

State of California
THE RESOURCES AGENCY
Department of Fish and Game

GREAT GRAY OWL SURVEY, 1984^{1/}

by Jon Winter

ABSTRACT

During the 1984 breeding season 19 meadow systems in 9 counties were surveyed for Great Gray Owls. Owls were found at seven areas, all in the Yosemite area; reproduction occurred at four of these sites. Owls were not found at two areas where they were found in 1981. Thirty-eight verified sight records have been received in the past five years, but breeding wasn't documented at any additional sites. A revised estimate of the state's population is about 60 individuals. Recently, breeding has occurred only in 1981 and 1984, during of years when both the microtine and pocket gopher prey was most abundant.

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RECOMMENDATIONS

1. Organize and implement a cooperative recovery program between responsible state and federal agencies for this species in California.
2. Continue basic population monitoring, prey evaluation and nesting success studies.
3. Expand the artificial nest program begun on the Stanislaus National Forest.
4. Initiate a long-term prey monitoring study in both grazed and ungrazed Great Gray Owl foraging habitats.

INTRODUCTION

During the 1984 breeding season, a survey was made of areas known to have been recently occupied by Great Gray Owls (*Strix nebulosa*). Additionally, a number of areas were checked where either there was potentially suitable habitat or where possible sightings of Great Gray Owls had been made. The following report updates the current status and distribution of Great Gray Owls in California. The only previous general survey of this species was completed in 1979 (Winter 1980) and resulted in the Great Gray Owl being declared "endangered" by the California Fish and Game Commission in June, 1980.

Significant new distributional data has accumulated since the initial survey. The purpose of the work reported here was to: 1) re-survey areas where Great Gray Owls are known to breed or have bred, 2) determine reproductive success and, if possible, locate nests, 3) survey areas that have come to the attention of the author since 1979, 4) reassess the original population estimate for California (Winter 1980), 5) summarize reproductive success in California since 1979, and 6) re-evaluate the criteria used to determine the current status of this species in California.

METHODS

Methods used to conduct the field surveys are described in Winter (1980). A Marantz PMD 220, seven watt tape recorder was used for most of the surveys, however, on several occasions a car stereo was used. This unit was capable of reproducing vocalizations that could be heard at a distance of 500 meters or more. When working from roads the use of a car stereo was felt to be justified because of the increased area of coverage that the additional volume could facilitate.

During daylight hours, the edges of the meadows to be surveyed were checked for signs of Great Gray Owls, such as pellets, molted feathers and fecal spots (see Winter 1982a) and a subjective assessment of the habitat was made.

RESULTS

Field surveys were started on 27 January and completed on 12 October 1984 in 19 different meadow systems, in 9 different counties (Table 1), that have either historical breeding records, specimen records, reliable sight records or were optimum habitat. Great Gray Owls were found at seven meadow areas (Table 2), of which one area, Ostrander Lake Trail Head, was a new location record. Reproduction was noted at four of the seven sites, Ostrander Lake Trail Head, McGurk Meadow, Summit Meadow and Ackerson Meadows; this was the first verified breeding record for the first three of these areas. In all cases of breeding two immature owls were observed. One nest was located at Crane Flat but was abandoned before any of the eggs hatched.

Since 1979, an additional 45 sight records have been received and verified (Table 3). Most (31) of these sightings were made in Yosemite N.P. and most (30) were from sites from which Great Gray Owls had been reported in the past

(Winter 1980). Also since 1979, eight sightings, from six counties, which haven't been confirmed, have been received (Table 4). Records prior to 1979 can be found in Winter (1980).

The accumulated data shows that Great Gray Owls have been verified from nine sites during the breeding season in the last seven years (Table 5); this has represented as many as 13 pairs. Breeding has been known to occur at only five of these sites, and only during the 1981 breeding seasons.

An assessment of the population dynamics of the principal prey of Great Gray Owls at Ackerson Meadows since 1981 was made (Figure 1). The relative abundance of both voles (*Microtus*) and pocket gophers (*Thomomys*) was high in 1981 and 1984; the years in which breeding of Great Gray Owls has been noted.

DISCUSSION

The results of the 1984 Great Gray Owl survey were quite similar to the 1979 study (Winter 1980). No birds were found outside of the greater Yosemite area in either study in spite of the improved knowledge and experience of the author in locating the owls. This fact suggests that, although there are Great Gray Owls outside the Yosemite area as the records indicate, they are very thinly distributed and difficult to find. The greater Yosemite area remains the stronghold of this species in California.

In the 1979 study the original estimate of the Yosemite population was placed at about 14 birds. A more intensive survey of the greater Peregrine Meadow area of Yosemite revealed that there are probably at least 5 pairs of owls there. Therefore, my original estimate of the Yosemite population was probably low and a more realistic estimate would be 20 to 24 birds for the park. Using the extrapolation method by which I assessed the state population in 1979 at about 50 birds (Winter 1980), and taking into account the revised estimate of Great Gray Owl density in Yosemite, a current estimate of the state population would be 60 to 70 birds. Judging by my lack of success in finding Great Gray Owls outside Yosemite, this estimate may be high. Regardless of the revised estimate, this owl remains one of California's rarest species and it should continue to be listed as endangered. If one were to assume that survivorship and mortality are approximately equal since 1978, and if one were to count only birds observed or heard in California since then, there are only about 40 known birds in the state. Without a more precise knowledge of survivorship and mortality in this species, it would be difficult to make a more refined estimate of the current population.

The breeding activity of Great Gray Owls inhabiting the greater Yosemite area, particularly at Ackerson Meadows, has been closely monitored since 1979. Since that time generalized breeding has taken place only in 1981 and 1984. The owls appear to be breeding very irregularly, perhaps only every 3 to 4 years. Such low fecundity is undoubtedly effecting an already small population and if the species were not long-lived, K-adapted, the owls would have long since disappeared from the forests of California. It is not known

how long Great Gray Owls live in the wild, but an estimate of survivorship based on body weight (Calder 1984) would be about 10 years with a maximum longevity of 23 years (average of both sexes).

The unresolved question is why are Great Gray Owls breeding so irregularly in California? From observations of fledged young in California, it is likely that the maximum clutch size is two eggs. By contrast, the average clutch size of 241 nests in Europe was 4.4 and in a year of poor vole abundance the average clutch was 3.3 in Finland (Mikkola 1983). In California the owls apparently do not breed when prey are not abundant. The California Great Gray Owls are the most southerly distributed population in the world, and are probably differentially adapted.

I have maintained that the breeding success of this owl is tied to the cycles of the Microtine prey base which forms a major part of the owls' diet (Winter 1982a). There was a noticeable shift in prey emphasis from pocket gophers (Thomomys bottae) to voles (Microtus montanus) from 1980 to 1981 at Ackerson Meadows (Winter 1982a) when the vole populations began to build late in 1980. Although pocket gophers form a major part of the Great Gray Owl diet in California (Winter 1982a), I don't think that they can be caught in sufficient numbers to allow breeding to take place; they are basically a maintenance prey item. In 1981 three pairs of owls bred or attempted to breed at Ackerson Meadow after the vole population had increased. It wasn't until 1984 that I again found evidence of breeding and then only one pair bred. When relative prey abundances are compared (for methods see Winter 1982a) an interesting, but deceptive, pattern emerges. Prey abundance of both voles and pocket gophers didn't reach 1981 levels until 1984, nor did the owls breed at Ackerson Meadows except during those two years. If 1981 is used as a base year, pocket gopher abundance in 1984 was not significantly different from the levels recorded in 1981 (Mann-Whitney Test, $z=.924$, $P>0.05$); but, vole abundance was significantly less in 1984 than in 1981 at Ackerson Meadows (Mann-Whitney Test, $z=2.00$, $P<0.05$). The area where the Great Gray Owl pair that bred in 1984 was in the NE part of Stone Meadow (see map, Winter 1982a). This part of the meadow has a significant slope providing good drainage. The prey transects run at Ackerson Meadows since 1981 are 300 foot (91 m) segments, and one of the segments sampled this part of Stone Meadow. When the vole abundance for 1981 on this transect is compared to the same transect run in 1984 there was no significant difference in prey abundance (Mann-Whitney Test, $U=22$, $P>0.05$). My observations of the 1984 breeding pair of Great Gray Owls indicated that they spent a good deal of time hunting this small section of Stone Meadow. Other areas of Ackerson Meadows that had less slope did not have a vole abundance comparable to that of 1981 and accordingly, no other Great Gray Owls bred in the summer of 1984 despite the fact that pocket gopher abundance that was similar to that found in 1981.

A possible explanation may lie in the rainfall patterns. The last breeding year, 1981, was preceded by a drought in 1980. With winters of 1982 and 1983 being the wettest on record in the Sierra Nevada and rainfall at Ackerson Meadows 20 to 25 inches (50-64 cm) above normal, the meadows never really dried out. Since most of the precipitation at Ackerson Meadows falls as rain rather than snow, the vole population may have experienced excessive mortality from the flooding of their burrows. At higher elevations such mortality may

have been considerably less because the precipitation falls mainly as snow and there is a fairly even melt-off in spring. If the population level from which the voles started to build at Ackerson Meadows in 1984 was already low from heavy winter mortality, such a population, even under good recruitment conditions, might reach only average levels. The slope in the NE part of Stone Meadow allowed the precipitation to drain more efficiently and this may have lowered the vole mortality in that small area during the winters of 1982 and 1983. Thus, this micro-population may have started to build in 1984 from a much higher level than in surrounding populations. This could account for the difference in the vole abundance found in the NE part of Stone Meadow when compared to the surrounding meadows where the slope was noticeably less steep, and may explain why the owls bred and hunted in only this territory in 1984.

The alternative hypothesis is that there is a general synchrony in the cycles of vole and pocket gopher populations, and the owls will not breed until the levels of both populations are sufficiently high to support the breeding effort. Prey data from Ackerson Meadows show that this synchrony exists (Figure 1) but the span of time over which these data were collected is too short to reveal if this pattern is real or coincidental.

Low prey diversity may be a major limiting factor affecting Great Gray Owl fecundity at more southerly latitudes. Studies in the Old World (Mikkola 1983) have shown that the prey base of the Great Gray Owl is highly specialized. A prey sample taken in Fenno-Scandia between 1955 and 1974 of 5,177 prey items showed that 98.2% of the food was mammals, of which over 93% consisted of 9 species of Microtines. The Fenno-Scandia sample shows that the prey diversity of the microtines is much greater at higher latitudes than in California. The cyclic nature of Microtine populations tends to be synchronous between species over rather large areas (Krebs and Meyers 1974). In any given area of Fenno-Scandia where Great Gray Owls breed at least 4 to 6 species of Microtines are available as prey. By contrast, in California only one species, possibly two, is present in any of the breeding areas. The presence of greater prey diversity that tends to be synchronous would provide Great Gray Owls breeding at higher latitudes with a greater abundance of optimum prey items critical to successful reproduction than an owl breeding at the more southerly latitudes of California. In Fenno-Scandia, even in a poor vole year, prey availability is usually great enough to provide enough food for a few pairs of owls to breed. My observations indicate that Great Gray Owls in California do not breed in a poor vole year. The lack of prey diversity similar to that found at high latitudes, coupled with the limited adaptability of Great Gray Owls in California to shift prey emphasis in the absence of optimal prey types, probably limits the capacity of this species to breed on a regular basis in California.

Clearly, if low prey diversity controls Great Gray Owls' fecundity, management options available to deal with this problem are limited. However, habitat degradation (i.e. loss of nesting snags) from timber harvesting (see Winter 1980) and the effect of grazing on prey availability, needs to be studied in greater detail to understand the basic factors affecting the ecology of this species in California. The need for research on these problems cannot be too strongly emphasized.

This study confirms the fact that the Great Gray Owl is very rare in California with a tenuously fragmented distribution pattern. The greatest concentration of these owls is in the greater Yosemite area. This is where a major recovery effort should be directed, without which the future of this species in California may be intractable.

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Table 1. Areas surveyed for Great Gray Owls in California during 1984

County	Location	Dates	Justification
Alpine	Grover Hot Springs State Park T10N, R19E, Sec. 24	8/12-13	RSR*
Fresno	Black Point (Sierra N.F.) T8S, R25E, Sec. 25	7/3-6	RSR
Madera	Jackass Meadow (Sierra N.F.) T5S, R24E, Secs. 14, 15	6/30-7/1	PSR
Mariposa	Crane Flat (Yosemite N.P.) T25, R20E, Secs. 17, 18, 19, 20	1/29, 4/14- 18, 6/25, 9/9	HBR
	McGurk Meadow (Yosemite N.P.) T3S, R21E, Secs. 11, 12, 13, 14	6/19-21, 9/9	
	Mono Meadow (Yosemite N.P.) T3S, R22E, Sec. 17	6/22	SR
	Ostrander Lake trail Head (Yosemite N.P.) T3S, R22E, Secs. 18, 19	6/20-21, 9/9	OH
	Peregoy Meadow (Yosemite N.P.) T3S, R21E, Secs. 13, 14, 24	6/18, 20-22, 9/9	HBR
	Summit Meadow (Yosemite N.P.) T3S, R21E, Secs. 10, 11, 14, 15	6/20, 25, 9/9, 15	RSR
	Westfall Meadow (Yosemite N.P.) T3S, R21E, Secs. 23, 24, 26	6/18	RSR
Modoc	Long Valley (Modoc N.F.) T38N, R15E, Sec.	8/25	OH
	Patterson Meadow (Modoc N.F.) T38N, R16E, Sec. 6	8/24-26	RSR
Plumas	Blakeless, Little, Grizzly Creeks (Plumas N.F.) T24N, R12E, Secs. 16, 17, 18, 21, 22, 23, 24	8/14-17	SR
Sierra	Webber Lake-Lacey Valley (Tahoe N.F.) T19N, R14E, Secs. 28, 33	8/21-22	OH
	Yuba Pass-Lincoln Valley (Tahoe N.F.) T20N, R13E, Secs. 11, 22	8/17, 19	RSR

Table 1 cont'd.

County	Location	Dates	Justification
Siskiyou	Huckleberry Creek (Shasta N.F.) T39N, R2W, Sec. 28	8/27	SR
Tuolumne	Ackerson Meadows (Stanislaus N.F.) T1S, R19E, Secs. 14, 15, 23, 24, 25, 26	42 days betw. 1/27 & 10/12	HBR
	Bourland Meadow (Stanislaus N.F.) T3N, R19E, Secs. 16, 17	8/11-12	OH
	Wilson Meadow (Stanislaus N.F.) T1N, R19E, Sec. 9	6/28-29	HBR

*HBR = historical breeding record
 OH = optimum habitat
 SR = specimen record
 PSR = possible sighting record
 RSR = recent sighting record

Table 2. Summary of Great Gray Owls located in California in 1984

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National Park (NP)			Number
National Forest (NF)	Location	Date	Birds

Stanislaus NF	Stone Meadow (Ackerson Meadow complex) Tuolumne Co.	8/7	4 (2 ad. & 2 imm.)
Yosemite NP	Crane Flat, Mariposa Co.	4/14	2 ad.
"	Peregoy Meadow, Mariposa Co., T3S R21E sec. 13, 14, 24	6/19-20	2 ad.
"	Ostrander Lake Trail Head, Mariposa Co., T3S R22E sec. 18 & 19	9/9	4 (2 ad. & 2 imm.)
"	Westfall Meadow, Mariposa Co., T3S R21E sec. 23, 24, 26	6/18	2 ad.
"	McGurk Meadow, Mariposa Co., T3S R21E sec. 11, 12, 13, 14	9/9	4 (2 ad. & 2 imm.)
"	Summit Meadow, Mariposa Co., T3S R21E sec. 10, 11, 14, 15	9/15	4 (2 ad. & 2 imm.)

Total			22
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Table 3. Accepted Sight Records of Great Gray Owls in California Since 1979

National Forest (NF) National Park (NP) County (Co.)	Location	Date	Number Birds	Observer
Alpine Co.	Grover Hot Springs State Park	June-Dec. 1979	1	P. Pennington
Modoc Co.	Modoc National Wildlife Refuge	mid-Oct. 1981	1	C. Bloom
Modoc NF	Patterson Meadow (Modoc Co.)	July 4, 1972	1	B. Walton, N. Neeshart
Stanislaus NF	Ackerson Meadow	1980	4	J. Winter
Stanislaus NF	Ackerson Meadow	1981*	9-10	J. Winter
Stanislaus NF	Ackerson Meadow	1982	0	J. Winter
Stanislaus NF	Ackerson Meadow	1983	6	J. Winter
Stanislaus NF	Ackerson Meadow	1984*	4	J. Winter
Stanislaus NF	Kassabaum Meadow (Tuolumne Co.)	June 28, 1982	1	J. Winter
Stanislaus NF	1 mi. SW Red Rock Meadow (Tuolumne Co.)	Sept. 27, 1982	1	D. Elliott
Stanislaus NF	Upper Relief Valley (Tuolumne Co.)	July 7, 1981	1	K. Ford
Stanislaus NF	Wilson Meadow (Tuolumne Co.)	summer 1981*	4	R. Smith
Tuolumne Co.	Groveland (2 mi. SE)	Dec. 17, 1981	1	D. Jewett
Tuolumne Co.	Twain Harte	May 14, 1982	1	C. Augustine
Yosemite NP	Aspen Valley (Tuolumne Co.)	Aug. 20, 1982	1	V. Young
Yosemite NP	Aspen Valley (Tuolumne Co.)	Sept. 21, 1983	1	V. Young
Yosemite NP	Big Meadow (Foresta)	Oct. 22, 1981	1	C. Otto
Yosemite NP	Big Meadow (Foresta)	Oct. 31, 1981	1	C. Williams et al.

Table 3 cont'd.

National Forest (NF) National Park (NP) County (Co.)	Location	Date	Number Birds	Observer
Yosemite NP	Crane Flat (Mariposa Co.)	Aug. 27, 1952*	4	D. Bleitz
Yosemite NP	Crane Flat (Mariposa Co.)	1980	2	m. obs.**
Yosemite NP	Crane Flat (Mariposa Co.)	1981	2	m. obs.
Yosemite NP	Crane Flat (Mariposa Co.)	1982	2	m. obs.
Yosemite NP	Crane Flat (Mariposa Co.)	1983	2	m. obs.
Yosemite NP	Crane Flat (Mariposa Co.)	1984	2	m. obs.
Yosemite NP	Cottonwood Meadow (Tuolumne Co.)	May 23, 1980	1	A. Lauter
Yosemite NP	Mono Meadow (Mariposa Co.)	Sept. 11, 1981	1	E. Keaven
Yosemite NP	McGurk Meadow (Mariposa Co.)	1979	1	m. obs.
Yosemite NP	McGurk Meadow (Mariposa Co.)	1980	1	m. obs.
Yosemite NP	McGurk Meadow (Mariposa Co.)	1981*	1 (juv)	m. obs.
Yosemite NP	McGurk Meadow (Mariposa Co.)	1982	1-2	m. obs.
Yosemite NP	McGurk Meadow (Mariposa Co.)	1983	1	m. obs.
Yosemite NP	McGurk Meadow (Mariposa Co.)	1984*	4	J. Winter
Yosemite NP	Ostrander Lake Trail Head (Mariposa Co.)	Sept. 9, 1984*	4 (2 ad/ 2 juv)	J. Winter

Table 3 cont'd.

National Forest (NF) National Park (NP) County (Co.)	Location	Date	Number Birds	Observer
Yosemite NP	Peregoy Meadow (Mariposa Co.)	1980	2	m. obs.
Yosemite NP	Peregoy Meadow (Mariposa Co.)	1981	2	m. obs.
Yosemite NP	Peregoy Meadow (Mariposa Co.)	1982	2	m. obs.
Yosemite NP	Peregoy Meadow (Mariposa Co.)	1983	2	m. obs.
Yosemite NP	Peregoy Meadow (Mariposa Co.)	1984	2	m. obs.
Yosemite NP	Summit Meadow (Mariposa Co., T3S, R21E sec. 10, 11, 14, 15)	Sept. 15, 1984*	4	J. Winter
Yosemite NP	Tamarack Creek (Mariposa Co., T2S R20E sec. 11)	July 1984	1	fide J. Lovio
Yosemite NP	Westfall Meadow (Mariposa Co.)	1979	1	J. Winter
Yosemite NP	Westfall Meadow (Mariposa Co.)	1980	1	J. Lovio
Yosemite NP	Westfall Meadow (Mariposa Co.)	July 3, 1982	1	J. Winter
Yosemite NP	Westfall Meadow (Mariposa Co.)	Sept. 19, 1983	1	J. Winter
Yosemite NP	Westfall Meadow (Mariposa Co.)	June 18, 1984	2	J. Winter

* = Breeding year

m. obs. = Many observers

Table 4. Unconfirmed Records of Great Gray Owls in California
Since 1979

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National Forest (NF)				
National Park (NP)				
County (Co.)	Location	Date	Number Birds	Observer

Calaveras Co.	New Hogan Reservoir	Oct. 1981 Oct. 1983	1	E. Carlson
Modoc Co.	Modoc National Wildlife Refuge	June 1978	1	S. Dudley
Siskiyou Co.	Lower Klamath National Wildlife Refuge	18 Dec. 1961	1	A. Small
Tahoe NF	Lincoln Creek (Sierra Co.)	June 1978	1	fide H. Greiman
Tiyoabe NF	Secret Lake	Aug. 1981	3	R. Clement
Tiyoabe NF	Upper Piute Meadows	Aug. 1981	1	R. Clement
Yosemite NP	Rancheria Mt. (Tuolumne Co.)	Aug. 1981	1	fide A. Haigh
Yosemite NP	Paradise Valley	Aug. 13, 1981	1 (juv)	A. Haigh
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Table 5. Sites Occupied by Great Gray Owls During the Breeding Season
from 1978 to 1984

Location	Year	No. of Adults	Breeding Status
Ackerson Meadows	1978	1	unknown
	1979	1	unknown
	1980	4	no breeding
	1981	6-7	3 yng.
	1982	0	
	1983	6	no breeding
	1984	3-6	2 yng.
Black Point	1979	2	unknown
	1984	0	
Crane Flat	1978		
	1979		
	1980	2	
	1981	2	
	1982	2	
	1983	2	
	1984	2	abandoned
McGurk Meadow	1979	1	
	1980	1	
	1981	--	1 yng.
	1982	1-2	
	1983	1	
	1984	2	2 yng.
Ostrander Lake Trail Head	1984	2	2 yng.
Peregoy Meadow	1978	2	
	1979	2	
	1980	2	
	1981	2	
	1982	2	
	1983	2	
	1984	2	no breeding
Summit Meadow	1984	2	2 yng.

Table 5 cont'd.

Location	Year	No. of Adults	Breeding Status
Westfall Meadow	1979	1	?
	1980	1	no breeding
	1981		
	1982	1	no breeding
	1983	1	no breeding
	1984	2	no breeding
Wilson Meadow	1981	2	2 yng.
	1982	0	
	1984	0	

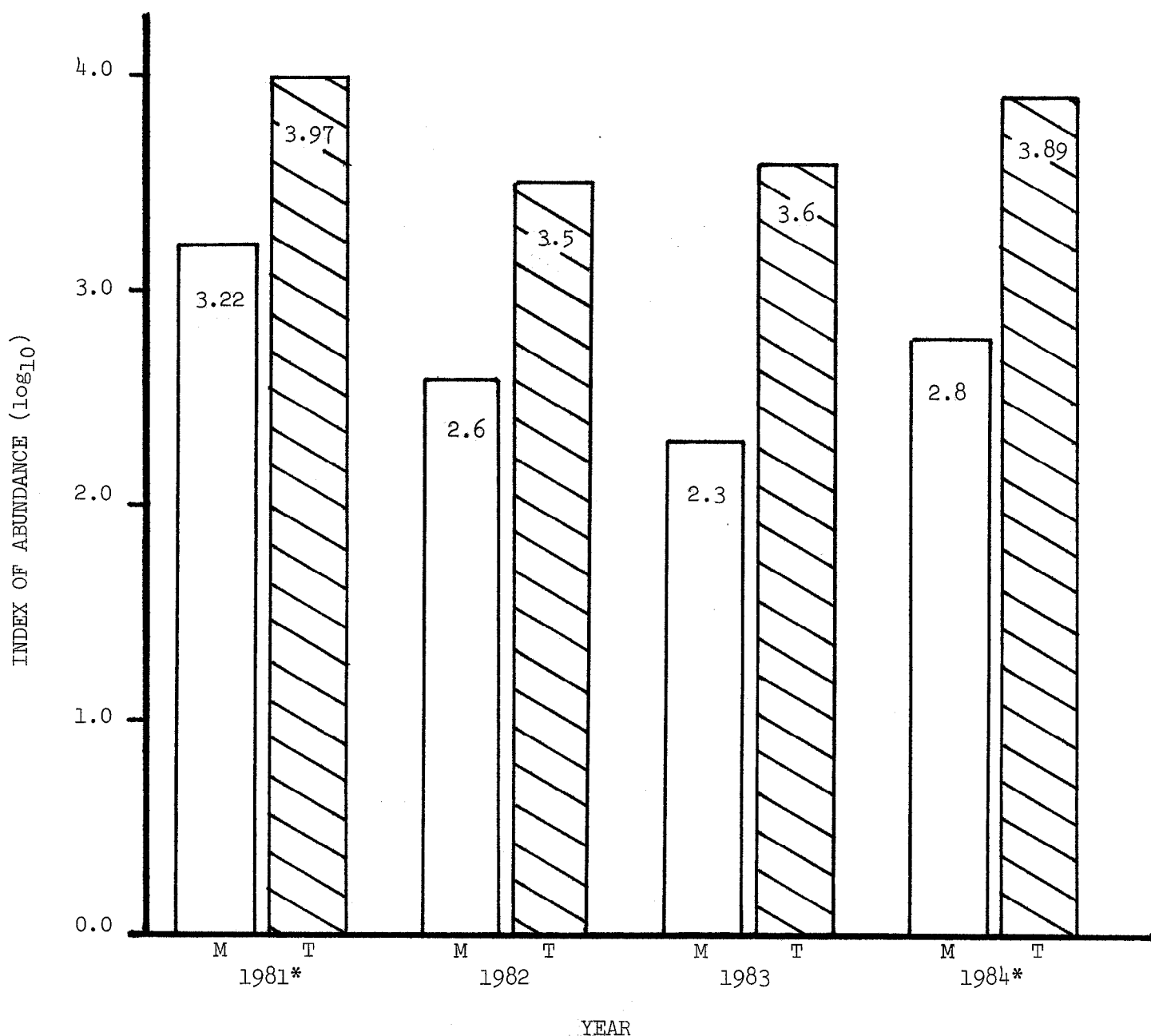


Figure 1. Relative abundance of *Microtus* and pocket gophers (*Thomomys*) at Ackerson Meadows, Tuolumne County, California since 1981. Abundance values converted to \log_{10} (See Winter 1982a). * indicates a breeding year. M=*Microtus*, T=*Thomomys*.

APPENDIX A

Individual Site Field Survey Results

Survey Area: Ackerson Meadows, Tuolumne Co., Stanislaus National Forest.

Legal Description: T1S R19E sections 14, 15, 23, 24, 25, 26.

Justification: Historical records and breeding (Winter 1980).

Date(s) Surveyed: 42 days between 27 Jan-12 Oct.

Results: Ackerson Meadows has been monitored regularly for Great Gray Owl activity since 1979. Recent observations suggest that this area is an important wintering grounds, as well as a breeding, area for Great Gray Owls. There were at least two pairs of owls present here in 1980, but no breeding occurred. In 1981 at least three pairs of Great Gray Owls bred or attempted to breed, producing three fledglings. In addition, there may have been an unmated male present during the 1981 breeding season. In late summer of that year there were at least 9 and possibly 10 Great Gray Owls frequenting Ackerson Meadows (see Winter 1982a). This meadow system has the densest population of Great Gray Owls in the state outside of Yosemite National Park. In 1982 the owls abandoned Ackerson Meadows as both a breeding and wintering grounds until 12 March 1983 when at least three pairs of owls wintered, staying until 5 June. No owls summered and consequently no breeding took place in the summer of 1983. The owls again returned to winter at Ackerson Meadows on 27 January 1984, but fresh pellets were found there in late October 1983 indicating there were birds hunting Ackerson Meadows well before January. An active wintering population was frequenting the area by late January and by February three to six Great Gray Owls were hunting Ackerson Meadows. No birds were heard or seen after April 1984. On 7 August 1984 however, two well-grown juvenile Great Gray Owls were found in the NE part of Stone Meadow (for map see Winter 1982a). In spite of several efforts to locate birds in the spring of 1984, one pair remained, undetected, in a small area of Stone Meadow and successfully fledged young. This is a good example of how secretive these birds can become when they are breeding. Their nests can be very difficult to locate. One adult and the two young Great Gray Owls that fledged at Ackerson Meadows were last seen on 4 September. At this time the young were quite healthy and were virtually indistinguishable from the adults. A full discussion of possible hypotheses that account for the irregular breeding patterns in California is included in the Discussion and Conclusions section.

Survey Area: Crane Flat, Mariposa Co., Yosemite National Park.

Legal Description: T2S R20E sections 17, 18, 19, 20.

Date(s) Surveyed: Jan. 29, April 14, 15, 16, 17, 18, June 25, Sept. 9.

Justification: Historical breeding records.

Results: It is clear from talking to the Yosemite Institute staff located at Crane Flat that Great Gray Owls do not winter here. They leave when the first heavy snows hit the high Sierra and drift down slope. The meadows at Crane Flat were 90% free of snow by mid-April this year. A pair of Great Gray Owls were observed copulating and courting at 18:53 on 14 April. This pair was frequenting a nest tree that was last used in 1975, and the female was found incubating in this nest on 16 April. Based on behavior, the first egg was probably laid on 14-15 April. Bill Kiger and Judy Murray of the Yosemite Institute staff at Crane Flat volunteered to watch this nest to determine the outcome of the breeding effort.

The nest was in the broken top of a red fir (*Abies magnifica*) snag about 72 feet (22m) high that was 66 inch (168 cm) DBH and was located about 75 yards (69 m) from Highway 120. Unfortunately, the female abandoned this nest, for an unknown reason, sometime between 18-20 May. The male was last seen on 17 May, the day Tioga Pass was opened for the summer. Up to the time the nest failed, the female seemed to be well-fed and it is likely that she did not abandon because of lack of food from the male (*fide* B. Kiger) as was the case with a nest at Ackerson Meadows in 1981 (see Winter 1982a). No Great Gray Owls were seen at Crane Flat until mid-June when a pair was seen and heard calling most of the rest of the summer and are believed to be the same pair that attempted to breed (*fide* B. Kiger).

Crane Flat is a very important historical breeding area for Great Gray Owls in Yosemite NP. The current Yosemite NP Master Plan includes some proposed major developments for Crane Flat that could have detrimental effects on the future of the Great Gray Owls that occupy this area.

Survey Area: Peregoy Meadow, Mariposa Co., Yosemite National Park.

Legal Description: T3S R21E sections 13, 14, 24, and T3S R22E sections 18 & 19.

Justification: Historical breeding records.

Date(s) Surveyed: June 18, 20, 21, 22, Sept. 9.

Results: I am including in this survey an unnamed meadow system located in T3S R22E sections 18 and 19. I have called this system the Ostrander Lake Trail Head and believe that there are two pairs of Great Gray Owls currently using this system and Peregoy Meadow itself. A male Great Gray Owl responded very strongly to a tape recording played in the parking lot of the Ostrander Lake Trail Head on 20 June at 21:42. This male was well seen by flashlight. At 22:01 another, and different, male was seen in the SE corner of section 13 on the same night. A quick check of the area around the Ostrander Lake Trail Head at 22:20 on 20 June revealed that the same male heard and seen at 21:42 was still present. At 21:34 on 21 June two males were heard in this area suggesting that each male was holding a separate territory. On September 9 I found two well-grown juvenile Great Gray Owls, that had been out of the nest 8-10 weeks, in the NE 1/4 of the NW 1/4 of section 19 (T3S R22E), very close to where I heard a territorial male on 20 June. Consequently, a pair of Great Gray Owls successfully nested in the vicinity of the Ostrander Lake Trail Head

where there are a series of meadows in sections 18 and 19 that run along a tributary of Bridalveil Creek which are large enough to support a breeding pair of owls.

On 19 June, while in an arm of McGurk Meadow (T3S R21E NE of NW of sec. 13), I found a female Great Gray Owl giving begging calls. At this late date if a female was not on a nest it is unlikely that she would breed successfully. I believe that this female was the mate of the male heard at Peregoy Meadow on 20 June at 22:01.

In summary, I believe that there is a pair of owls that did not breed this year in the Peregoy Meadow area and a different pair that successfully fledged two healthy young in the meadow system adjacent to the Ostrander Lake Trail Head. No nests were found. Although Great Gray Owls have been seen every year in the Peregoy Meadow area since 1979, no positive evidence of breeding is known since that time.

Survey Area: Westfall Meadow, Mariposa Co., Yosemite National Park.

Legal Description: T3S R21E sections 23, 24, 26.

Justification: Historical records.

Date(s) Surveyed: June 18

Results: At 19:02 on June 18 I found a female Great Gray Owl giving begging calls from a lodgepole pine (Pinus murrayana) on the NE side of Westfall Meadow. At this late date, if this female were not on a nest, it is safe to assume that this pair did not breed in 1984. Great Gray Owls have been seen in this meadow every year since the last general survey in 1979, but there is no evidence of breeding since.

Survey Area: McGurk Meadow, Mariposa Co., Yosemite National Park.

Legal Description: T3S R21E sections 11, 12, 13, 14.

Justification: Historical records.

Date(s) Surveyed: June 19, 20, 21, Sept. 9.

Results: A female Great Gray Owl was heard giving begging calls in the eastern arm of McGurk Meadow (NW 1/4 of sec. 13) on June 19 at 18:39. I have reason to believe that this female was the mate of a male Great Gray Owl frequenting Peregoy Meadow. Since this female was not on a nest at this time, it is unlikely that she bred successfully. However, I heard a rather aggressive male answer my tapes on 21 June at 22:20 just south of McGurk Meadow, and on 9 September I found two well-grown juveniles, that had been out of the nest about 8 weeks, in the eastern arm of this meadow. The presence of two juveniles led me to believe that there was an additional pair that bred successfully in McGurk Meadow and that the female that was heard begging in this area on 19 June was not the same female that successfully fledged two young owls. The female that bred successfully was probably already incubating

eggs when I surveyed this meadow, and she remained quiet in response to my tapes, and thus prevented me from finding her nest. There were indications that the Microtus and the pocket gophers were abundant in McGurk Meadow.

Survey Area: Summit Meadow, Mariposa Co., Yosemite National Park.

Legal Description: T3S R21E sections 10, 11, 14, 15.

Justification: Historical records.

Date(s) of Survey: June 20, 25, Sept. 9, 15.

Results: This meadow system is unnamed on USGS maps, but it is referred to as Summit Meadow by the National Park Service and is located in the SE of the NE of section 15 along the Glacier Point Road. There are two additional meadows just north of Summit Meadow that I am including in this legal description. A territorial male Great Gray Owl responded to a tape on 20 June at 23:10 and was observed calling atop a 50 foot (15m) snag next to the Glacier Point Road. On 15 September at 19:34 two juvenile Great Gray Owls were heard in the SE of section 10. Since it was nearly dark at the time, I was unable to see the birds. There is no doubt about the identification, however. A pair fledged two young in this rather small meadow system, but the adult male also may have hunted Badger Pass one mile SW of Summit Meadow. On June 22 I surveyed some of the Badger Pass area with negative results. No nests were found in the Summit Meadow system.

Survey Area: Mono Meadow, Mariposa Co., Yosemite National Park.

Legal Description: T3S R22E section 17.

Justification: Historical specimen records.

Date(s) of Survey: June 22

Results: This meadow is the location where Joseph Grinnell collected the first Great Gray Owls for Yosemite NP in June 1915. It is a very wet meadow system and, by itself, probably wouldn't support a pair of Great Gray Owls, but when hunted with several other support meadows nearby, it should be more than adequate. My survey here on 22 June was negative. The meadow is surrounded by heavy red fir and lesser amounts of lodgepole pine that appear to provide both good breeding habitat and good hunting perches.

Survey Area: Blakeless-Grizzly Creek, Plumas Co., Plumas National Forest.

Legal Description: T24N R12E sections 16, 17, 18, 21, 22, 23, 24.

Justification: Historical specimen record.

Date(s) of Survey: August 14, 15, 16, 17.

Results: A single Great Gray Owl was shot 3 miles south of Mt. Ingalls along Blakeless Creek in September 1937. There are some very extensive meadows in this area that lie along Blakeless, Little and Big Grizzly Creeks. Prior to the building of the dam that formed Lake Davis, there was a large meadow in Big Grizzly Valley of several thousand acres surrounded by mixed-conifer with marginal lodgepole pine and red fir. Overgrazing and extensive timber cutting have degraded the habitat. The density of snags suitable for Great Gray Owl nests is low (see Winter 1980a). A check of the meadow edges did not reveal any sign of Great Gray Owl use, and no response to the tapes was heard. The meadows are being hunted by Spotted, Great Horned (bred), and Long-eared Owls (bred). Although some Microtus and pocket gopher activity was noted in several local areas of this meadow system, the general level of prey abundance was considered average. There are no confirmed recent Great Gray Owl records for Plumas County and the species may well be extirpated in this county, in spite of some rather extensive habitat.

Survey Area: Black Point, Fresno Co., Sierra National Forest.

Legal Description: T8s R25E section 25.

Justification: Recent sight (heard) records (see Winter 1980).

Date(s) of Survey: July 3, 4, 5, 6.

Results: There were at least two Great Gray Owls heard in the vicinity of Blackpoint in the summer of 1979. To my knowledge no one has checked the area since. The habitat is largely a high mixed-conifer association with a few marginal red firs. The area is grazed and the grass ranges from 1/2-2 inches (1.3-5.0 cm) in height. Pocket gopher mounds are almost nonexistent, and I found no evidence of Microtus runways. There has been a logging sale cut here since my last visit in August 1979. My observations of the habitat lead me to believe that the meadow system is overgrazed and logging sales may have degraded the nesting potential of the surrounding forests. There are a few meadows to the NE of Blackpoint in the Kaiser Wilderness that may provide Great Gray Owls with suitable habitat. Not only were my surveys negative for Great Gray Owls in the Blackpoint area, but I did not hear any other species of owl during my stay. This fact alone suggests that the habitat is suboptimum for owls.

Survey Area: Yuba Pass-Lincoln Valley, Sierra Co., Tahoe National Forest.

Legal Description: T20N R13E section 11 (Yuba Pass) and section 22 (Lincoln Valley).

Justification: Historical sight record.

Date(s) of Survey: Aug. 17, 19.

Results: There is a sight record of a Great Gray Owl near Yuba Pass in September 1966. The meadow system at Yuba Pass is too small to support breeding activity, and I suspect that the 1966 record was of a wandering bird. The closest area to Yuba Pass that has suitable Great Gray Owl habitat is in

Lincoln Valley. I checked this meadow twice and found that the area is grazed, but the grass was in good condition. No owls were heard here nor was any sign of owl use found. There is an unconfirmed record of a Great Gray Owl in Lincoln Valley in June 1978 and the habitat is worth checking again in the future.

Survey Area: Patterson Meadow, Modoc Co., Modoc National Forest.

Legal Description: T38N R16E section 6.

Justification: Historical sight record.

Date(s) of Survey: Aug. 24, 25, 26.

Results: A sight record of a Great Gray Owl in July 1972 prompted a survey of this meadow. There are only two records of Great Gray Owls for the Warner Mountains (Winter 1980) and I suspect that the species is very rare in this mountain range in spite of the fact that there are areas with suitable habitat. I found an adult and a juvenile Great Horned Owl at Patterson Meadow, but no Great Gray Owls. The meadow is probably not large enough (circa 25 acres) to support both species. It is in good condition and the cattle are fenced out, although a few horses are occasionally grazed in a small area of the meadow. During this visit Microtus and pocket gopher abundance seemed low.

I also surveyed Long Valley on the night of August 25 which is located in T38N R15E, about 2 miles SW of Patterson Meadow. This meadow system has approximately 1 1/2 to 2 miles of grass in the shape of a narrow corridor and it is in good condition. I found two Great Horned Owls here, but no Great Gray Owls. I think that Long Valley has better potential to harbor Great Gray Owls than Patterson Meadow, principally because of its larger size.

Survey Area: Wilson Meadow, Tuolumne Co., Stanislaus National Forest.

Legal Description: T1N R19E section 9.

Justification: Historical breeding record.

Date(s) of Survey: June 28, 29.

Results: A breeding pair of Great Gray Owls that fledged two young were observed in Wilson Meadow in 1981. I checked the meadow in July of 1982 with negative results, nor did I find any Great Grays this year. Snag availability is rather poor and the breeding recorded in 1981 might be exceptional. The habitat was rated as average (Winter 1982b) for Great Gray Owls. I did find a pair of Spotted Owls in the lower part of Wilson Meadow at 22:41 on 28 June (T2N R19E NE 1/4 section 16).

Study Area: Huckleberry Creek, Siskiyou Co., Shasta National Forest.

Legal Description: T39N R2W section 28 (six miles of SE of McCloud).

Date(s) of Survey: Aug. 27.

Justification: Historical specimen record.

Results: A single bird was shot here in September of 1913. The property is privately owned by the Randolph Hearst family. The collecting site lies along Huckleberry Creek about 6 miles southeast of McCloud. I was unable to visit this meadow in 1979 because of a snowstorm and access difficulties. It is a very small meadow, approximately 10-15 acres, and would not support Great Gray Owl breeding. In addition, it lies at an elevation of about 3000 feet (912 m) and has virtually no large snags surrounding the meadow for nest sites. In general, it is poor Great Gray Owl habitat and the meadow is overgrazed. I did find one pellet beneath a downed log in the meadow that was in the size range of a Great Gray or Great Horned Owl. The only owl heard here was a Northern Pygmy Owl at 22:38. As for the bird collected in 1913, my suspicion is that it was a transient and did not breed, particularly in view of the early fall date when Great Gray Owls are known to wander (Winter 1982a).

Survey Area: Webber Lake-Lacey Valley, Sierra Co., Tahoe National Forest.

Legal Description: T19N R14E sections 28 & 33.

Justification: Good habitat.

Date(s) of Survey: Aug. 21, 22.

Results: No Great Gray Owls were recorded here, but the habitat is excellent and I consider it to be a good release site for captive-bred Great Grays fledged from the upcoming breeding program at the Peregrine Fund's Santa Cruz breeding facility. Even in a drought year there is a substantial amount of green vegetation in Lacey Valley which borders Webber Lake to the south. Pocket gopher activity was substantial, and I noted a number of Microtus runways as well. Lacey Valley and Coppins Meadow, which are just NW of Webber Lake in section 20, are good Great Gray Owl habitat. Lacey Valley is privately owned and timber harvesting has been tightly controlled. Consequently, there is a substantial amount of old-growth habitat surrounding the meadow. Public access also is controlled and hunting is limited to a few friends of the owner. The large meadow system consists of about 400-500 acres (160-200 ha). I saw a family of Great Horned Owls that had fledged two young and I heard at least one Long-eared Owl in Lacey Valley on the night of 21 August. I also surveyed Coppins Meadow with negative results. Both meadow systems are grazed by sheep or cattle, but Lacey Valley is in very good condition because the grazing pressure is kept at a sensible level.

Survey Area: Jackass Meadow, Madera Co., Sierra National Forest.

Legal Description: T5S R24E sections 14 & 15.

Justification: Possible sight record.

Date(s) of Survey: June 30, July 1.

Results: A possible Great Gray Owl was observed here in July of 1981 but the identification was never confirmed. This meadow was scheduled to be flooded by PG&E for a hydroelectric project that has since been cancelled, which is

fortunate as it is very good Great Gray Owl habitat. It lies at an elevation of 7000 feet (2128 m), is surrounded by lodgepole pine and is about 100 acres (40 ha) in size. My surveys here did not reveal any Great Gray Owls, but one Great Horned Owl was heard at 23:20 on June 30. The presence of this species may exclude the meadow being occupied by a Great Gray Owl. The meadow is privately owned and is grazed by both horses and cows. In spite of the grazing, reasonably good Microtus activity was noted. The area is worth checking again in the future.

Survey Area: Grover Hot Springs State Park, Markleeville, Alpine Co.

Legal Description: T10N R19E section 24.

Date(s) of Survey: Aug. 12, 13.

Results: A single Great Gray Owl frequented a large meadow adjacent to the Hot Springs from June to December 1979, disappearing just before the first heavy snows. Paula Pennington, a State Park Ranger who reported the bird told me that it called actively during the entire summer. This behavior leads me to believe that it was not paired. The meadow runs east-west and has a bath house for tourists who wish to bathe in the mineral waters that seep from the south side of the meadow. Consequently, the meadow gets a good deal of visitor use from hikers, bathers, fishermen and campers. In spite of the heavy use, the meadow is in very good condition and is about 50 acres (20 ha) in size. Daytime surveys of the meadow indicated that the Microtus and pocket gopher populations were high. The surrounding forest is old-growth and would easily support breeding and, in addition, there are a number of excellent hunting perches around the edge of the meadow. Unfortunately, I did not hear a single owl here; however, Ms. Pennington told me that she has heard both Great Horned and Spotted Owls here regularly. She also said that she has never seen another Great Gray Owl at Grover Hot Springs or has had reason to believe that one was present. There is no reason why this meadow would not support a pair of great gray owls except that heavy visitor use by recreationists in the early evening hours might inhibit a male from hunting, which might limit the desirability of the meadow for the owls.

Survey Area: Bourland Meadow, Tuolumne Co., Stanislaus National Forest.

Legal Description: T3N R19E sections 16 & 17.

Justification: Good habitat.

Date(s) of Survey: Aug. 11, 12.

Results: Great Gray Owls have not been recorded in this meadow, but the habitat seemed very good when I first visited it in August 1982. In addition, it is located on the boundary of the Emigrant Wilderness Area and could provide suitable habitat for birds dispersing from nests in Yosemite. A qualitative habitat assessment done here in 1982 (Winter 1982b) indicated that the habitat was very good for Great Gray Owls. During my visit in 1982 a drift fence was in place to prevent cattle from grazing the meadow. This year the fence was down and the meadow was being heavily grazed by cattle. It is

judgment that the grazing will have an adverse effect on the suitability of the meadow for Great Gray Owls. I found only a single Great Horned Owl during this survey. This meadow could be a good release site for captive-bred Great Gray Owls, but with the grazing pressure it is now under, its suitability for this purpose is limited.

APPENDIX B

Specimen Records of Great Gray Owls in California Since 1979

National Forest (NF) County (Co.)	Location	Date	Sex, Specimen Number
Del Norte Co.	Prairie Creek State Park	Jan. 22, 1982	F, HSU #5029 (mount)*
Plumas NF	Quincy	Winter 1924-25	U, PES
Tuolumne Co.	1/2 mi W. Kassa- baum Meadow	September 16, 1984	U, TES (mount)

*HSU--Humboldt State Univ.

PES--Pioneer Elementary School, Quincy, CA

TES--Tenya Elementary School, Groveland, CA