National Forest of Minnesota fledged an average of 1.5 young per productive site. However, the number of young per active site averaged only 0.78 for the same time period (Mathisen, 1971). In 1964, the average number of young produced on Kodiak Island, Alaska, was 1.8 young per productive site. However, the number of young per active site was only 1.0. This indicates a large percentage of unsuccessful pairs (Chrest, 1964). Table 1 shows that for 31 bald eagle territories in California, the average number of young per active site was 1.26 in 1973. This is 21% and 38% higher than the Alaska and Minnesota bald eagle productivity, respectively.

In northwestern Ontario, Canada, 105 nesting attempts at 15 active territories per year during 1966-1972 produced an average of 1.54 young per productive site but only 0.73 young per active site was produced (Grier, 1972). It is believed that this population is declining at the present time. This is based on the yearly decrease in the number of productive nests. Bald eagle productivity in California can be considered stable in comparison to the decline which followed the 1966 breeding season for Ontario's bald eagles (Table 4). This does not imply that bald eagles in California are on the threshold of a precipitous decline. It is believed that the major decline has already occurred and that it is still being manifested in the number of territories which are abandoned each year. The current population may be a remnant of a once larger population. In California there was a 28% reduction in the number of active territories in 1973 from those active during 1972. Regardless, more information is needed before a true assessment can be made regarding a decline in productivity or activity at nesting territories. It does appear that the number of pairs is decreasing. The six new territories found in 1973 are believed to be the result of intensified efforts to locate nesting territories.

PREY UTILIZATION

Prey species taken by bald eagles vary considerably between localities; from fish to rabbits and waterfowl (see Edwards, 1969; Retfalvi, 1970; and Swisher, 1964). Prey selection and utilization was not recorded

TABLE 4. Comparison of Productivity for Active Bald Eagle Nests in Northwestern Ontario from 1966-1972 and California in 1973. ^{1/}

	Ontario				California	
	1966	1967	<u>No. of Nests-15</u> 1968 1969	1970	1971	<u>No. of Nests-13</u> 1972 1973
Productive	11(73)	10(66)	10(66) 6(40)	3(20)	3(20)	7(47) 10(77)
Non-productive	4(27)	5(34)	5(34) 9(60)	12(80)	12(80)	8(53) 3(23)

^{1/} From Grier, 1972
() Percentage

quantitatively. However, some prey remains found near nests indicated that birds, mammals and fish of several species were taken. Birds were the primary food source, particularly western grebes (Aechmophorus occidentalis) and coots (Fulica americana) at territory 1 at Eagle Lake, Lassen County. This site produced one young in 1973. In contrast, at territory 15 in Shasta County, trout (Salmo sp.) were the exclusive diet. This territory is located approximately three quarters of a mile east of a California Department of Fish and Game fish hatchery. The nest was not visible to the employees or visitors to the hatchery, but the presence of the eagles and their hunting of "hand-reared" trout is tolerated. The adult bald eagles were accustomed to observing the hatchery personnel from a nearby perch as they feed the trout, bringing them to the surface for an easy kill. This was the only site which produced three young in 1973.

NEST CONSTRUCTION

Within a nesting territory, several nests may be found (Murphy, 1965). These "alternate" sites are the result of the abandonment and construction of new nests over a period of years. Factors which induce the construction of a new nest when apparently suitable nests are nearby is unknown. However, damage sustained by a nest or the nest tree dying appears to be responsible.

At 31 territories visited during 1973, 45 stick nests were found. The distribution of the number of stick nests per territory is given in Table 5.

TABLE 5. Distribution of the Number of Stick Nests at 31 Nesting Territories in California, 1973.

	None	NUMBER OF STICK NESTS				
		1	2	3	4	5
Number of Territories	5(16)	14(45)	7(23)	4(13)	0	1(3)

() percentage

These nests were in coniferous trees. All but two were situated to allow some sort of canopy of foliage to shade the nest platform. This is not believed to be a complete count. A lack of information on sites visited during 1972 limits quantification of this data.

The construction of a new stick nest was recorded at territory 24. This was the construction of a second stick nest in a tree which had been used prior to 1970.

LAND OWNERSHIP

A summary of the land ownership at 31 territories is given in Table 6.

TABLE 6. Summary of the Land Ownership of 31 Known Nesting Territories in California, 1973.

U. S. Forest Service	21 (67)
Private lumber companies	3 (9)
Other private	3 (9)
Pacific Gas and Electric	3 (9)
Bureau of Land Management	1 (3)
Unknown ^{1/}	1 (3)
	<hr/>
	32 ^{2/}

^{1/} Exact location of nest unknown.

^{2/} 1 territory is shared between BIM and a private ranch.

() percentage

Nesting territory 3 consisted of two stick nests but one was on Bureau of Land Management land and the other nest was on an adjacent private ranch. The presence of 67% of all known nests on U. S. Forest Service land is an aid in any possible management proposals.

MORTALITY

Shooting

In 1972 an adult female bald eagle was found shot near its nest which contained one young. It died shortly after the discovery and the adult male reared the young in the female's absence. In 1973, nesting territory 23 was again occupied and the new pair fledged two young. This may be an indication of the recruitment ability of the population.

Predatory Animal Trapping

The extent of bald eagles lost to fur trapping each year is unknown. One instance where an immature bald eagle was mistakenly trapped in a typical "coyote-set" was encountered during the study. It took place in an area near the northwest shore of Eagle Lake, Lassen County. The bird was subsequently released by the trapper with apparently a minimum of injury (J. Kahl, per comm.).

During the winter trapping season of 1972-1973, the U. S. Fish and Wildlife Service reported a minimum of 600 eagles lost in northeastern Nevada. Eagles were lost while trappers were trapping for bobcats with exposed bait sets. Two to 3 percent were estimated to be bald eagles. U. S. Fish and Wildlife Service Agent Downs (per. comm.) indicated 4 eagles were reported taken in California during the 1972-1973 trapping season. One was reported to be a bald eagle. Nevada has since passed a law prohibiting the placement of exposed bait within 30 feet of a trap to take furbearers and/or predators. A similar restriction was proposed for California where 88 percent of the fur catch is muskrat.

MOVEMENTS WITHIN TERRITORIES

A pattern to the movements of nesting tree utilization within territories has provided evidence of a response by bald eagles to human disturbances. This is particularly evident at territories which are located on mountainsides overlooking lakes or rivers. Typically the nest(s) is situated in a canyon with reduced exposure to wind.

In all cases, the movements have been a series of alternate nest site constructions away from the shore of the lake or river, while remaining in line with the same vantage point. Human disturbance has greatly increased in the same time period in all instances.

Whatever the requirements are for the acceptance of a particular section of shoreline or mountainside by a bald eagle, they are assumed not to be influenced by bald eagle population densities.

The movement described is up-slope, if possible, rather than to a remote section of shoreline. This indicates that the nesting site selection requirements are constant within a small area and are possibly an influence in maintaining fidelity to nesting territories. Therefore, it cannot be assumed that areas adjacent to existing bald eagle nesting territories, but appearing to be "remote", would be utilized by the resident bald eagles should the territory presently occupied be disturbed by whatever means. This is true for disturbances occurring throughout the year which might be evident upon the arrival of bald eagles at the nesting territories and during the nesting season. The areas which bald eagles have selected have apparently been chosen to meet specific requirements (Murphy, 1965). If movement is forced upon a nesting pair, it could be expected to be an up-slope movement before an entirely different section of mountainside would be used.

An example of this is the southeast shore of Eagle Lake, Lassen County. Eagle Lake has approximately 75 miles of shoreline. In 1925, Grinnell located a bald eagle nest near the shore of this location (Grinnell et al, 1930). Through the 1940's to 1960's a site was reported at what became the Eagle Nest Summer Home Tract. It was subsequently abandoned by the bald eagles. In the years following, territory 1 was reported as active on the mountainside almost directly above the home tract territory and Grinnell's 1925 territory. This vertical movement was approximately 1,000 feet in elevation since Grinnell's first report (Figure 2). At least 44 years of

bald eagle reproduction occurred in this small area with never more than one other pair being reported nesting at the lake in the same year.

During these 44 years, there had been drastic changes in the local conditions; human disturbance had increased due to recreational and commercial pressures and increased human use of the area. It is believed that this human disturbance induced the up-slope movements of nesting tree selection over the years by the bald eagles.

Vertical movement is limited by ridge elevation. An example of this is territory 29 at Lake Almanor, Plumas County, where approximately 70 miles of shoreline exist. There were no historical records of bald eagles nesting along the shoreline. One nest is known at approximately lake elevation in a level coniferous forest. It has not been used since before 1968. A continuation canopy of coniferous trees cover the mountainside to the west and overlook the lake. There is a group of four nesting trees on the hillside in a typical canyon situation approximately two-thirds up the hillside (Figure 3). One nest was used in 1971 by bald eagles, and in 1972 a new site was constructed at an elevation of 5,700 feet, approximately 400 feet higher up the canyon. It was directly above the group of four stick nests, on the ridge of the mountain. In 1972 it was active but the number of young was not reported. During the following winter the mountainside was logged to the east of the uppermost nesting tree (active 1972) but forest practices left the nest tree standing. In 1973, these nesting sites were inactive and no new nests were found during extensive searches. It appeared that the ridge elevation had limited the up-slope possibility for movement from the disturbance caused by the logging operation. This resulted in the abandonment of the territory.

Nine locations were active in 1972 and 1973 which were adjacent to lakes or rivers. Ten sites were active in 1973 which were in positions where they received a considerable amount of human intrusion. At six sites, which were both adjacent to water and subjected to excessive disturbances, the possibilities of up-slope movement are limited. These limitations are considered due either to a lack of suitable trees at higher elevations or the presence of a low hillside. I consider these six nesting territories (territory nos. 1, 9, 14, 20, 24, and 30) are likely to be abandoned. Human disturbance in the vicinity of these nests must be reduced.

At Lake Brittons, Shasta County, nesting territory 19 had a definite limit on its up-slope movement. It had been active continuously from 1961-1972 but was abandoned in 1973. Lake Britton is the location of MacArthur-Burney Memorial State Park and is a popular fishing, boating, water skiing, and camping area. It is believed that these factors were responsible for the abandonment of the nesting territory. In contrast, nesting territory 4 is on a remote reservoir in northern Modoc County, near the Oregon border, and receives almost no human visitors. It also has the potential for up-slope movement; yet, a group of three alternate nests are within 100 yards of each other and within 50 yards of the reservoir's shore. This shows a preference for shoreline nesting positions has been maintained. Lack of human disturbance has apparently allowed this to continue. This site produced one young in 1972 and two young in 1973.

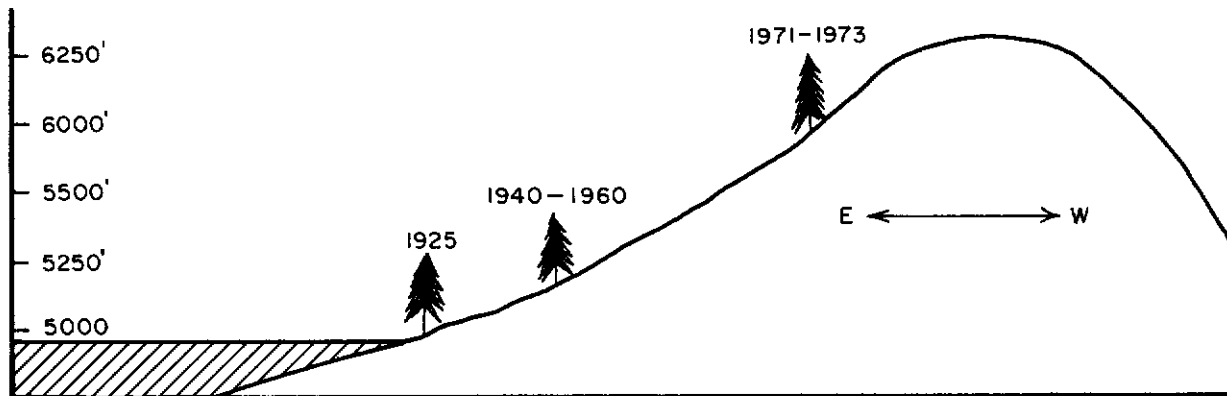


Figure 2. Diagrammatic representation of the vertical trend in nesting site relocation over long periods of time at Eagle Lake, Lassen County.

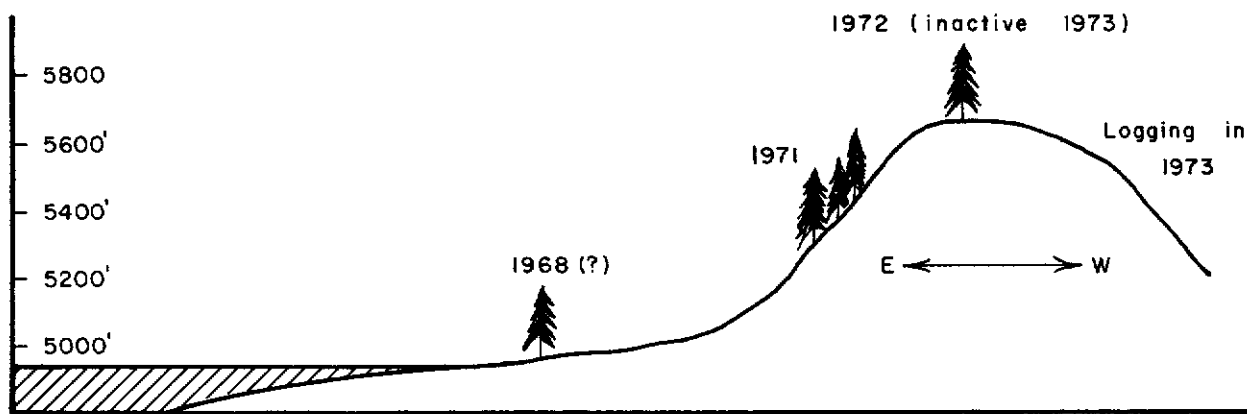


Figure 3. Diagrammatic representation of the vertical trend in nesting site relocation over long periods of time at Lake Almanor, Plumas County.

There is a lack of lateral movement at bald eagle nesting territories which are exposed to extreme human disturbance. Instead, movements have been up-slope within the immediate area. If up-slope movement is not possible, due to some limitation, the abandonment of a nesting territory may result. This should become a serious consideration in the management and protection of bald eagle nesting territories and should be dealt with cautiously in any future decision making regarding such disturbances as logging operations, road construction, and campsite regulations.

HUMAN DISTURBANCE

An attempt was made to categorize nest site selection into gross requirements and specific or immediate factors for the bald eagles of Yellowstone National Park (Murphy 1965). Gross requirements considered essential to territory selection were: 1) location adjacent to large lakes or major streams; 2) presence of dependable and readily available food sources; and 3) freedom from human disturbance. Murphy believed that the degree of tolerance to human disturbance varied with individual pairs and this generalization was supported substantially.

I also found this true with bald eagles in California. Movements within various nesting territories were shown to relate with the amount of human activity near a nesting site. There were several examples of territory abandonment in areas where eagles had a long history of activity. Not until the present levels of human disturbances were reached did abandonment occur. Pine Flat Reservoir, Fresno County, is another example similar to Lake Britton, Shasta County. This territory, approximately 30 miles from Fresno, is in a major recreational area and is utilized by large numbers of boaters, water skiers, fishermen, off-road vehicles, and campers throughout the year. This territory was not active in either 1972 or 1973 but reportedly produced young in 1970. These factors may have been responsible for the abandonment of this nesting territory.

The abandonment of two territories, 27 and 29, is directly attributable to logging operations conducted in the winter of 1972-1973. No alternate nests were found at either although an extensive search was conducted in 1973. Condition of the areas surrounding both nesting territories was drastically altered. This was evidenced by extensive logging and soil disruption. This alteration contributed to the rejection of the territory by the returning adult bald eagles.

Territory requirements of the bald eagle vary between adults. Adults return to the same territory each year. Specific conditions must be present to prompt selection of a site. However, the criteria of the site selection has not been well defined.

In Plumas County, nesting territory 24, the U. S. Forest Service has stipulated in logging contracts that logging operations will be conducted only from September 15 to November 15 in areas adjacent to the nesting territory. This was effective for this pair of bald eagles. This does not mean, however, that this measure will be adequate for all future considerations. As long as logging operations are conducted within the vicinity of a nesting territory, "disapproval" of this territory by the resident bald eagles is likely, and the ultimate abandonment of the territory follows. Therefore, the risk of losing more nesting bald eagles is present. Logging operations and recreational utilization must be limited or prevented in areas of nesting bald eagles.

CONCLUSIONS

Human disturbances have interfered with the reproductive behavior, particularly nesting territory selection and occupancy, of the bald eagle in California. This issue is complex. Problems such as land use policies, recreational demands, illegal shooting, and excessive human intrusion at nesting territories, are all involved. When combined they constitute a major threat to the remaining and already endangered species.

Bald eagle productivity appears satisfactory when compared to other populations in North America. However, there appears to be a decreasing number of pairs present at historical territories. At the present time a reduction in the number of pairs appears to be related to human disturbance. As long as the present level of recreational and economic uses are placed on our lakes and major rivers, overt competition with the bald eagle exists. The outcome of this competition will be the elimination of nesting bald eagles in California within the near future unless very careful and, in some cases, major economic and personal sacrifices are made.

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