VERTEBRATE ANIMALS

BIRDS

Paul Lehman

OBJECTIVE - To inventory the birds and assess the importance of various portions of More Mesa for species of special concern, particularly the White-tailed Kite, Marsh Hawk, Merlin, Burrowing Owl, and Short-eared Owl.

METHODS - Bi-weekly bird surveys were conducted throughout the study period, July 1981 - May 1982. The dates of these surveys were: 25 July, 8 August, 22 August, 4 September, 20 September, 4 October, 18 October, 31 October, 14 November, 30 November, 15 December, 30 December, 12 January, 26 January, 9 February, 26 February, 13 March, 30 March, 10 April, 25 April, 9 May, and 23 May. These censuses took place in early or mid-morning and lasted approximately two hours. During each census, forty-five minutes to one hour was spent in the Scrub-Shrub Forested Wetland and Southern Coastal Oak Woodland areas (collectively called Riparian Vegetation herein) in the northern section of the study area and one hour to one hour and fifteen minutes was spent in the Cismontane Introduced Grasses area (the mesa proper) and in the ravines of the East Drainage System. Separate tallies of species for these two major divisions were always made. All species seen and heard were recorded. The results of these censuses are presented in Appendix II-A. The results of this past year's study, along with data collected from bird observations at More Mesa since 1971, were combined to produce a thorough bird species checklist for the mesa (Appendix II-B).

During the censuses associated with the study, special attention was given to the raptors of particular interest and concern. These include the White-tailed Kite (Elanus leucurus), Marsh Hawk or Northern Harrier (Circus cyaneus), Merlin (Falco columbarius), Burrowing Owl (Athene cunicularia), and Short-eared Owl (Asio flammeus). Their behavior (hunting, roosting, nesting, and responses to disturbance), and ranges over the Mesa area were noted. Separate discussions for each of these five species follows later in this report.

Additionally, dusk surveys of the White-tailed Kites and Short-eared Owls were made from approximately one hour before sunset until dark on 18 October, 14 November, 12 December, 2 January, 3 February, and 3 March. During these censuses the observer stood along the south side of the Central Hill (4), from which the roost area, approaching kites, and virtually the entire mesa could be seen. The results of these dusk censuses are presented under the individual species accounts for the White-tailed Kite, Marsh Hawk, and Short-eared Owl. Dusk survey and census data from previous years also are included in these discussions.

Literature dealing with the White-tailed Kite, various proposed species of special concern in California, and effects of human disturbance on raptor nesting were consulted and brought into the discussion of the individual raptor species.

RESULTS - Overall bird diversity was always significantly higher in the Scrub-shrub/Forested Wetland and Southern Coastal Oak Woodland areas than in the Cismontane Introduced Grasses. The number of species recorded in these two communities are listed in Table 1.

Table 1- Number of bird species recorded during censuses in two contrasting plant communities of More Mesa

Date		Oak woodland and scrub-shrub/ forested wetland	Cismontane introduced grasses
25 Jul	1981	31	23
8 Aug		35	20
22 Aug		28	17
4 Sep		42	21
20 Sep		31	26
4 Oct		31	19
18 Oct		42	27
31 Oct		36	22
14 Nov		25	17
30 Nov		28	21
15 Dec		34	14
30 Dec		33	15
12 Jan	1982	34	18
26 Jan		34	18
9 Feb		34	18
26 Feb		34	29
13 Mar		32	16
30 Mar		37	16
10 Apr		46	22
25 Apr		35	12
9 May		43	15
23 May		34	15

Both resident and migratory species are more numerous in the wetland areas, and significantly more breeding individuals are present there. Riparian habitats support very rich avian populations throughout much of California and such areas in the More Mesa study site are no exception. While the number of individuals and diversity of species there are high, there are no officially classified "Rare and Endangered" species present.

The main grassland areas of the Mesa (along with their many patches of naturalized Sweet Fennel) support a relatively low diversity of

species. This diversity is particularly low between April and September. Between early fall and early spring sizeable numbers of Western Meadowlarks (Sturnella neglecta) and Savannah Sparrows (Ammodramus sandwichensis) winter on More Mesa. Both of these species are relatively common and widespread throughout coastal Southern California. If these two are removed from consideration, the combined numbers of the other non-raptors using More Mesa is rather small. There are no officially classified "Rare and Endangered" species present in the grassland areas.

The census totals for the wetland and grassland areas are located separately in Apendix II-A. A full species list for More Mesa which denotes seasonal abundance and nesting status is found in Appendix II-B. This list supercedes previous lists published on the birdlife of More Mesa. Such previous attempts include Dames and Moore (1972) and Environmental Science Associates (1980). Both of these lists contain numerous factual errors concerning the status and distribution of the birds of More Mesa. There are many omissions, various species listed as breeding locally which do not, and many inaccuracies concerning seasonal status.

Of major concern and importance is the regular use of the More Mesa study area by six species of raptors including the White-tailed Kite, Marsh Hawk, Merlin, Screech Owl (Otus asio), Burrowing Owl, and Short-eared Owl. While not "endangered", these species all have regional or state-wide importance and are discussed separately in the following section of this report. Four of them (Marsh Hawk, Merlin, Burrowing Owl, and Short-eared Owl) are included in the draft of "Bird Species of Special Concern in California" (Remsen, 1978), which has yet to be

officially acted on by the state. It includes species for which there is, at present, no state policy but which may have state-wide legal status in the future (Csuti, pers. comm.).

White-tailed Kite - The White-tailed Kite is a raptor, and as such is "fully protected" (as of 1957) by the California Fish and Game Commission and federal Migratory Bird Treaty (Csuti, pers. comm.). It is not federally or state listed as "rare and endangered". However, even though the kite is not considered threatened officially, More Mesa plays a very important role on the regional and, probably, state level for the species. More Mesa "is the single most important piece of land for the White-tailed Kite from Gaviota to Santa Barbara and possibly further south. There is no other comparable large grassland area in the region that has exhibited a potential for providing food for that many birds for an extended period of time" (Waian, 1972).

Prior to 1895, the White-tailed Kite was termed "fairly common" in Southern California (Willett, 1933) and common and widespread (Eisenmann, 1971). However, by the beginning of this century it was noted as declining in numbers. Ten pairs were known to nest "near Santa Barbara" in 1928 and 1929 (Willet, 1933). During the 1920's and 1930's the species was "rare or entirely gone from many sections" (Grinnell and Miller, 1944) and thought to be nearing extinction in California (Warner and Rudd, 1975). Hunters, egg collectors, and habitat destruction were largely blamed. Then, beginning in the 1940's, the population began to increase, and did so significantly beginning in the 1950's. The population reached a peak in the mid-1970's and has declined somewhat since then. The estimated California population tallied on Audubon Christmas

Bird Counts was 232 in 1964, 1437 in 1975, and 797 in 1978 (Pruett-Jones et al., 1980). The large increase in the population of White-tailed Kites in the past forty years has been attributed by a number of authors (i.e. Eisenmann, 1971; Warner and Rudd, 1975; Schlatter et al., 1980) to its high reproductive potential and its ability to adapt to disturbed areas, most notably irrigated agricultural areas which support a higher abundance of prey species. However, questions regarding the significant short-term fluctuations in population within this longer-term increase (such as that observed in the late 1970's) remain largely unanswered (Larson, 1980). The only source to propose a cause for such smaller-scale fluctuations is Pruett-Jones et al. (1980), which discusses the possibility that they were related to rainfall patterns and, subsequently, fluctuations in small mammal populations.

The preferred habitat of the White-tailed Kite is grassland, salt and freshwater marshes, and agricultural areas supporting a high abundance of small rodent species, particularly the California Vole (Microtus californicus). White-tailed Kites are semi-social and they often roost and feed together. Communal roosting may play an important role in pair bonding and be a key factor in the efficient exploitation of the California Vole (Waian, 1976). Selection of roost sites may be related to localized concentrations of voles. "Birds can hunt fields with high prey densities as they travel between the roost and their daytime, defended hunting territories every morning and evening." (Waian, 1976). It is during these periods of the day that voles are most active. Such roosts are occupied during the fall and winter. The number of individuals using such roosts increases throughout the fall (beginning in September), usually peaks in December or early January,

and then declines to almost zero by the end of March. During the spring and early summer, White-tailed Kites are largely occupying defended breeding territories with no communal roosts in existence.

Such roosts were discovered in San Diego County at Camp Pendleton in 1948 (up to 25 individuals) (Morgan, 1948); and in cottonwoods (Populus spp.) and willows (Salix spp.) in 1950 (34 individuals) and in an avocado grove in 1954 and 1955 (39 individuals) in Vista (Dixon et al., 1957); near Sacramento in the mid-1960's (100 individuals) (Waian and Stendall, 1970; Waian, 1973), and in Sonoma County in 1964 (156 individuals) (Bolander, 1965). In addition, during 1971-72, locations of three other roost sites in Southern California were published (Waian, 1973): one in eucalyptus trees and a lemon orchard near Oxnard; one in a eucalyptus grove in Santa Paula; and one in a large avocado grove near Lake San Marcos in northern San Diego County. Waian and Stendall (1970) state that "personal communications and our observations suggest that communal roosting by White-tailed Kites occurs statewide at least during the non-nesting season."

One of the largest fall and winter night-time roosts known in California was found on More Mesa in October 1965 and has been known to exist in that area every year since then. How long it had existed prior to 1965 is unknown.

The roosting (and nesting) of the White-tailed Kite along the coastal plain of southern Santa Barbara County was studied extensively by Waian (1973) as part of his Ph.D. research on the behavioral ecology of this species. His study took place between the fall of 1965 and the spring of 1968, and again between the spring of 1970 and spring of 1972. This information, in addition to the data collected by the current

investigator since 1971, provides a relatively clear picture of the population sizes of the White-tailed Kite using More Mesa during the past 16 years and of this species' uses of the area.

The principal use of More Mesa by White-tailed Kites is for a major fall and winter roost. This roost is used by virtually all of the kites in a fifty square-mile area (Waian, 1976). The number of individuals using the roost varies both from year to year and from month to month. During Waian's research period (1965-68, 1970-72) the More Mesa roost was located in a "mixed live oak - willow grove" (Waian, 1976), and contained up to 40-50 individuals in four of the years and a peak of 84 in 1966-67. Counts made at More Mesa on Santa Barbara Audubon Christmas Bird Counts (taken in late December or early January close to the peak roosting period) since 1971 are:

year	# kites	
1971-72	40	
1972-73	25	
1973-74	39	
1974-75	84	
1975-76	98	(high count of 110 in mid-December)
1976-77	51	
1977-78	47	
1978-79	42	
1979-80	23	
1980-81	37	
1981-82	40	(high count of 79 in November; see below for full account of season)

In general, these totals are probably slightly lower than the peak counts for each year in that the dates may not have been absolutely optimal and the censuses themselves were likely not exhaustive. However, these counts are in agreement with the species' overall change in abundance in California as a whole over the past ten years, with a peak

in 1975, a subsequent decline, and a possible slight increase again in the past two years. They also illustrate the importance of More Mesa as a roosting site for this species. Using the 1978-79 Christmas Count total of 797 kites for California as a whole (Pruett-Jones et al., 1980) the More Mesa roost contained over 5% of the state's total count.

The results of the More Mesa roost census conducted during this study period are as follows:

Date	# kites	
6 October 1981	24	(brief observation only)
18 October 1981	49	
14 November 1981	79	
12 December 1981	50	
2 January 1982	35	
3 February 1982	21	
3 March 1982	2	

These counts differ slightly from previous years by peaking somewhat earlier during the season, during November instead of December or early January. It is not known whether this earlier peak actually occurred or if subsequent counts in December and January failed to tally the number of individuals still using the More Mesa site on most nights.

Since 1971, and probably earlier, the main roost site of kites on More Mesa has been located in mixed Coast Live Oak and Arroyo Willows (habitat as described by Waian (1976)) in the South Central (6e) and South (6f) Ravines of the Eastern Drainage System (Fig. 38). Area 6f has been the principal site, area 6e being of secondary importance. During this recent study the White-tailed Kite roost was located at the secondary site (6e) during October and November, and at the principal site (6f) from December into March. A few individuals (up to 10% of the

Fig. 38. ROOSTING AND FORAGING AREAS OF THE WHITE-TAILED KITE.

White-Tailed Kite (Elanus leucurus) use of More Mesa during the fall and winter seasons, consisting of two roosting sites and foraging areas, is illustrated.

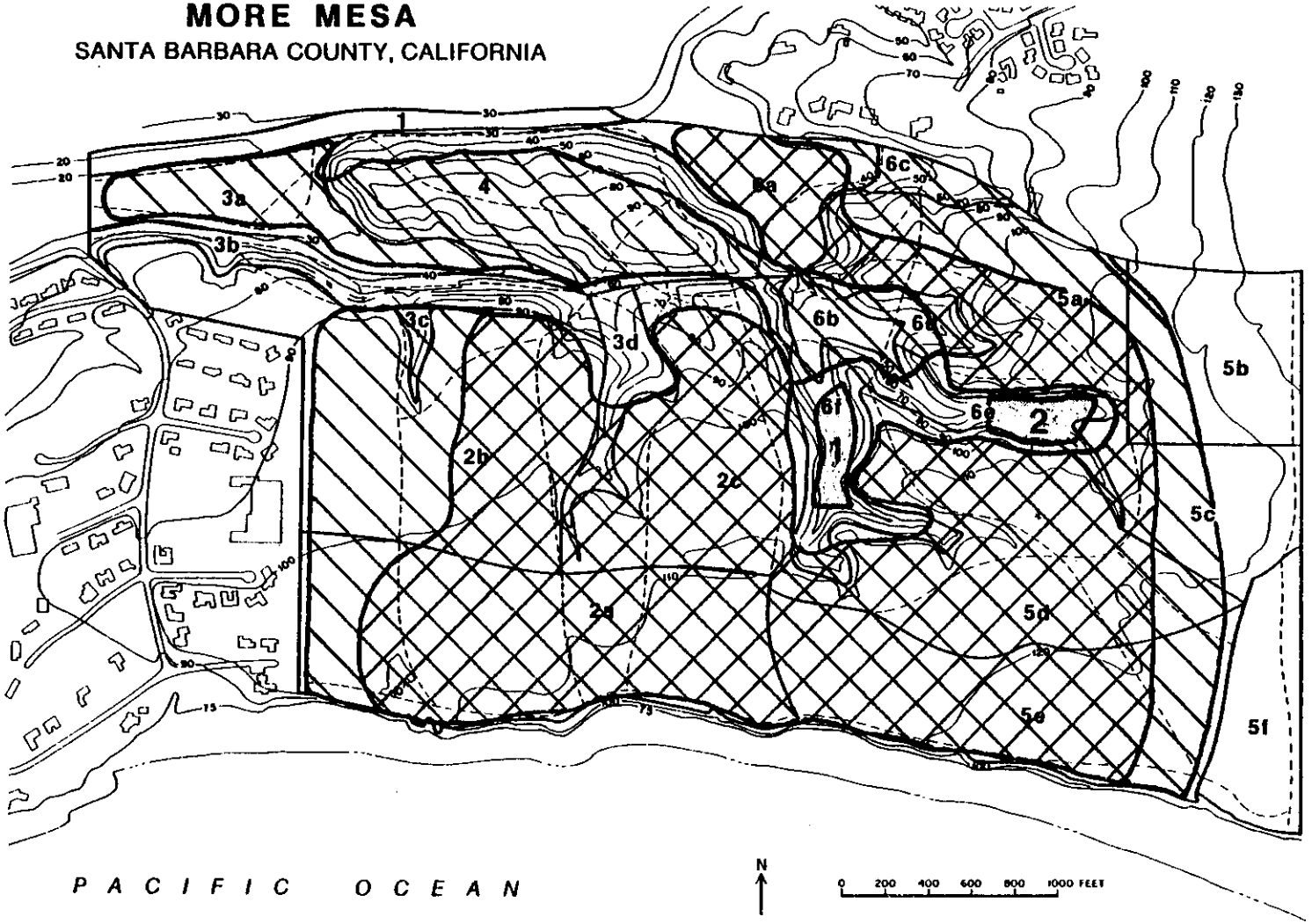
Principal fall/winter roost site.

Secondary fall/winter roost site.

Principal foraging area.

Secondary foraging area.

Fig. 38. ROOSTING AND FORAGING AREAS OF THE WHITE-TAILED KITE



total) occupied area 6f in October and November when most of the birds were in 6e.

Virtually all of the birds arrived at the roost from the west and over 90% did so during the last hour of light. They arrive singly and in small groups. The last individuals arrived with very little light remaining. Their approach has been to fly at low elevations (up to 75 feet up) over areas 2b and 2c and on into the roost. Only a small number of these birds arriving on the mesa were observed to hunt over the area. Seven or eight individuals were seen to do so on 18 October, four did so on 14 November, three on 12 December, three on 2 January, and five on 3 February. The most consistent areas in which these individuals hunted were the western half of 2b, 2c, 2a, 5d, and 5e. Areas 4, 5a, and 6a were utilized more infrequently. These findings of only moderate hunting on More Mesa in the late afternoon by roosting kites differs somewhat from Waian's findings, which state that the birds carried on "considerable" aerial activity (i.e. hunting) until dark (Waian and Stendall, 1970). However, low Microtus densities during the roosting period of our study could account for this difference.

In the morning, White-tailed Kites largely leave the roost site "en masse at the first hint of morning light" (Waian, 1976). This was largely the case during this study, except for during January and February when as many as nine individuals were noted hunting and perched in Coyote Brush in area 2a until mid-morning.

Since 1974, this observer (Lehman) has not found any other communal roost in the Goleta Valley area. More Mesa roost counts have fluctuated to a small degree (<20%) from day to day or week to week, however, which may be due, in part, to other, small roosts existing in the area. In

contrast, Waian (1973, 1976) found several changes in roost location both within and between seasons during his studies. However, there was never more than one principal roost at a given time. These additional roost sites included: "Johnson's Ranch" (now a residential development) northeast of More Mesa (approx. 50 kites in November 1965), an avocado orchard off San Simeon Drive in Goleta (December 1966), a lemon orchard to the south of Hollister Avenue and east of Ward Memorial Blvd. (as many as 20 lemon trees utilized by approx. 40 kites), a lemon orchard in Glen Annie Canyon (December 1967), and Dos Pueblos Ranch west of Goleta (January 1968). Waian (1973) noted that as a result of disturbance an entire roosting population sometimes circled 400 feet up into the twilight and moved to another roost site for the night; subsequently the birds often returned to the original roost site the following night. Such behavior in kites was never observed by Lehman during this study or in previous years. If kites were forced to take wing due to disturbance (i.e. by dirt-bikes) they circled about for several minutes overhead and then always returned to the same (More Mesa) site. From this information it is apparent that winter White-tailed Kite roosts did exist at least during a several year period, at several other localities along the South Coast in addition to More Mesa. However, More Mesa has definitely been the largest and most consistent winter roosting locality. It is not known at the present time whether the kites would form a new roost locally or whether many would abandon the Goleta Valley area if the More Mesa site received excessive disturbance.

In contrast to the large fall and winter roost which exists on More Mesa, only one or two pairs of White-tailed Kites actually nest on the site. Successful nests have been located there seven months of the year

(Waian, 1973), with the peak nesting activity apparent March-June. While the same nest is never used twice, many nesting locations are used repeatedly. For the past 15+ years one pair has consistently nested on More Mesa (Gray, pers. comm.). One pair possibly nested on the west side of area 4 in the mid-1970's (Gray, pers. comm.). During this study (1982) two pairs are apparently breeding on the site. One of these is occupying the oaks which are along the slope forming the east side of area 4 (Fig. 39), the site used repeatedly over the years. Much display activity has been noted there since late January, attempted copulation was observed in late January, and a nest with eggs was discovered in late April. The pair at this site has not successfully fledged young since June 1978. The other pair has consistently been present in the oaks and willows at the east end of area 6e (Fig. 39). No attempt has been made to find a nest due to potential disruption to the nest and the difficulty of access (i.e. very thick growth and much Poison Oak). However, 3 birds were successfully fledged by this pair in June 1982 (Gray, pers. comm.). This site has been frequented by a nesting pair since 1979. The major hunting ranges of these two pairs is plotted in Fig. 39. According to Waian (1973), territories varied in size from 17.8 to 51 hectares, and sometimes increased after young hatched.

More Mesa was utilized by four or less individual kites for hunting purposes during most of the day in the late summer and fall. During the late summer period of this study the population may not have exceeded one individual. Therefore, More Mesa was not an especially significant area regionally for kites during much of the day during the year of the study. However, cyclic changes in Microtus numbers may result in a significantly greater number of kites utilizing the site in years of

greater prey densities. The principal areas on More Mesa which were utilized by White-tailed Kites for feeding between one hour after sunrise and one hour before sunset since 1974 are shown in Fig. 38.

Of utmost importance in determining the feasibility of housing construction on More mesa is the preservation of the site's large and regionally significant night-time White-tailed Kite roost. The ability of the roosting birds to tolerate any loss of habitat surrounding the roost and additional disturbance to the roost itself must be determined for an accurate assessment.

There is very little published information on the tolerance of roosting or nesting kites to adjacent disturbance. Little information is available either from researchers or bird watchers. However, some important points have been raised. In a study of nesting raptors in urban areas in Sacramento County (Vincenty, 1974) it was found that of the total of ten raptor nests which were abandoned, nine were the result of human activites. Waian (1976) states that "invariably the roost would be located within a mile of the largest vole habitat area in the fifty square miles" of the study area. Therefore, if the More Mesa vole habitat were significantly reduced or negatively impacted the roost may disappear. It is not known whether any other site presently exists in the Goleta Valley area that would be suitable to the kites. It is doubtful, however, that a roost of this size could exist elsewhere. Such suitable habitat, in any case, is decreasing and was "less than 12% of the region" even before 1973 (Waian, 1973).

Only one observer in California has reported White-tailed Kites roosting or nesting where they are <u>surrounded</u> in close proximity by development. Waian (pers. comm.) found two examples of this situation

Fig. 39. NESTING AND FORAGING AREAS OF THE WHITE-TAILED KITE.

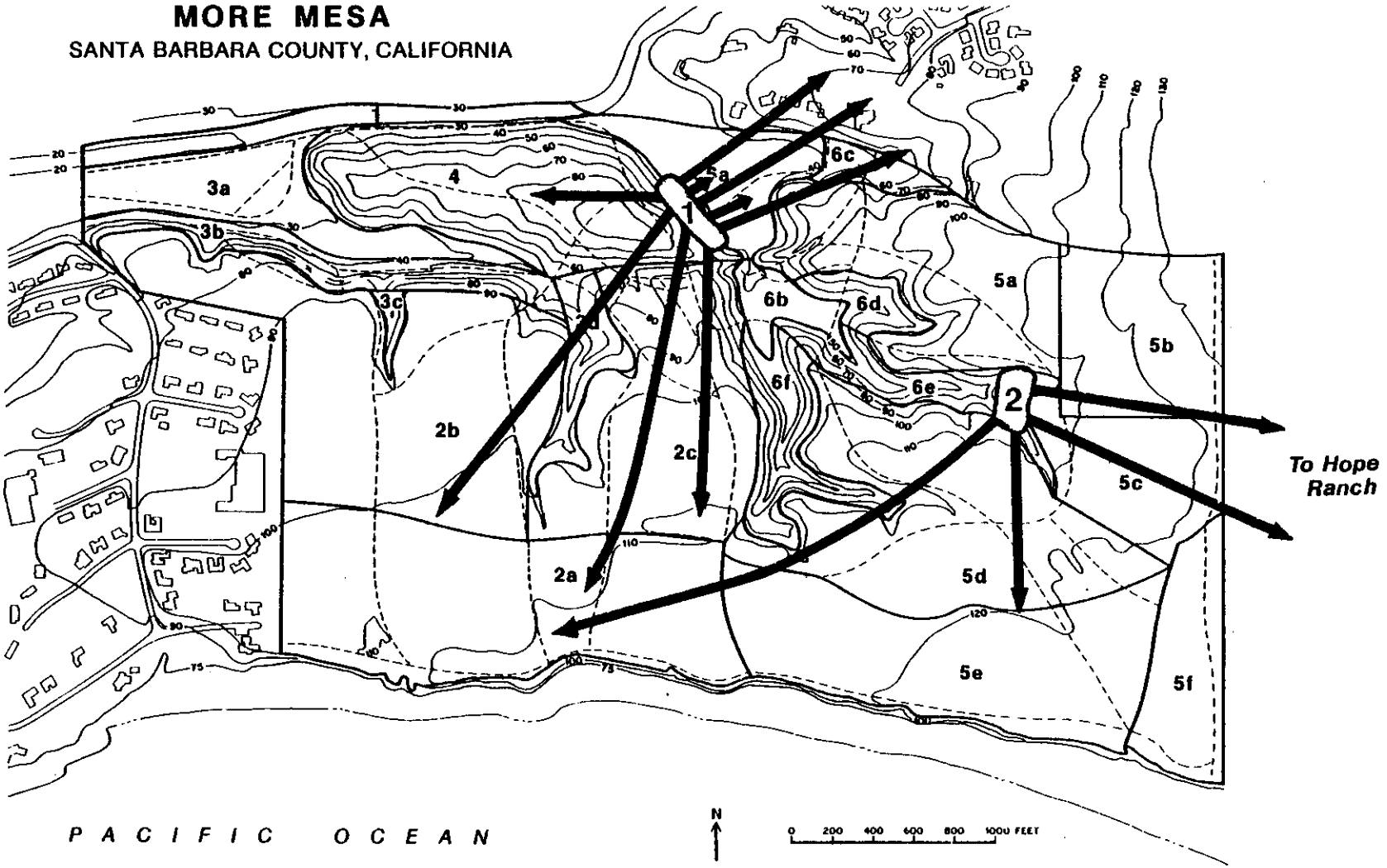
White-Tailed Kite (Elanus leucurus) use of More Mesa during the nesting season, consisting of two nesting site and related foraging areas, is illustrated.

Regular nest site area.

Second pair nest site, 1979-1982.

Foraging directions.

Fig. 39. NESTING AND FORAGING AREAS OF THE WHITE-TAILED KITE.



in Southern California. Both of these sites were characterized by dense groves of cultivated trees that had virtually no human access due to fencing. Waian emphasized the fact that these sites were characterized by limited accessibility, concealment from view, and low noise levels. The closest homes were less than 200 yards from the roost.

Hunting individuals are regularly noted close to homes and alongside highways. This is not the case with roosts or nests. The closest development to a roost or nest in Santa Barbara County was noted by Waian and Stendall (1970), who stated that a roost near More Mesa during November 1965 was located in a dense stand of live oak "200 yards from a housing development". Extensive studies of raptor nests and roosts have been made during the past ten years in northern San Diego County (Oakley, pers. comm.; Schram, pers. comm.). While several species such as Cooper's Hawk (Accipiter cooperii), Red-tailed Hawk (Buteo jamaicensis), and Red-shouldered Hawk (Buteo lineatus) have been observed nesting close to human habitation, White-tailed Kites appear not to tolerate regular human activity near nest sites. The closest habitation to a kite nest reported in San Diego county was 150 yards from a lone farm house. The closest kite roost to human habitation was one located in an orchard near Vista in the 1960's approximately 100 yards from a lone farm house out of view of the roost and surrounded by avocado groves and grassland (Oakley, pers. comm.). During the More Mesa study, White-tailed Kites were observed to be flushed out of the roost near dark (but would return within five minutes) by motor-bikes passing within 150 yards. Hunting kites were disturbed typically at 75-100 yards distance by motor-bikes. Pedestrian traffic was an important factor at 100-150 yards of the roost. Waian (per. comm.) states that the kites are

particularly sensitive to noise and visual disturbance at specific light intensities preceding night fall.

Therefore, I recommend that if the More Mesa White-tailed Kite roost is to be preserved that 1) a minimum buffer of 150-200 yards be maintained around the roost sites in areas 6f and 6e; 2) any construction activities take place during the non-roosting season, as such disturbances would likely cause abandonment; and 3) any potential homes built nearby must be fenced or walled in such a way as to discourage any vehicular or pedestrian traffic from approaching closer to the roost site than this needed buffer. In addition, much of the surrounding grassland (California Vole habitat) on the mesa should remain intact, as per Waian's comments above, if the roost is to continue at More Mesa.

Marsh Hawk - This species has suffered a significant reduction this century in its California population due to a loss of the required habitat of extensive open country (i.e. marshes, grassland, some agriculture). The Marsh Hawk is on the National Audubon Society's "Blue List" (Tate, 1981) of those species which have recently given or are currently giving indications of non-cyclical population declines or range contractions, either locally or widespread. It has also been placed in the 2nd priority of concern (definitely on the decline throughout a large part of its range in California) in the draft of "Bird Species of Special Concern in California" (Remsen, 1978). Only 2-4 individuals now winter, October-March, annually along the South Coast of Santa Barbara County between Goleta and Carpinteria. More Mesa has hosted one or two wintering Marsh Hawks annually since at least 1971. During the fall and winter of 1981-82 up to two individuals were regularly present,

October-March. The sections of the mesa they frequented are shown in Figure 40. As with the White-tailed Kite and Short-eared Owl (see below) the favored areas for hunting are largely along the southern half of the site, including 5d, 5e, 2c, and most of 2a, although the species occurs over all other grassland areas of More Mesa to a lesser extent.

Merlin - This falcon is quite rare in Southern California and has suffered a significant decline in its population throughout much of North America this century. It has been placed in The National Audubon Society's Blue List, and is in the first priority (faces immediate extirpation if current trends continue) in the draft of Remsen (1978). A small number (less than 10) are seen annually along the South Coast of Santa Barbara County. One or two individuals are reported each year in the More Mesa study area, usually in the fall for only a brief period. Single individuals wintered there in 1974-75 and 1975-76 and were observed occasionally hunting over the open mesa (particularly in areas 2c, 2a, 5d, 5e, and the eastern section of 2b). While the study site has been utilized by this species, it probably cannot be considered of major importance to it regionally.

Screech Owl - The population of this species in the Goleta Valley is down to, at most, just a few pairs. One pair is known to be resident along the northeastern edge of the More Mesa study area. These birds frequent the oaks along the east slope of area 4 and to the northeast of there just outside the study area. Thus, it is recommended that these oaks not be disturbed.

Burrowing Owl - Placed on both National Audubon Society's Blue List and in the 2nd priority in the draft of Remsen (1978), this species has

suffered a major reduction in its numbers throughout much of California due to the loss of short grassland habitat and needed Ground Squirrel burrows. In the South Coast area of Santa Barbara County only 1-4 individuals now winter annually. These individuals are present October-March. One particularly consistent location for this species during the past seven years has been More Mesa, where it has occurred during at least five of these. Fig. 41 illustrates the locations of those sightings for which information is available. Most of these are from the West Mesa (2a and 2b); although suitable habitat also appears to exist elsewhere on More Mesa (i.e. areas 2a, 4, 5d, 5e). The low number of recent sightings from these areas may be the result of motor-bike disturbance and/or lack (?) of burrows. There were two sightings of Burrowing Owl in early winter during the study period.

Short-eared Owl - This species has been placed on both National Audubon Society's Blue List and in the 2nd priority in Remsen (1978). It has declined as a result of the loss of much extensive marsh and grassland habitat in the state. From 1-3 individuals have wintered annually, October-March, at More Mesa since at least 1971. This is the only known location which annually supports this species in Santa Barbara County. During this study two individuals were present, October-March. While this species may be seen hunting over any grassland area on More Mesa, ever since 1971 it has preferred the southern half of the mesa (areas 2a, southern 2c, 5d, and 5e) and the slopes of the ravines in the center of the Mesa (Fig. 42).

Fig. 40. FORAGING AREAS OF THE MARSH HAWK.

Marsh Hawk (Circus cyaneus) foraging areas at More Mesa, based on observations for the period of 1971 through mid-1982, are illustrated.

Principal foraging area.

Secondary foraging area.

Fig. 40. FORAGING AREAS OF THE MARSH HAWK

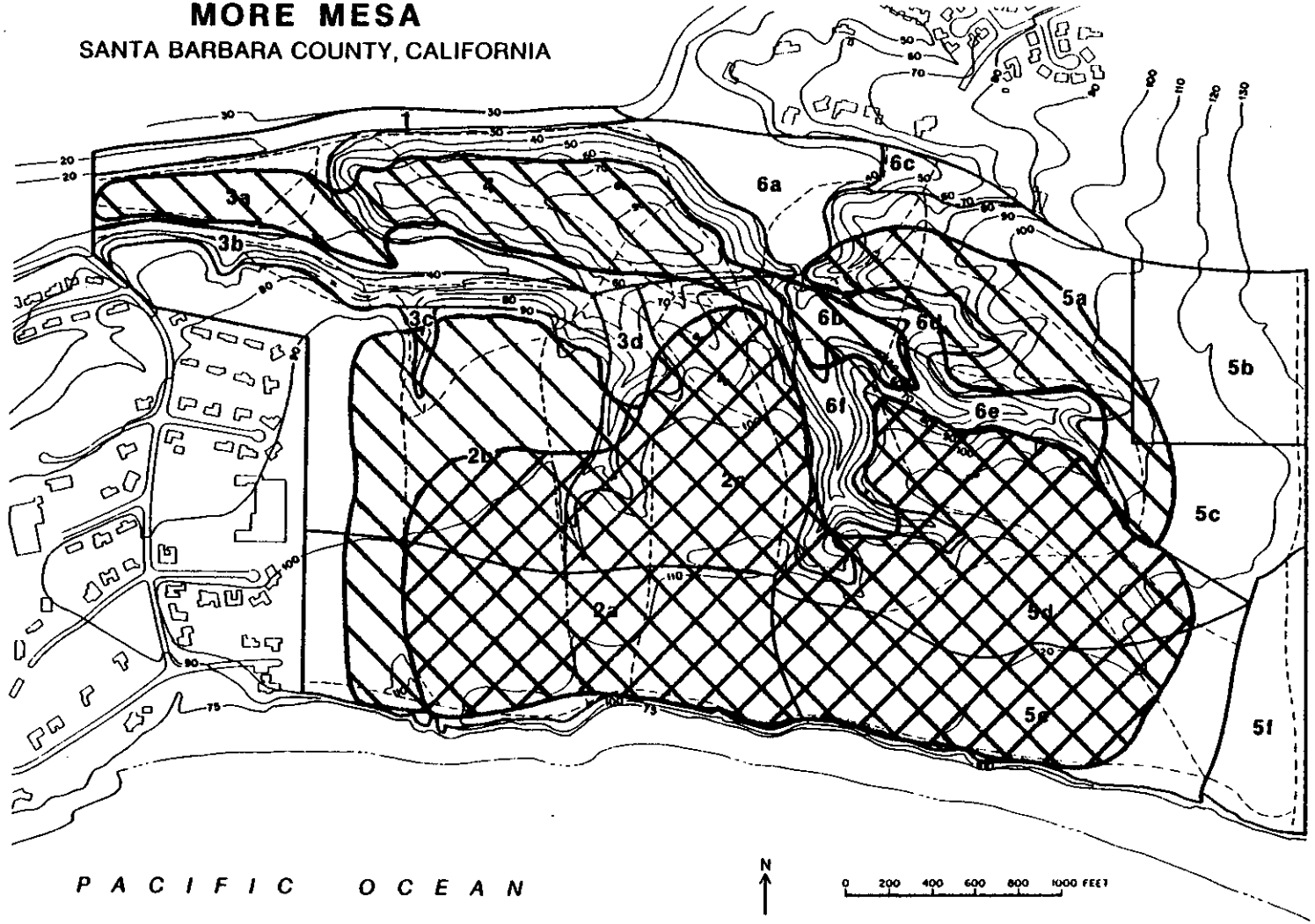


Fig. 41. SIGHTINGS OF THE BURROWING OWL.

Burrowing Owl (Athene cunicularia) utilization of More Mesa, based on sightings of individual birds and birds associated with burrows, is illustrated.

O Individual bird and burrow.

X Individual bird only.

Date adjacent to symbol refers to time of sighting.

Fig. 41. SIGHTINGS OF THE BURROWING OWL

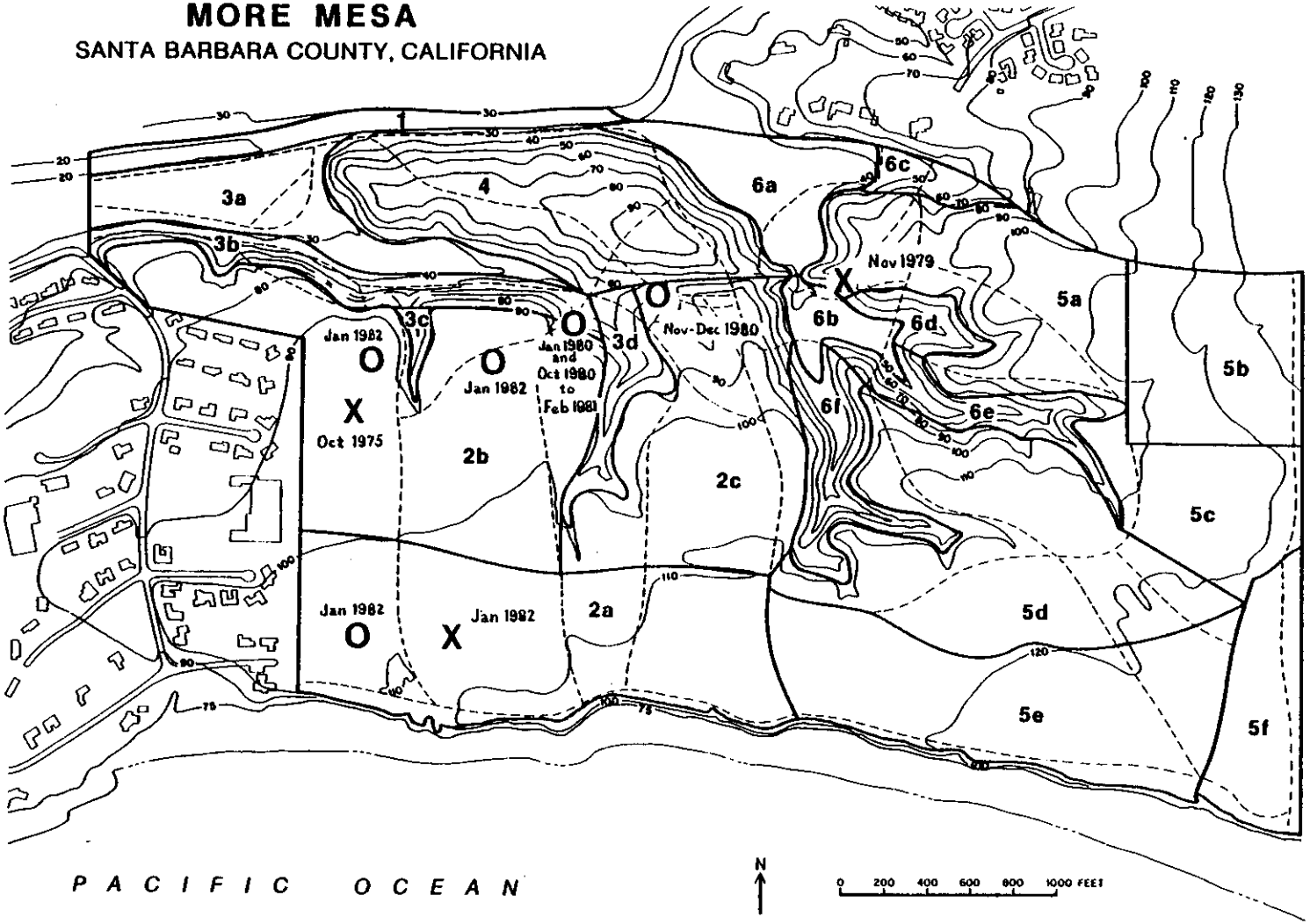


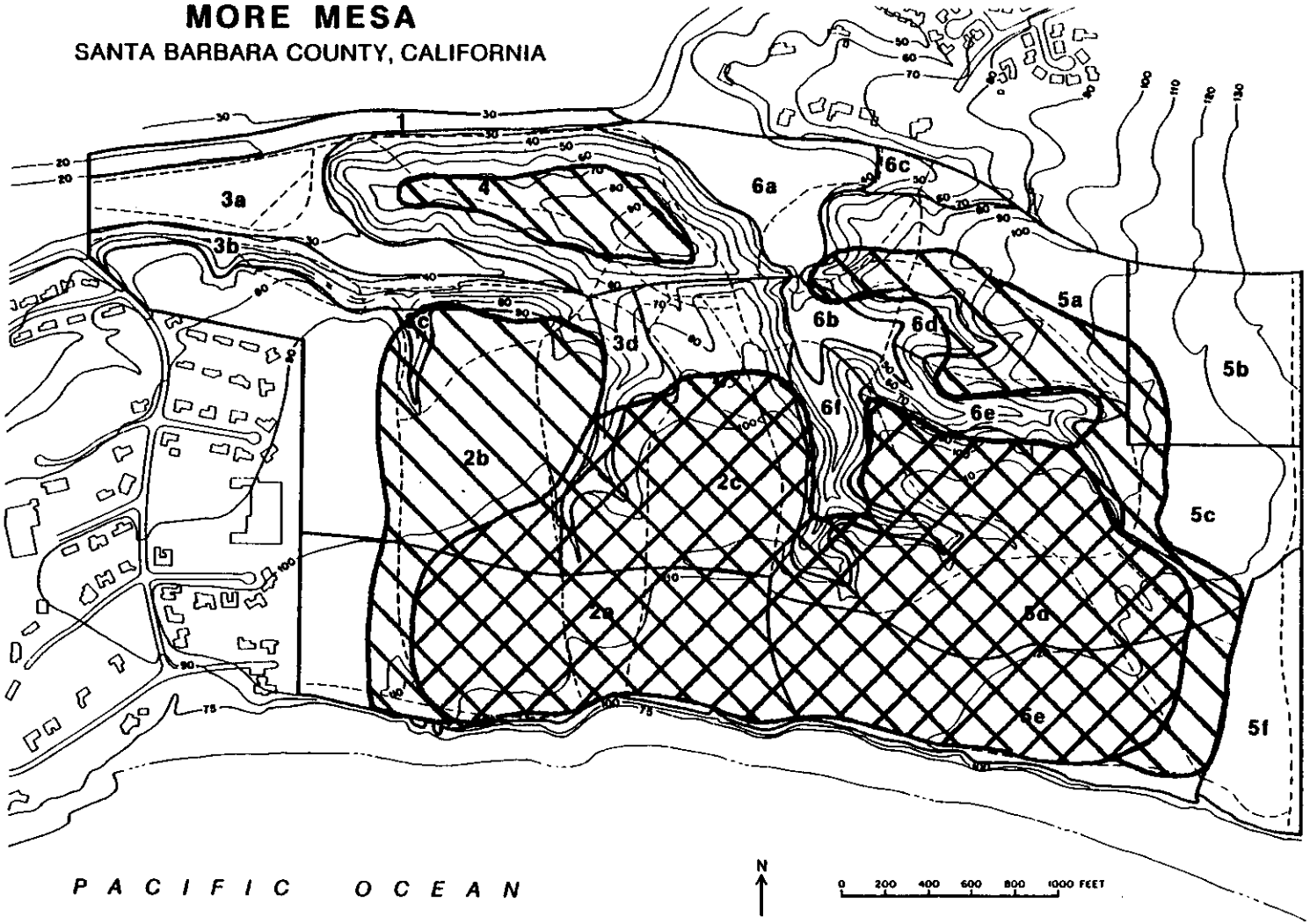
Fig. 42. FORAGING AREAS OF THE SHORT-EARED OWL

Short-Eared Owl (Asio flammeus) foraging areas at More Mesa, based on observation for the period of 1971 through mid-1982.

 Principal foraging area.

 Secondary foraging area.

Fig. 42. FORAGING AREAS OF THE SHORT-EARED OWL.



MAMMALS

Gary N. Fugle

OBJECTIVE - To inventory the mammals of More Mesa, determine the presence of any species of special concern, evaluate the importance of portions of More Mesa as habitats of special concern for these animals, and investigate the relationship between small mammal populations and the foraging of raptors.

INTRODUCTION - The mammals of More Mesa were considered in two ways in this study. The first was to identify those species that are present or possibly present in the study area, designate where within the area they occur or are expected to occur, and assess their general abundances. This information provides the data needed to evaluate the value of More Mesa in terms of its overall mammalian fauna. The second was to investigate the distributions and relative abundances of small rodent species in particular. These animals serve as the major prey of three of the special raptors that occupy the Mesa: the White-tailed Kite, Marsh Hawk and Short-eared Owl (Brown and Amadon 1968, Clark 1975, Craighead and Craighead 1969, Waian and Stendall 1970). A knowledge of rodent distributions and numbers over the year allows judgements with regard to the Mesa's role as a hunting area for these birds of prey.

I have made 26 trips to the study site and have spent 83 total hours in the field to accomplish these aims. My efforts were concentrated around three small rodent trapping sessions: 28 July - 26 August 1981, 7-18 January 1981, and 14-27 May 1982. An additional 4 hours was required in the survey of local museum records.

METHODS -

(a) Mammals of More Mesa

I utilized a variety of information sources to make assessments of species presence and/or abundance: (1) Observation of live or dead animals, tracks, scats, burrows or other evidence by myself or other members of the research team. Dr. Sam Sweet (Herpetofaunal Specialist) was particularly helpful in this regard. (2) The capture of animals in either my small rodent traps or Dr. Sweet's can-traps. (3) Sightings by local residents or visitors to the Mesa. (4) Museum records from the Museum of Vertebrate Zoology, University of California, Santa Barbara and the Santa Barbara Museum of Natural History. (5) The general knowledge of myself and other persons who have trapped or are otherwise familiar with mammals in the Santa Barbara area. Included in this group are Dr. Sally Holbrook, Associate Professor, and Don Schroeder, Research Associate and Museum Scientist, both of the University of California, Santa Barbara; and Paul Collins, Associate Curator, Vertebrate Zoology, Santa Barbara Museum of Natural History.

(b) Small Rodents

The small rodents at More Mesa were censused during three trap sessions: 14-26 August 1981, 7-18 January 1982 and 16-27 May 1982.

Six grids were chosen in early August, 1981. All grid areas were selected on the basis of their likelihood of being utilized for feeding by White-tailed Kites and other raptors of the site. This limited my interest to open areas with grasses as the predominant vegetation. I attempted to sample from all major physiographic sections of the Mesa and to choose grid locations that were representative of the grass vegetation in each section. I was also sure to include one area that was

previously trapped by Waian (1973) and I placed a grid near a second area trapped by that author. These are my Central Hill (4) and South-central grids, respectively. The precise locations on the Mesa of these six grids are shown in Figure 43. All grids were used during the three trap sessions.

In addition to these trapping grids, two short traplines were used once each during the study. The West Drainage trapline was placed in area 3a for use during the second (January) session and the Basin trapline was run in area 6a for the third (May) session. These provide supplementary information to the main grids. Trapline locations also are noted on Figure 43.

All trapping areas contained Sherman live-traps. On grids, these were placed in a matrix pattern with a standard 15m distance between neighboring traps. The length and width of each grid, in trap number, and the area enclosed are as follows: Southwestern = 4 X 10 traps (6075 m^2), Southcentral = 4 X 11 traps (6750 m^2), Southeastern = 5 X 9 traps (7200 m^2), Northeastern = 3 X 10 traps (4050 m^2), East Drainage = 4 X 5 traps (2700 m^2) and Central Hill = 3 X 7 traps (2700 m^2). On the traplines, traps were spaced at a distance of 10 to 15m. The West Drainage line contained 12 traps placed in a question mark arrangement through the available habitat. The Basin line contained 10 traps in a straight line.

Trap sessions followed a standard pattern that included (1) a prebait period, (2) a sampling period, (3) a wait period, and (4) a second sampling period. First, the traps were carried to the field and placed with a small amount of rolled oats bait left near the closed door of each. This began the two day "prebait period". For a "sampling

Fig. 43. SMALL RODENT TRAPPING AREAS.

Grids were used in all three trapping sessions (14-26 August, 1981, 7-18 January, 1982, and 16-27 May, 1982). The West Basin Trap Line was used in the January session, while the Basin Trap Line was used in the May session.

A = Southwestern Grid (4 x 10 = 40 traps).

B = Southcentral Grid (4 x 10 or 11 = 40 or 44 traps).

C = Southeastern Grid (5 x 9 = 45 traps).

D = Northeastern Grid (3 x 10 = 30 traps).

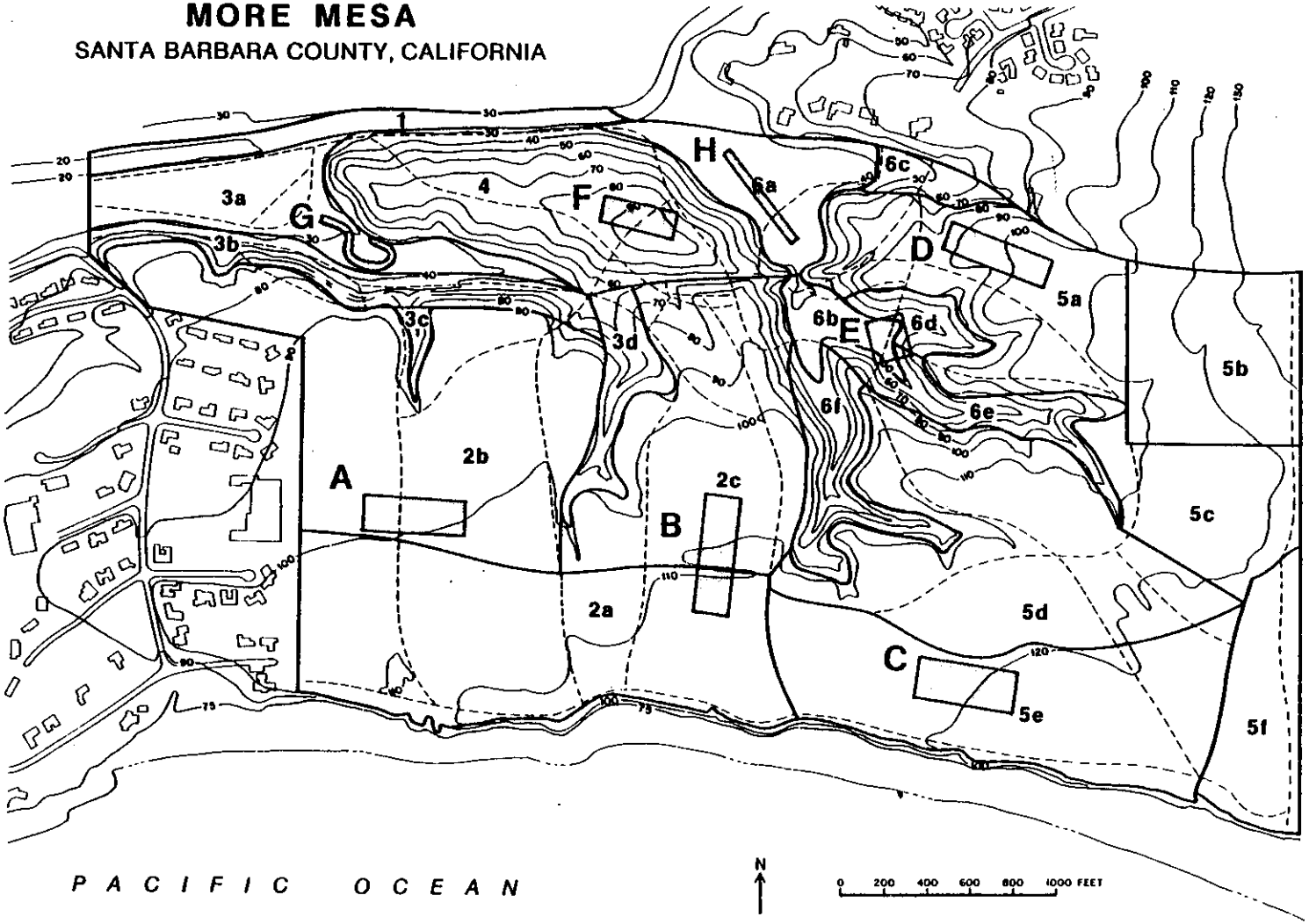
E = East Drainage Grid (4 x 5 = 20 traps).

F = Central Hill Grid (3 x 7 = 21 traps).

G = West Drainage Trapline (12 traps).

H = Basin Trapline (10 traps).

Fig. 43. SMALL RODENT TRAPPING AREAS.



period", traps were set on the early afternoon of one day, checked and reset the next morning, and then checked and closed the following morning. This provided two trapping "intervals"; one 3/4 day (afternoon to morning) and one full-day (morning to morning). The two sampling periods were conducted in an identical manner. They were separated by a five to six day "wait period".

Additional information on small rodents comes from the herpetological survey of this study. The can-traps used in this work captured a good number of small mammals and this augments my data. These records are of particular value since the can-traps were in specific locations that I did not cover in my efforts. Can-trap placement is described in the amphibian and reptile section of this report and locations are indicated in Figure 44.

Data from the small rodent trapping was used to compute an abundance index for each species for each trapping area. This index is the number of animals of a particular species per available trap. The number of available traps is simply the number of traps on a grid multiplied by the number of sampling intervals (four per trap session). For example, there were 10 captures of House Mouse (Mus musculus) on the Southwestern grid during the first trap session. The 40 traps on this grid multiplied by the four trap intervals of the session yields 160 available traps. The abundance index for Mus on the Southwestern grid for the first trap session is therefore .063 (10/160). These abundance indices can be used to compare the relative densities of rodents, and thus the relative hunting value to raptors, of different areas of the Mesa.

A second estimate of relative abundance, that utilizes a capture-

recapture technique, was intended for use in this analysis. However, this approach was judged to be unsatisfactory for this final report. Small sample sizes yielded density estimates with large degrees of standard error. Rather than attempt to draw conclusions from such data, I decided to use only the more conservative abundance index described above.

RESULTS

(a) Mammals of More Mesa

During the study, a total of 21 mammal species were recorded on the study area and these are known to be uncommon to common on the site (Appendix III, Part 1). An additional 8 species may possibly be present (Appendix III, Part 2). The latter include three species for which little distribution and abundance information is known (Myotis bats); three species that went unrecorded in this study and are rare if present (Trowbridge Shrew, Sorex trowbridgei; Deer Mouse, Peromyscus maniculatus); California Mouse, Peromyscus californicus) and two large mammals that may frequent the area on rare occasions (Coyote, Canis latrans; Mule Deer, Odocoileus hemionus). Appendix III provides an indication of the habitat types that each species is expected in as well as additional comments.

The list reported herein differs in important respects from a previous report compiled for the More Mesa area (Dames and Moore, 1972). Most significant is the omission here of three species included in that report: California Pocket Mouse (Perognathus californicus), Black-tailed Jack Rabbit (Lepus californicus) and Black Bear (Ursus americanus). The first is most frequent in chaparral habitat that is not

represented on or near the study site. The latter two may have been historically present, but it is doubtful that either has occurred on the Mesa in recent years.

A short list of mammals and their abundances for the Central Hill (4) reported in Waian (1973) agrees comfortably with the information provided herein.

(b) Small Rodents

Table 2 provides a summary of the small rodent trapping work. Three primary species were captured; California Vole (Microtus californicus), House Mouse (Mus musculus) and Western Harvest Mouse (Reithrodontomys megalotis). Individual Microtus are generally three to five times larger than individual Mus or Reithrodontomys (approximate average weights of adults: 50g versus 19g and 11g, respectively). It is no wonder that the former species is the preferred prey item of the White-tailed Kite, Marsh Hawk and Short-eared Owl (Brown and Amadon 1968, Clark 1975, Waian and Stendall 1970). Black Rats (Rattus rattus) were caught once each on the Southwestern and East Drainage grids. This species is thought to be of minor importance in the rodent communities of the Mesa.

Perhaps the most noticeable aspect of Table 2 is that Microtus are virtually absent until the spring trap session. Voles appeared in traps for the first time on the Southcentral, Northeastern and East Drainage grids during this last session. It is not known whether Microtus were present previously near the Basin trapline, but the species was well represented here in the spring session, the only time it was sampled. Microtus are well known for their cyclic fluctuations in population size (Krebs 1966). It would appear that this species increased in number in

some areas during the late winter and early spring months and, on the East Drainage grid, demonstrated its capacity for explosive increases.

One potentially significant observation is that vole abundances were highest in my traps located in Drainage areas (i.e. East Drainage System and Basin traps; abundance indices of .313 and .225, respectively). Church (1966) has suggested that Microtus californicus favors moist habitats. Therefore, we might expect voles to occur most frequently in the more moist drainage areas. Perhaps my data illustrate this.

Some of the can-trap lines of the herpetological study captured individual Microtus between November and May (Table 3). These data might at first appear to conflict with the small rodent trapping information. My January trap session shows that Microtus were rare or absent over much of the Mesa, but the can traps produced several captures of this species during the same period. Dr. Sweet indicated that the bulk of the can-trap captures were of small juvenile individuals in his January and February runs. This may suggest that a surge in Microtus reproduction occurred in the first months of the year and that populations of this species started to increase in numbers just after my second trapping effort. More important, however, it should be remembered that two entirely different capture methods are involved. Can-traps that are left open for continuous three week periods offer a much greater opportunity for capture than do my traps which are run for much shorter periods. A few individuals of Microtus in can-traps does not necessarily conflict with the indications of my relative abundance index that populations of this species were generally at low numbers at the same time period. Since I captured voles freely in the third trap session,

TABLE 2

The number of captures for small rodents (California Vole, Microtus californicus; House Mouse, Mus musculus; and Western Harvest Mouse, Reithrodontomys megalotis) and relative abundance indices for the different trapping areas on More Mesa. Trap sessions are (1) 14-26 August 1981, (2) 7-18 January 1982, and (3) 16-27 May 1982. The abundance index is the number of captures per available trap (see text).

			Microtus		Mus		Reithrodontomys	
Trapping Area	Trap Session	Available Traps*	# Captures	Abundance Index	# Captures	Abundance Index	# Captures	Abundance Index
Southwestern Grid	(1)	160	0	-	10	.063	0	-
	(2)	160	0	-	9	.056	8	.050
	(3)	160	0	-	12	.075	10	.063
Southcentral Grid	(1)	176	0	-	0	-	6	.034
	(2)	160	0	-	6	.038	14	.088
	(3)	160	2	.013	6	.038	4	.025
Southeastern Grid	(1)	180	0	-	13	.072	7	.039
	(2)	168	0	-	13	.077	13	.077
	(3)	180	0	-	21	.117	29	.161
Northeastern Grid	(1)	120	0	-	1	.008	1	.008
	(2)	82	0	-	0	-	11	.134
	(3)	120	6	.050	0	-	17	.142
East Drainage Grid	(1)	80	0	-	10	.125	26	.325
	(2)	80	0	-	0	-	31	.388
	(3)	80	25	.313	3	.038	21	.263
Central Hill Grid	(1)	84	0		11	.131	10	.119
	(2)	84	1	.012	32	.381	5	.060
	(3)	84	2	.024	5	.060	5	.060

Trapping Area	Trap Session	Available Traps*	Microtus # Captures	Microtus Abundance Index	Mus # Captures	Mus Abundance Index	Reithrodontomys # Captures	Reithrodontomys Abundance Index
West Drainage Trapline	- (2) -	48	0	-	0	-	13	.271
Basin Trapline	- (3) -	40	9	.225	0	-	8	.200

* Missing traps (broken or stolen) cause variations in number of available traps in some cases.

it does not follow that my traps were somehow avoided during earlier sessions. Waian (1973) captured numerous Microtus on the mesa throughout 1971-72 using the same trapping methods I employed here, so there is no reason to expect seasonal variation in the trapability of the species. Further, I know of no indication in the literature that voles are more difficult to catch in certain seasons. I therefore feel it is safe to conclude that Microtus were indeed rare on my trap areas until after the first months of the year.

However, I cannot eliminate the possibility that voles were more abundant in the vicinities of some can-trap lines than on the rodent trapping areas. This might be the case since the majority of Dr. Sweet's lines were located in or near drainage slopes and ravines while my trap areas were concentrated on elevated grassland areas. This could be a second indication that Microtus do better in or near the more moist drainage areas.

Summarizing this collective information, I conclude that Microtus were available as prey for raptors only at low densities over much of the Mesa through at least January. It is possible that there were patches of higher densities in some areas in or near the drainages during the same period. During the late winter and early spring, voles increased in numbers in some locations.

Abundances of Mus and Reithrodontomys showed variations through the year on my trap areas, but no consistent seasonal pattern is evident (Table 2). These species are known to show fluctuations in numbers (Blaustein, 1978; Pearson, 1963), but they typically are not as drastic or pronounced as for voles. It appears that these species were available to raptors on most of the Mesa for the entire study period.

TABLE 3

Traplines of the herpetological survey in which California vole (Microtus californicus) were captured. Most captures were of juvenile individuals.

Trapline	10-16 Sept.	7 Nov.	10 Jan.	6 Feb.	28 Feb.	18 Apr.	21 Mar.	29 May
I					X		X	X
II		X	X				X	
III			X	X		X		
IV			X			X		
V			X	X		X	X	X
VI			X	X	X			
VII	not					X		
VIII	open							
IX								X
X			X	X	X			

Interestingly, there were no areas that were noticeably lacking in rodents. The herpetological study picked up Reithrodontomys in every trapline through the year. Mus do not enter can-traps.

Previous information for small rodents on the More Mesa comes from Waian (1973). This author trapped at the same location as my Central Hill (4) grid over a year period between February 1971 and January 1972. Also, he trapped once in September 1971 in the eastern portion of area 2a, near my Southcentral grid, and once in May 1971 just east of area 6e. The same species of small mammals were present in the rodent community ten years ago as are present today. Waian found that Microtus occurred in good numbers through the entire study (from 2.5 to 13.5 mice per 100 trap nights) and this species was the most frequently captured rodent in all trap areas, regardless of the time of year. Mus and Reithrodontomys were also present, but at lesser abundances than voles. The important indication is that Microtus can occur at high densities on the Mesa at all times of the year. This, of course, differs from the findings in the present study. It appears that any judgements about raptor-rodent relationships on the study area cannot be based solely on data from the present year, but must also consider conditions in the rodent communities that are likely to be present at other times (i.e. high Microtus abundance).

DISCUSSION

(a) Mammals of More Mesa

There are no species which occur in the study area that are of special concern at the federal, state or local level. From the perspective of the mammalian fauna alone, there is no unique or particularly valu-

able habitat present.

A comparison of the More Mesa areas with other lowland areas in the Goleta Valley does not create the impression that the study site is of a special quality. Inventories of the UCSB West Campus (Bennett, 1972; UCSB Herbarium, 1980) correspond closely with the species list compiled in this study. My impressions of other similar areas, such as the Goleta Slough, Coal Oil Point Reserve and the Ellwood Beach Mesa, are that these locations contain a comparable mammalian fauna. Rodent trapping in the Santa Barbara coastal region also shows More Mesa to be typical rather than unusual (Vertebrate Biology Class, 1975-82, UCSB; personal data; Schroder, pers. comm.; Holbrook, pers. comm.; Blaustein, 1978). Although the study area is not unique compared to other mentioned areas, it should be noted that these few locations share a special quality due to the expanse of habitats available to large mammals. Species such as the Gray Fox (Urocyon cinereoargenteus), Raccoon (Procyon lotor) and Striped Skunk (Mephitis mephitis) require large areas of land in order to find sufficient food and shelter and they would not be expected to survive if the Mesa habitats were reduced by any substantial amount (see White et al., 1980, for home range information).

Within the study area itself, the West and East Drainage Systems show the greatest species diversity. This is due to the fact that certain species are restricted there: Ornate Shrew (Sorex ornatus), Broad-handed Mole (Scapanus latimanus), Brush Rabbit (Sylvilagus bachmani), and Dusky-footed Woodrat (Neotoma fuscipes). However, the majority of species are expected throughout the area so the value of the drainage systems in regard to overall species diversity is not pronounced.

The introduced species on the Mesa are House Mouse (Mus musculus), Black Rat (Rattus rattus), Domestic Dog (Canis domesticus) and House Cat (Felis catus). All are generally expected throughout the study area.

(b) Small Rodents - The main contribution of this section towards a sensitivity analysis of More Mesa is an evaluation of the study site as a feeding ground for the three special raptors of the Mesa that feed primarily on small rodents. The Marsh Hawk and White-tailed Kite are diurnal predators, but the latter is known for concentrating its feeding efforts in the early morning and late afternoon (Stendall, 1967; Waian, 1973). The Short-eared Owl feeds mostly around dusk, but also through the evening hours (Clark, 1975; Craighead and Craighead, 1969). It is interesting to compare these activity patterns with those of the prey rodent species. Microtus is active at all times of the day and night (Pearson 1959) and thus is available to all these birds. Mus show crepuscular (twilight) activity (Jaksic and Yanez, 1979) which corresponds nicely with the habits of the kite and owl. This species appears a likely alternative prey. Reithrodontomys also show a small degree of activity at dawn and dusk, but it is primarily nocturnal in habit (Pearson, 1959). This species is clearly available to the Short-eared Owl, but it would appear that it is the least available prey for the Marsh Hawk and White-tailed Kite.

There is a general consensus in the literature that Microtus is the preferred prey item of the White-tailed Kite (Dixon et al., 1957; Hawbecker, 1940; Pruett-Jones et al., 1980; Stendall and Myers, 1973; Waian and Stendall, 1970; Warner and Rudd, 1975). Many studies show that Microtus is the most plentiful species in pellet remains (most of the references just mentioned). It has been suggested that voles may be

required for successful breeding by the kite (Hawbecker, 1940; Pruett-Jones et al., 1980). Mus is invariably the second most common rodent in the diet of these birds and Reithrodontomys is known to comprise as much as 18% of the prey (Waian and Stendall, 1970). However, it is known that the White-tailed Kite can get along adequately with Mus as a predominant prey and Microtus at low levels (Bond, 1942; Cunningham, 1955; Warner and Rudd, 1975). Waian and Stendall (1970) have reported that the kite shows nomadic behavior in order to search out and take advantage of fluctuating Microtus populations, but significantly, Mus can be used as a substantial alternative prey if vole numbers are not high (Stendall, 1967).

I have generally concluded that Microtus were not plentiful on the Mesa until after the first months of the year. It is significant that a number of White-tailed Kites spent substantial time hunting on the study site this winter, particularly on the upper grassland areas (see bird section). On several occasions they were observed hunting over my grids that did not capture Microtus. This implies that these birds were utilizing the area to hunt Mus, (or perhaps Reithrodontomys). Given this situation, it may be true that the use of the study site as a feeding area by the White-tailed Kite this winter has been less than it could be in other years. Given a year with healthy populations of Microtus, the kite might be found feeding more frequently and more abundantly on the Mesa.

In considering which area(s) of the study site might be the most important for feeding by the White-tailed Kite in future years, I would point to the possible indication that the vicinities of the drainages favor Microtus, the kite's favorite prey. To maintain Microtus

populations, these areas are potentially needed as refuges for the species during dry periods (i.e. summer). However, the grasslands are the most important foraging areas for the kites and Microtus will occur abundantly in these locations when conditions are favorable. In contrast to these results, I could not detect any particularly favorable or unfavorable areas for Mus or Reithrodontomys from the rodent trapping, so no judgements can be made about different areas of the Mesa in regard to these alternative prey.

In a manner parallel to the White-tailed Kite, the Short-eared Owl seems to prefer voles and will be nomadic in order to find and utilize good populations of that prey type (Clark, 1975). Clark (1975) also indicates that this owl will eat mostly other rodents if Microtus is not abundant. The comments I have just made about rodents in relation to the kite seem to apply equally well in regard to the Short-eared Owl.

The last raptor, the Marsh Hawk, takes birds to a large degree along with its preferred small rodents (Brown and Amadon, 1968); so it is undoubtedly less susceptible to variations in the numbers or types of rodents available. Any consideration to provide adequate feeding area for the previous two species would be expected to also cover for the needs of this latter species with regard to rodent prey.

Finally, the winter home ranges of all three species are generally large and each species will travel a considerable distance from its roost if necessary (i.e., far enough to be off the Mesa site) (Verner et al., 1980). It is therefore not possible to make a judgement about the size of areas on the Mesa that should be maintained to support the raptors that occur there. Marsh Hawks generally range over 100 ha or more and Short-eared Owls usually range over at least 75 ha in continuous

natural habitat. Therefore, a single individual of either species requires nearly half the area of the study site or more, if it ranges only within the Mesa boundaries.

HERPETOLOGICAL FAUNA

Samuel S. Sweet

OBJECTIVE - To inventory the herpetological fauna (amphibians and reptiles), determine the presence of any species of special concern and evaluate the importance of More Mesa as habitats of special concern for these animals.

INTRODUCTION - The amphibian and reptile portion of the survey was conducted to assess the species composition, abundance and habitat affiliations of the herpetofauna of More Mesa. Amphibians (frogs, toads and salamanders) and reptiles (turtles, lizards, and snakes) are relatively sedentary vertebrates, and are good indicators of levels of environmental disturbance. Many species are poor colonists, and seem to require a long period to re-establish themselves in an area; many of these are habitat specialists and hence are sensitive to changes in environmental quality on a finer scale than are such mobile vertebrates as birds and mammals. The local fauna also includes several opportunistic species which are quick to recolonize disturbed areas. These are, nonetheless, sensitive to continuing levels of disturbance, and can provide good comparative data for the assessment of overall environmental quality.

Of the 22 species known or reasonably expected to occur on More Mesa (the latter based on extensive field experience elsewhere in coastal Santa Barbara County), 12 may be considered poor colonists and 10 appear to be good colonists (Table 4). Comparisons between these sets of species comprise a general level of analysis pursued below. Finer

resolution is available through a consideration of the abundances of species found to be present at characteristic densities observed elsewhere in coastal Santa Barbara County.

METHODS - Amphibians and reptiles are quite diverse in their habitat preferences, activity patterns and population densities: no single survey method is adequate for all components of the fauna. For the present study I adopted two techniques: direct search and pitfall trapping. When performed with knowledge of habitat requirements and times and seasons of peak activity, direct search is effective in establishing presence or absence for most species, but it is not reliable as a means of estimating absolute densities. Relative density impressions are useful in comparing areas for single species if conducted under comparable conditions.

Pitfall trapping is a well-established technique for censusing populations of amphibians and lizards, though it is generally not effective or representative for frogs, toads, turtles and larger snakes. The method involves sinking large, smooth-sided containers flush with the ground surface, with a projecting and slightly raised solid lid. Animals foraging or seeking shelter pass under the lid and fall into the container to await the investigator's return.

The pitfall trapping portion of the study was conducted in the following way: containers were 4 gallon plastic buckets fitted with plywood lids. The lids were raised about 3 cm above the bucket rim on small notched pegs. Notching prevents the lids from being dislodged by skunks, raccoons, opossums and other predators, which are often attracted to the traps by the sounds or scents of the animals within.

Table 4. Designation of species of amphibians and reptiles known or expected to occur on More Mesa as "poor" or "good" colonists following habitat disturbance. Species are ranked 1 to 3 on the basis of degree of restriction (low to high) to localized habitat types. Asterisks denote those species observed on the study area during the course of the survey, or within the past two years (pond turtle).

Poor Colonists	Rank	Good Colonists	Rank
* Slender Salamander (Batrachoseps nigriventris)	2	* Western Toad (Bufo boreas)	2
Ensatina (Ensatina eschscholtzii)	3	* Pacific Treefrog (Hyla regilla)	1
Arboreal Salamander (Aneides lugubris)	3	* Bullfrog (Rana catesbeiana)	3
Red-legged Frog (Rana aurora)	3	* Pacific Pond Turtle (Clemmys marmorata)	3
* Side-Blotched Lizard (Uta stansburiana)	3	* Western Fence Lizard (Sceloporus occidentalis)	1
Coast Horned Lizard (Phyrnosoma coronatum)	3	* Southern Alligator Lizard (Gerrhonotus multicarinatus)	1
Western Skink (Eumeces skiltonianus)	1	* Gopher Snake (Pituophis melanoleucus	1
Legless Lizard (Anniella pulchra)	3	* California Kingsnake (Lampropeltis getulus)	1
* Ringnecked Snake (Diadophis punctatus)	2	Striped Racer (Masticophis lateralis)	2
Blue Racer (Coluber constrictor)	2	Common Garter Snake (Thamnophis sirtalis)	2
Night Snake (Hypsiglena torquata)	3		
Rattlesnake (Crotalus viridis)	2		
Mean Rank	2.50		1.70

The initial study proposal called for the establishment of 10 lines of 20 traps each in a diversity of habitats on the Mesa. Cost of materials and the labor involved in sinking traps in hard soil led us to reduce the number of traps/line to 10 while maintaining broad areal coverage (10 lines); this was felt to be a better practice than extending 5 lines to 20 traps each. The locations of the 10 lines established are shown in Figure 44; an effort was made to sample each of the major vegetation types present on the Mesa with the exception of the wetter portions of areas 3a and 6a, and the willow-choked ravines (areas 3d, 6c, 6d, 6e and 6f) where seasonal flooding would render the traps ineffective.

Where possible, traps were laid out in a line with 10-20 m spacing between them. Each trap was sited near a feature (usually the base of a Coyote Bush or Sweet Fennel clump) which would be attractive to foraging animals as well as offering shade and concealment for the trap lid. Traplines were initially flagged with surveyor's tape, but this lead to a repeated pattern of vandalism and trap destruction. We were thus forced to leave the line locations unmarked and to conceal the trap lids with grass and brush, and in a few cases to relocate the traps.

Traplines I-IV were established in late August. Difficulties encountered in producing trap-sized holes in the hard adobe soil caused us to postpone siting further traplines until the first rains, lines V-VI being placed on 12 November and lines VII-X in the period 21-25 November. Installing lines I-IV required 46 hours of work by myself and Ms. Leum; I installed the 6 remaining lines myself in 14 hours.

The traps were designed to be securely closable when not in operation, the initial plan being to open them for 10 days each in late

summer (July-August), late fall (November-December) and late spring (April-May). The first sampling intervals (10-16 September and 5-12 November) were conducted in this way, but thereafter the traps were left open continuously and checked at approximately three-week intervals from January to June. Continuous sampling was decided upon when the early results failed to show several species which were expected on the basis of occurrence in similar habitats in close proximity to More Mesa.

We were initially concerned that continuous trapping would result in high mortality in trapped animals, due both to the limited fat reserves of recent hatchlings in the fall and relatively high soil temperatures. This did not develop to be the case; of a total of 763 western fence lizards removed from the traps only 23 were dead, and 17 of these were in traps which had flooded. Four of the remaining six dead lizards were apparently killed by large Jerusalem crickets. Trap aperatures were purposely kept low to exclude most small mammals; that this was largely successful is documented by the inadvertent capture of only one adult vole and three subadult gophers in undisturbed traps, versus about 20 gophers, 12 adult voles, 7 moles, 5 black rats and a young ground squirrel in traps whose lids had been taken or destroyed by vandals.

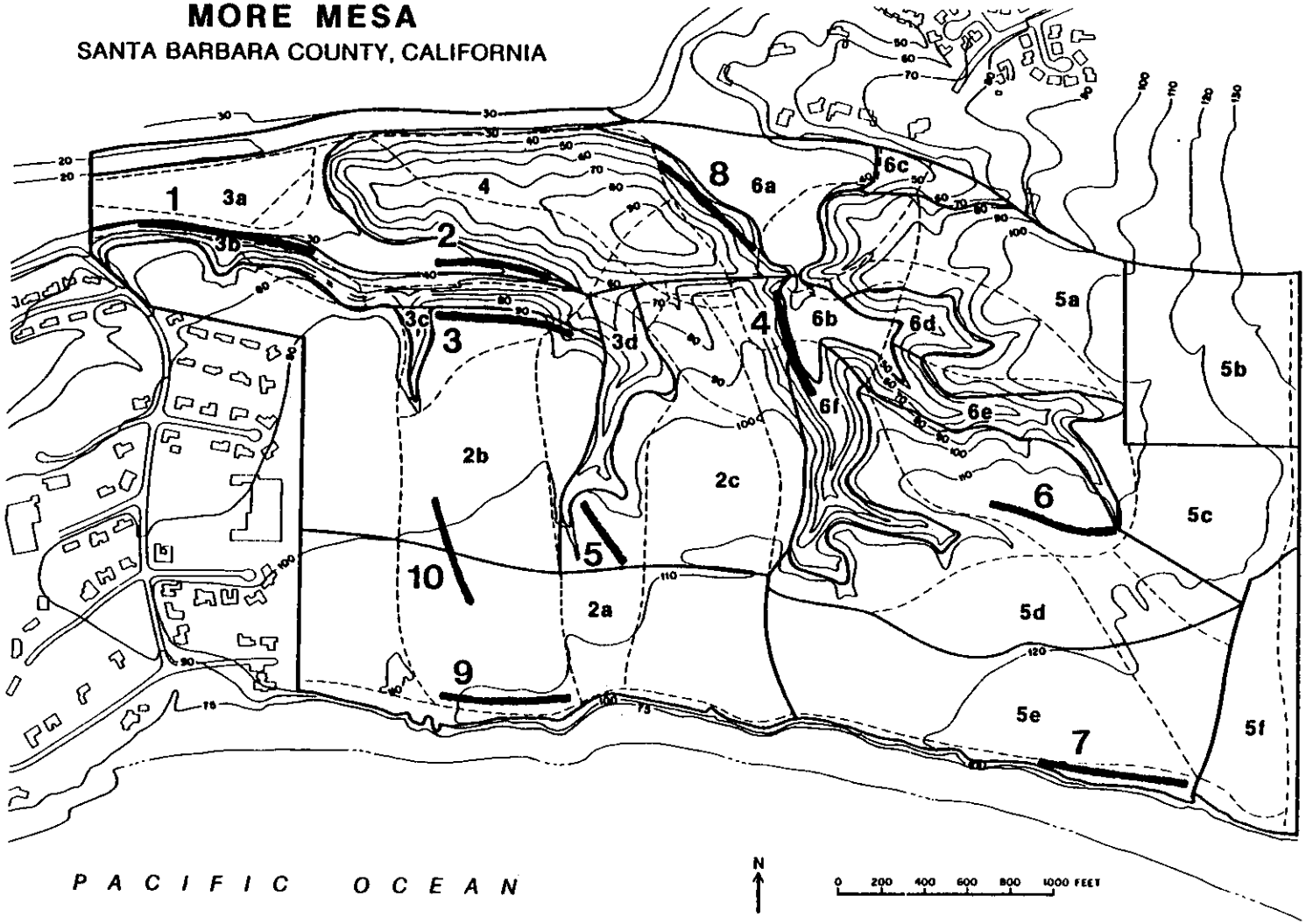
Animals removed from traps were counted and categorized by size (hatchling, subadult, adult), and released about 10 m distant at right angles to the trapline to avoid their immediate recapture. None was individually marked, since the object of the study was to establish occurrence, relative measures of density, and patterns of seasonal activity. Nonetheless, the maximum total captures/interval is a conservative figure for minimum population sizes for each species in each

Fig. 44. LOCATIONS OF PITFALL TRAPLINES.

The locations of pitfall traplines used to capture herpetofauna are illustrated.

1 - Line I.
2 - Line II.
3 - Line III.
4 - Line IV.
5 - Line V.
6 - Line VI.
7 - Line VII.
8 - Line VIII.
9 - Line IX.
10 - Line X.

Fig. 44. LOCATIONS OF PITFALL TRAP LINES.



habitat.

The work performed totalled 93 hours of field work on 30 visits to the site by myself, and about 30 hours of field work on 8 visits for Ms. Leum, who also fabricated the trap lids (22 hours). Ms. Leum was unable to continue on the project after October owing to academic time constraints.

Field time spent on the project consisted of the following: initial survey work, 5 trips, 3-31 July, 9 hours (Sweet) and 7 hours (Leum); can trap installation, 9 trips, August and November, 37 hours (Sweet) and 23 hours (Leum); trapline checking, 9 trips, September through May, 29 hours; and other survey work, 7 trips, December through May, 18 hours.

RESULTS - Eleven of 22 expected species were found to occur on the More Mesa tract (Table 4), consisting of one salamander, three frogs, one turtle, three lizards and three snakes. Eight of these 11 species are considered good colonists; only two species in this category were not observed. In contrast, only 3 of 12 species in the "poor colonist" category were found to be present. At this level of analysis, More Mesa would appear to have undergone severe habitat damage in the past. Despite its present natural appearance it supports a very reduced amphibian and reptile fauna, with fewer species than either the adjacent UCSB campus or undeveloped portions of the western edge of the Mesa in Santa Barbara, along Las Positas Road (see Table 5). This result was not expected, but seems to be a reliable one based on the amount of field work conducted on More Mesa.

The following discussion presents short accounts of the biology of species known to occur on More Mesa, together with distribution maps of

Table 5. Amphibian and Reptile species presently known from comparable coastal habitats adjacent to More Mesa.

Mesa, Santa Barbara	UCSB Campus
• Slender Salamander	• Slender Salamander
• Arboreal Salamander	• Ensatina
• Western Toad	• Western Road
• Pacific Treefrog	• Pacific Treefrog
• Bullfrog	• Bullfrog
• Pacific Pond Turtle	• Pacific Pond Turtle
• Side-Blotched Lizard	• Western Fence Lizard
• Western Fence Lizard	• Coast Horned Lizard
• Western Skink	• Western Skink
• Southern Alligator Lizard	• Southern Alligator Lizard
• Legless Lizard	• Legless Lizard
• Gopher Snake	• Gopher Snake
• California Kingsnake	• California Kingsnake
• Striped Racer	• Common Garter Snake
• Blue Racer	? Rattlesnake
• Ringnecked Snake	
16 species	14 (15) Species

records for each species (Figures 45-55) and can trapping results. The latter are most extensive and informative for the Western Fence Lizard (Sceloporus occidentalis; Appendix IV and Table 6); results for other species are treated in summary fashion (Table 7).

A. Species known to occur on More Mesa.

Southern Slender Salamander (Batrachoseps nigriventris). The several species of slender salamanders are characteristic amphibians of woodland and chaparral habitats below about 7000' elevation throughout much of California. They are fully terrestrial, depositing their eggs in damp situations on land, where they hatch without undergoing a larval stage. A single species, B. nigriventris, occurs in mainland Santa Barbara County.

Slender salamanders are abundant locally in oak woodland, and are active on the surface from October-April, depending on the advent and periodicity of the winter rains. They are relatively tolerant of disturbed conditions, and may be abundant in watered shrubby yards and gardens.

As indicated on Fig. 45, slender salamanders were not common on the study area, occurring in and adjacent to oak woodlands comprising area 3b and the east slope of area 4, and in oak-willow vegetation in the ravine area 6e. Other ravines with stands of willow are very probably inhabited as well. The adobe soil underlying most of the Mesa proper probably limits the occurrence of these salamanders, which require access to moist soil at depth during the dry season.

The pattern of occurrence seen for this species is typical of the local coastal strip. Individuals are less common here than in compar-

Table 6. Total captures for Western Fence Lizards by habitat type and date. The largest number caught on each line is underlined.

Line	Habitat	Area	10-16 Sept.	5-12 Nov.	10 Jan.	6 Feb.	28 Feb.	21 Mar.	18 Apr.	4 May	29 May
I	Willow/road edge	3a,b	20	23	0	1	0	1	4	10	11
II	Willow/wet grassland	3a,4	19	20	0	2	15	0	2	13	8
III	Oak-grassland slope	2b,3b	20	18	4	1	66	3	7	7	40
IV	Sweet Fennel-Baccharis Slope	2c,6b	45	54	3	2	3	1	4	9	7
V	Sweet Fennel-grassland flat	2c	not open		2	0	5	5	2	6	13
VI	Dense Sweet fennel flat	5d	"	"	6	0	1	1	2	6	6
VII	Scrub-cliff edge	5e	"	"	6	5	13	1	6	19	9
VIII	Oak woodland	4	"	"	6	2	2	0	2	11	6
IX	Grassland-cliff edge	2a	"	"	15	6	3	7	10	16	11
X	Grassland-flat	2a,2b	"	"	16	8	21	5	18	22	17
	captures/date		(104)	(115)	58	27	129	26	57	119	128

able areas on the UCSB campus and in the vicinity of Hope Ranch, but the animal is nowhere abundant below the Santa Ynez foothills.

Western Toad (Bufo boreas). This is the only toad in coastal Santa Barbara County, and throughout most of the Pacific states. It is an adaptable species, and will tolerate suburban development as long as suitable breeding sites remain within a distance of half mile or so.

These toads breed in early spring in ponds and slow-flowing drainages, beginning as early as late February in some years, in others (such as 1982) not until mid-April, apparently depending on the cessation of winter storm patterns. The larvae require 40-60 days for development, metamorphosis often being initiated by the drying up of streams and pools. Juveniles and adults construct permanent burrows in soft soil, from which they emerge to forage on damp nights.

The several creeks which drain into Goleta Slough are the principal remaining breeding sites for western toads in the Santa Barbara-Goleta region. The largest population I know of locally employs Atascadero Creek between Patterson Avenue and Turnpike Road. Both the streambed and its sandy environs are essential for the continued presence of this species, and adjacent patches of willows are probably important as accessible refuge and foraging areas for juveniles.

Figure 46 indicates the principal breeding areas in Atascadero Creek near More Mesa; the few other sightings are all in seasonally-flooded wetlands (3a, 6a) or in the riparian vegetation nearby. While adults may forage more widely, the adobe soil of the Mesa proper prevents the construction of daytime retreats, and toads probably do not occur much beyond the confines of lowland and ravine areas.

Pacific Treefrog (Hyla regilla). This is one of two local species,

Table 7. Can-trap records for amphibians and reptiles other than Sceloporus occidentalis on More Mesa. See species accounts for details of occurrence and abundance.

Species	# of records	Traplines
Slender salamander (Batrachoseps nigriventris)	4	I, III
Western toad (Bufo boreas)	2	I, II
Pacific treefrog (Hyla regilla)	10	I, II, IV, VI, VIII, X
Alligator lizard (Gerrhonotus multicarinatus)	18	I, II, III, IV, VI, VII, IX
Ring-necked snake (Diadophis punctatus)	1	I
King snake (Lampropeltis getulus)	1	I

Fig. 45. SOUTHERN SLENDER SALAMANDER
Batrachoseps nigriventris

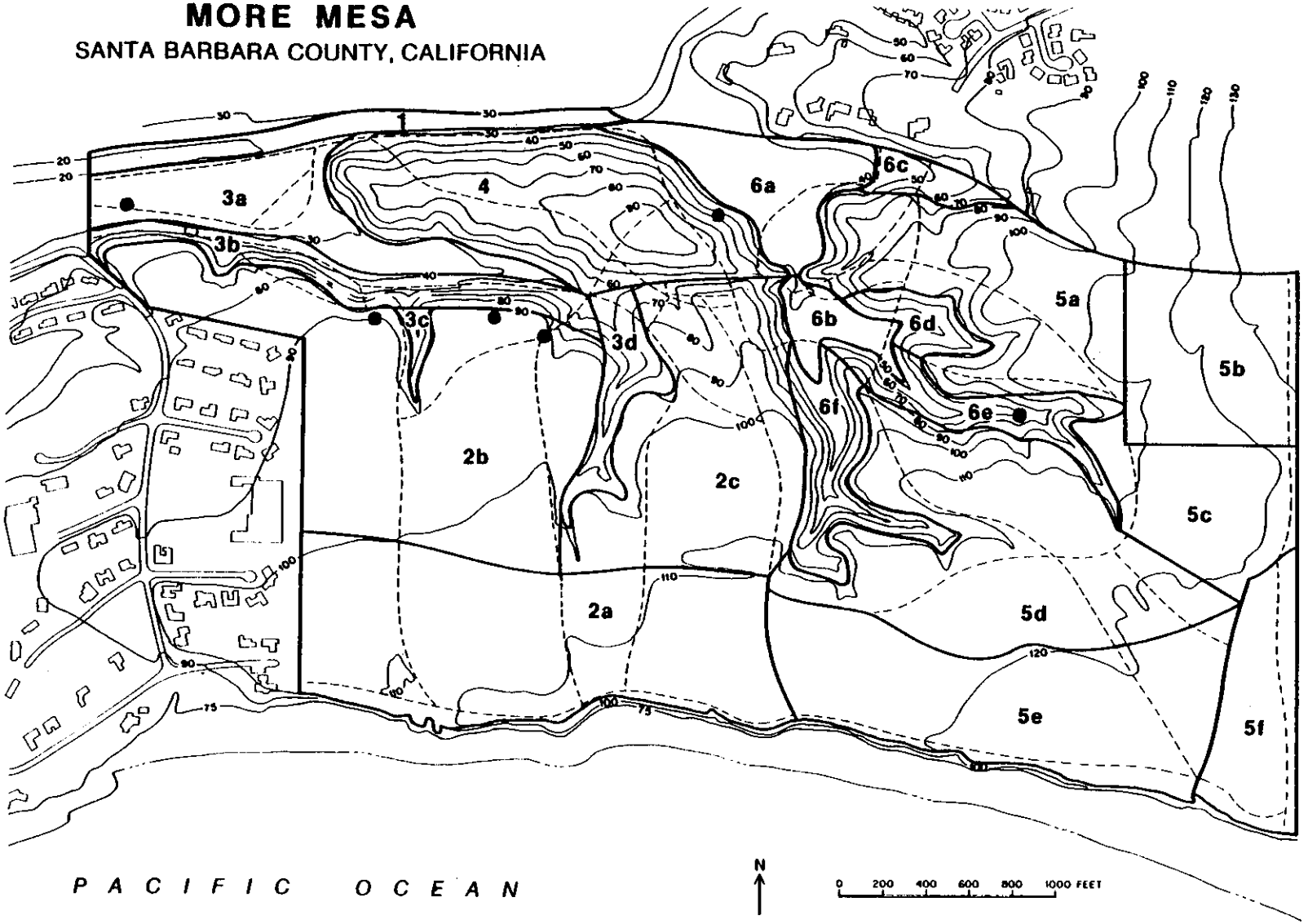
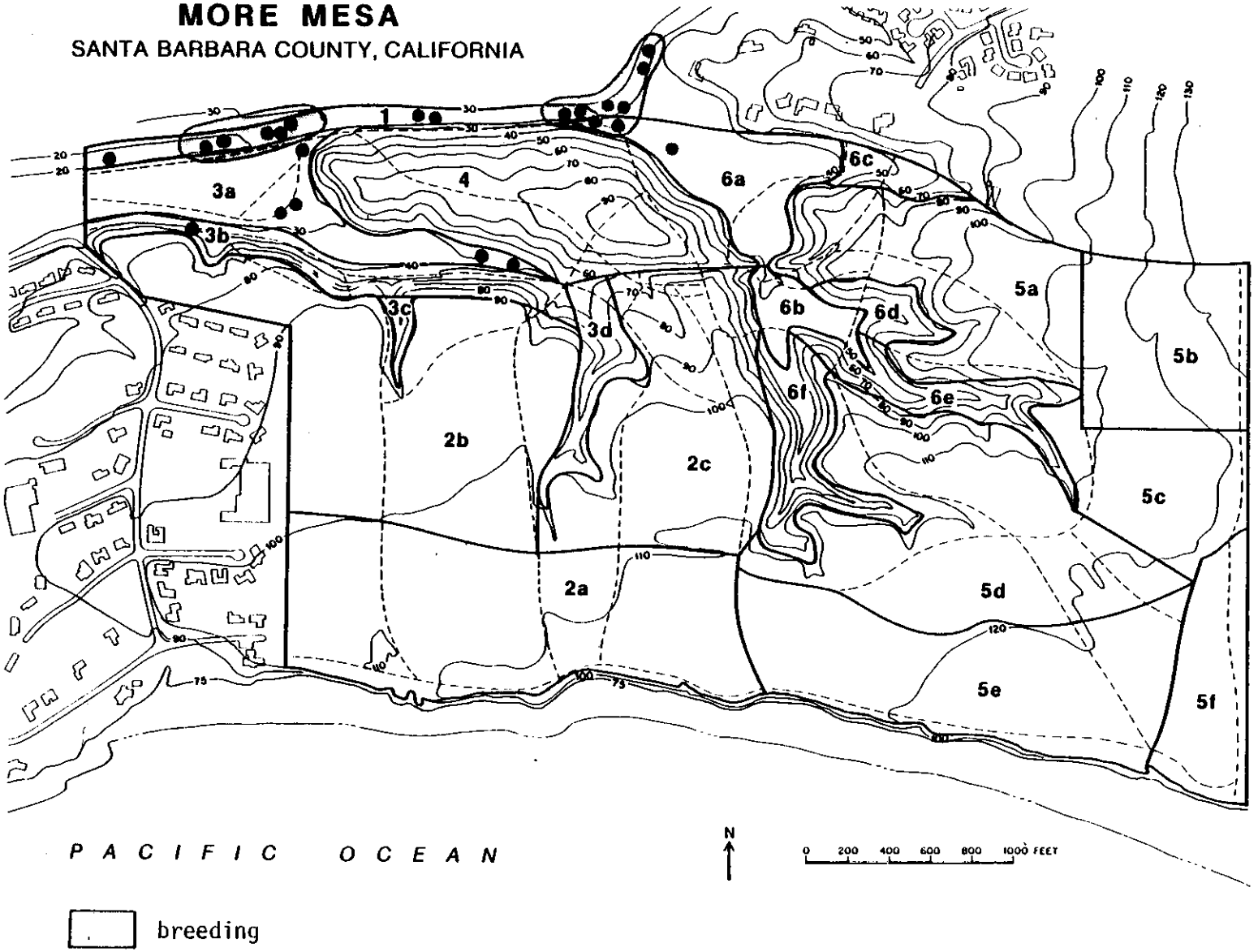


Fig. 46. WESTERN TOAD
Bufo boreas



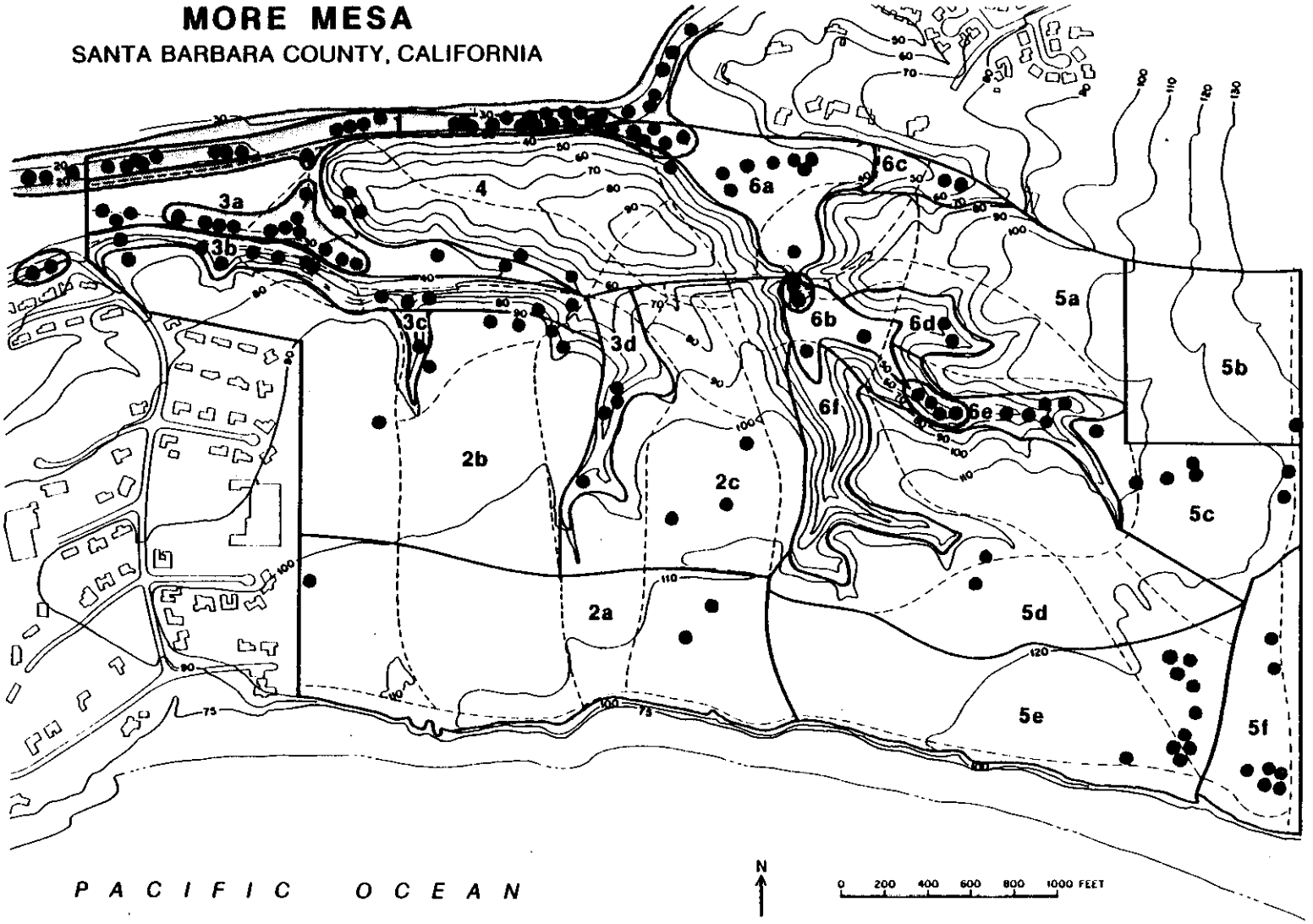
and by far the more generally distributed (H. cadaverina being restricted to rocky canyons). These frogs seem little affected by suburban development as long as breeding sites are preserved, and in fact may benefit from well-watered dense hedges, etc.

Pacific Treefrogs remain underground in rodent burrows during the summer and fall, emerging with the first fall rains to forage in grassy and shrubby areas. Males begin calling as soon as vernal ponds, ditches and streams fill with runoff, but breeding is delayed until most of the rainy season is past. Vernal pool populations may begin breeding in late January, whereas stream populations seldom breed until late March or early April. Larvae require 30-50 days for development.

As Figure 47 indicates, Pacific Treefrogs occur throughout More Mesa, individuals dispersing onto the Mesa proper as soon as the soil is wet, and probably remaining there yearround where rodent burrows offer shelter. There are several breeding sites on the study area, the most important being the flooded ditches transecting area 3a. Atascadero Creek supports scattered breeding individuals, as do flooded parts of areas 6b and 6e, plus the vernal pool in area 5f. Based on the numbers of males calling, the ditches in area 3a support more treefrogs than all other sites combined. The rank vegetation of areas 3a and 3b probably contributes to this by providing a large expanse of excellent foraging and sheltering habitat for juveniles and adults. The dense emergent vegetation of the ditches provides both food and shelter for larvae. The latter is important, for, unlike Western Toad larvae, treefrog larvae are not toxic and are extensively preyed on by birds.

Bullfrog (Rana catesbeiana). Bullfrogs were introduced to California in the 1840s, and appeared in the Goleta area in the late 1950s,

Fig. 47. PACIFIC TREEFROG
Hyla regilla



probably either as escaped fish bait in Lake Los Carneros or as released animals from UCSB. These large, fully aquatic frogs are a major nuisance, and have eliminated the native lowland Red-legged Frog (R. aurora) from much of its former range.

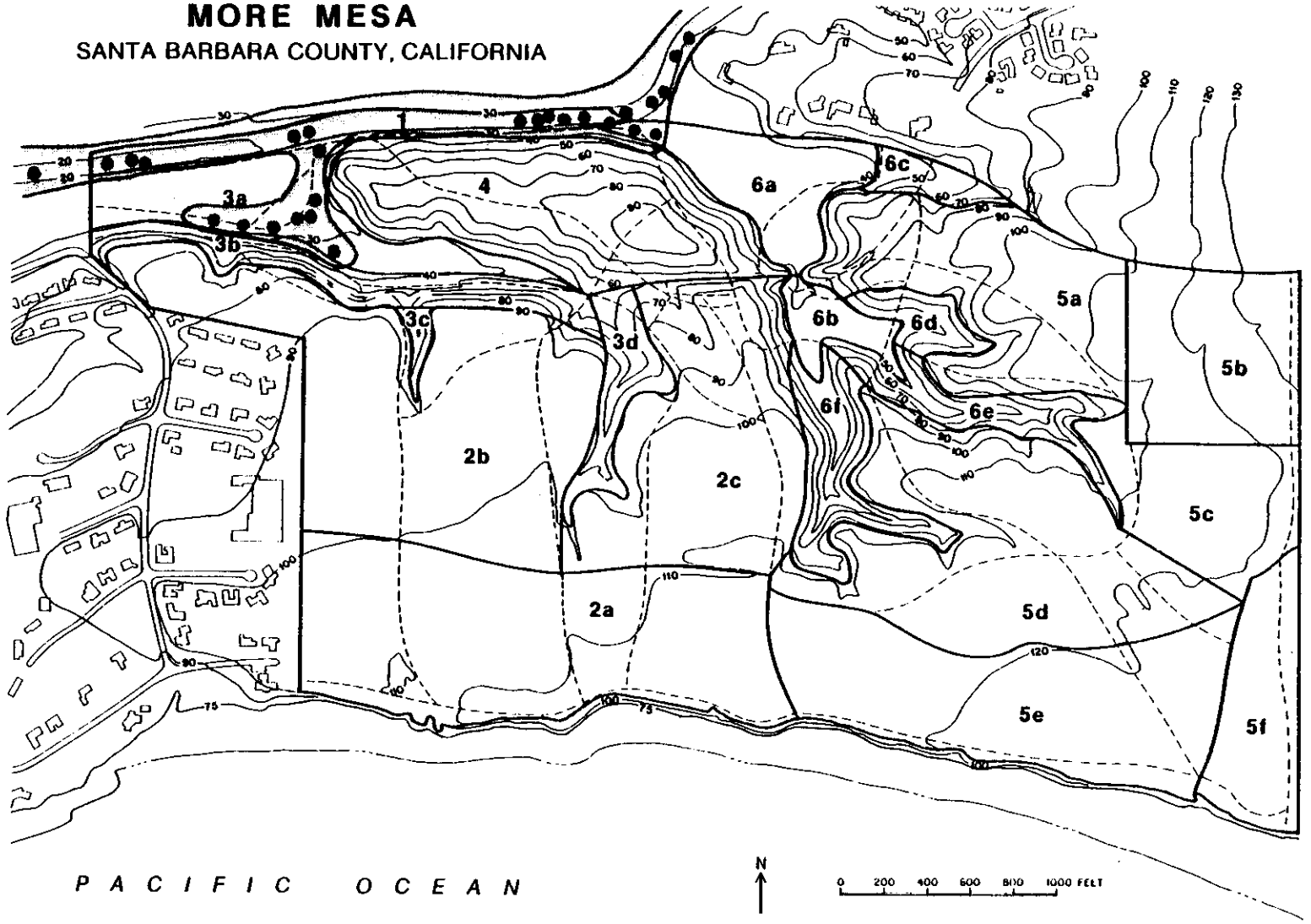
Bullfrogs are active yearround in permanent streams and ponds, requiring little other than a few deep pools and dense emergent vegetation. They may survive several months of drought buried in the mud of such sites. Breeding occurs in early spring (March-April); for the first 1-1/2 to 2 months the larvae are active only at night, burrowing into sediment and submerged vegetation by day. As they reach large size the larvae become more conspicuous and active; depending on the availability of water and the degree of crowding, larvae may metamorphose at 5-6 months of age or over-winter and metamorphose the following summer.

Bullfrogs are moderately common in Atascadero Creek, although this is unfavorable for them in many respects. Few larvae survive to metamorphosis, most being killed when the creek dries up in mid-summer. Figure 48 shows scattered records in Atascadero Creek and the ditches in area 3a. These frogs do not leave the immediate vicinity of permanent water, and would not be expected to occur elsewhere on More Mesa. No consideration whatsoever should be given to their survival.

Pacific Pond Turtle (Clemmys marmorata). Pond turtles are becoming rare in coastal Southern California as freshwater marshes are drained and the lower reaches of streams channelized. Only a few small populations remain on the coastal slope in Santa Barbara County, though they are moderately common in the larger drainages inland.

Pond turtles require relatively permanent bodies of water with deep pools or dense emergent vegetation for shelter. They are intolerant of

Fig. 48. BULLFROG
Rana catesbeiana



human activity, and seldom persist except as occasional vagrants once their habitat is modified or small boys become frequent.

The records plotted on Figure 49 are from 1977-79; no pond turtles were found during the present survey, although a few are still present in Atascadero Creek below Patterson Avenue. It is doubtful that these constitute a breeding population; more likely they are vagrants from Lake Los Carneros or escaped or released captives.

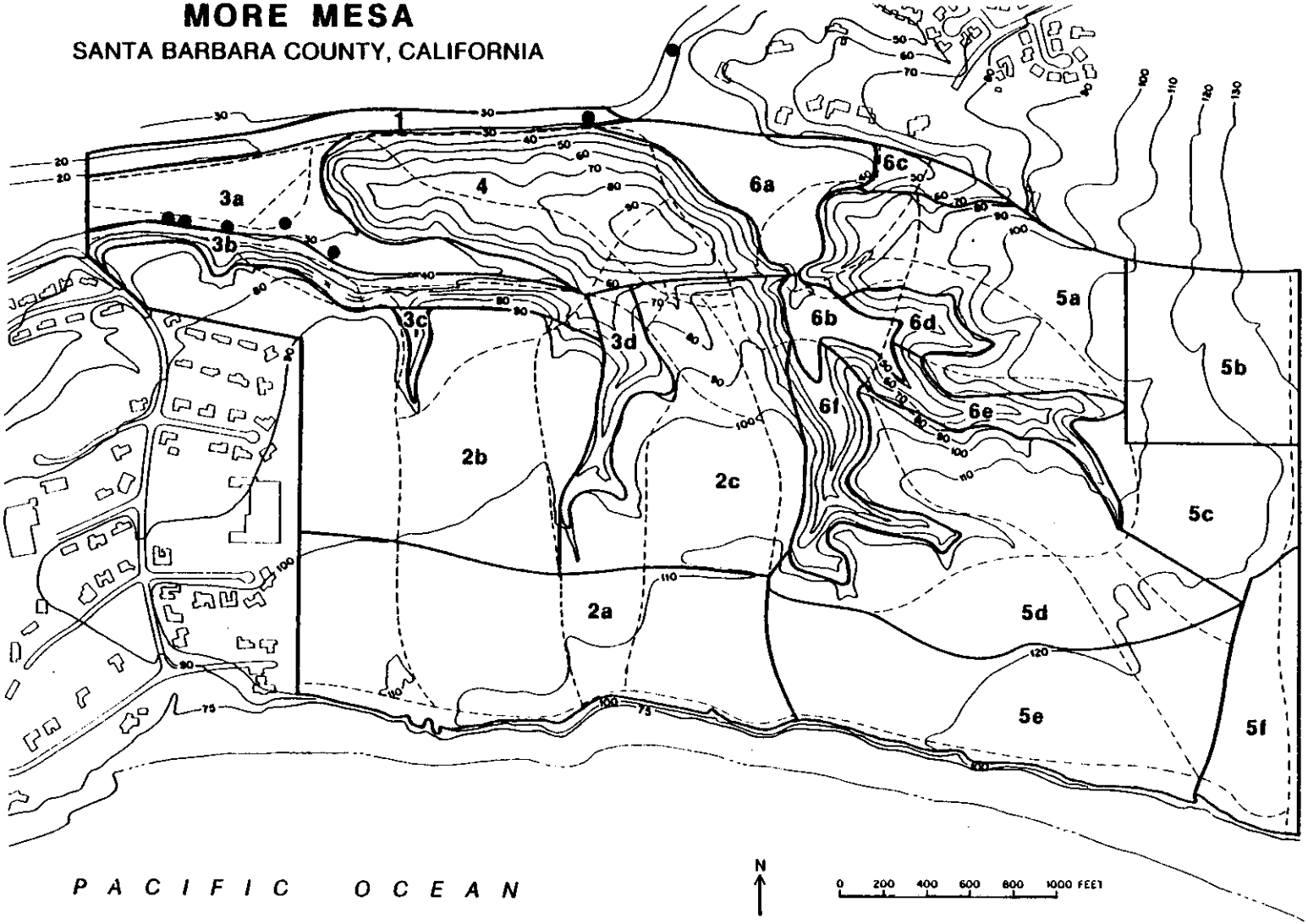
The ditches in area 3a and Atascadero Creek itself constitute very marginal habitat for pond turtles, and there is little potential for improving this situation.

Side-Blotched Lizard (Uta stansburiana). This species is one of the most widespread and abundant lizards in California, occurring from beaches and deserts up to elevations of 8500 feet. It is a smaller animal than the Western Fence Lizard, and tends to occur in more open habitats. Individuals are short-lived, populations turning over almost annually. Females produce several clutches of 4-6 eggs during the summer, which hatch in 35-45 days. The young mature and breed towards the end of their first year of life, and few survive more than 2 years.

Populations of Side-blotched Lizards occur down to the coast as far north as Carpinteria; to the north and west they quickly retreat inland to the foothills. A few very local populations occur along the coast in the Santa Barbara-Goleta area: near City College, above the tennis courts on Las Positas Road, on the beachfront cliffs below Hope Ranch 3/4 mile W of Henry's Beach, and on the rocky point below More Mesa (Figure 50). None is known farther up the coast.

The apparent basis for this distributional restriction is tied to the frequency of summer fog. Cool, foggy days permit little activity,

Fig. 49. PACIFIC POND TURTLE
Clemmys marmorata



and the lizards grow slowly; apparently they fail to survive long enough to reach sexual maturity. The More Mesa population contains few individuals, but is probably stable and reproducing. As is the case in other local coastal sites, the rocky habitat here presumably offers better than average shelter from predators, resulting in individuals surviving long enough to reach reproductive size even though growth rates are comparatively slow.

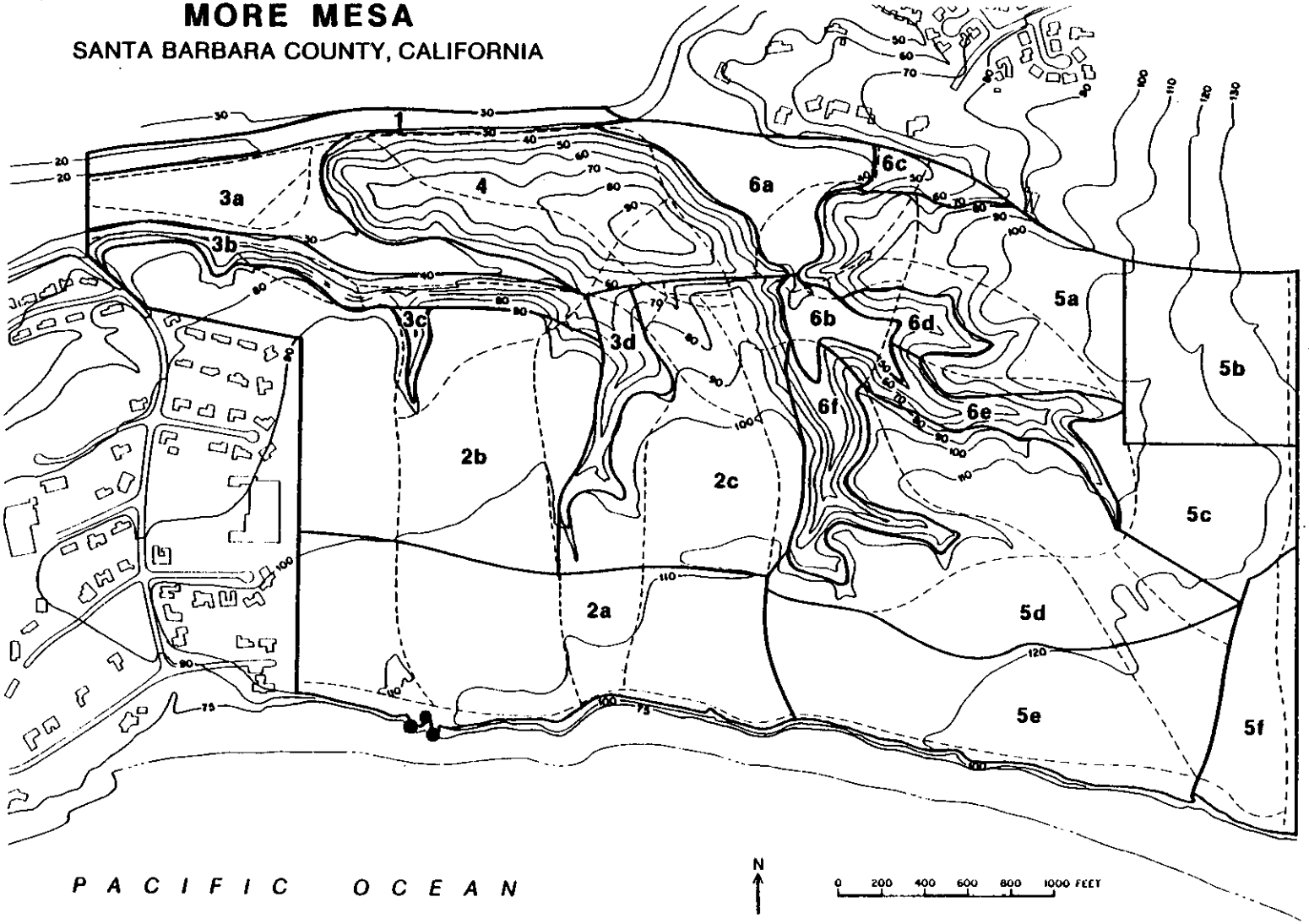
The presence of this species is interesting, but in view of its abundance a few miles inland and throughout much of California the More Mesa cliff population is of significance only in view of the discussion above.

Western Fence Lizard (Sceloporus occidentalis). Fence lizards are by far the most abundant and widespread reptile on More Mesa, as is the case in most of California. They are well-suited to most habitats in coastal Santa Barbara County, being uncommon or absent only in marshes and wet lowland areas.

This species reaches larger size than the side-blotched lizard with which it usually occurs, and seems to exhibit higher survival rates. Much of this probably owes to a lesser tendency to occupy microhabitats which offer few sites for concealment from predators; usually a fence lizard is only a few feet from a secure mammal burrow, rock crevice or log into which it can retreat. Nonetheless, this species is an important prey item for many snakes and smaller birds of prey, particularly kestrels and to a lesser extent white-tailed kites.

Female western fence lizards deposit 2-3 clutches of 6-10 eggs during the summer, usually in exposed sandy situations such as road edges or the tops of steep slopes. These require about 45-50 days to hatch.

Fig. 50. SIDE-BLOTCHED LIZARD
Uta stansburiana

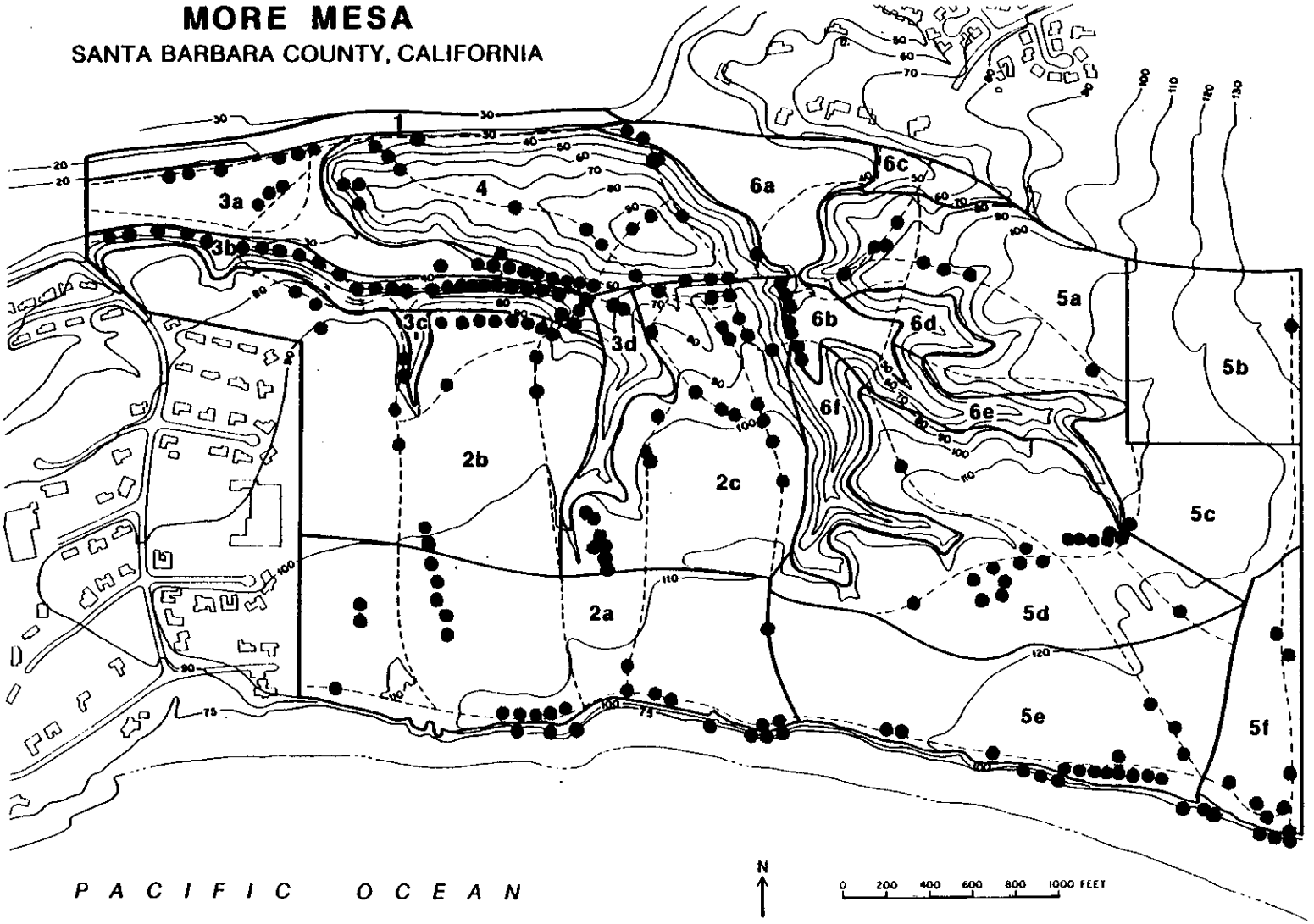


Young from the first clutch, laid in late April or early May, may attain sexual maturity and breed in the following summer, whereas those from later clutches require an additional year to reach reproductive size. Overwinter survival of young is typically about 10% versus about 50% for larger individuals.

Distributional records for this lizard on More Mesa are shown in Figure 51; the occurrence and seasonal abundance of individuals is treated in more detail in the next paragraph. It will be noted that most of the records plotted lie along trails (particularly in area 3b), or derive from the can-trapping portion of the herpetological survey. Trails (and the cliff edge) appear to offer excellent habitat for these lizards on the Mesa, probably because of the juxtaposition of dense cover and open ground. The latter is important since fence lizards are sit-and-wait predators, remaining still in or near cover and rushing out to capture insects. The dense grassland and Sweet Fennel-grassland of the Mesa proper appears to support low lizard densities presumably because it offers little open ground for foraging. Fence lizards are absent from the marshy areas 3a and 6a except along raised roadbeds, and they are uncommon or absent in the densely vegetated ravines (areas 3d, 6e and 6f).

Western Fence Lizards were by far the most abundant species on the Mesa: a total of 763 captures was recorded, representing a minimum of 250 individuals. Capture data for this species are listed in Appendix IV and summarized in Table 6. The overall seasonal activity pattern is well displayed in these results: in the mid-September and early November sampling periods the large number of captures in lines I-IV was comprised of about 65% hatchlings (146 of 219); thereafter only adults

Fig. 51. WESTERN FENCE LIZARD
Sceloporus occidentalis



were secured until late February, when a few days of warm weather brought out large numbers of hatchlings again. Cold weather in March and early April reduced activity markedly, with only a few adults active; individuals of the hatchling class began to reappear in late April, but constituted only 35% of the sample (13 of 39) on 2 May, and 38% of 25 on 29 May. This reduction in frequency probably approximates overwinter mortality, which from these data would be about 91% of the hatchling age group. In contrast, by the same method I estimate about 47% overwinter mortality in adult lizards on lines 1-4. These figures are typical for small lizard populations, and suggest that More Mesa is "average" in terms of environmental quality for this species.

The winter and spring records from lines V-X show a comparable seasonal pattern; overwinter mortality cannot be estimated owing to the lack of fall records, but the hatchling age group amounted to about 39% (31 of 80) of the captures in these traps on 2 May, and 37% (23 of 62) on 29 May.

Habitat usage and populations density estimates for Sceloporus on More Mesa are derivable from the information summarized in Table 6. Densities appear to be least (6,13) in the flat mixed Sweet Fennel grassland and oak woodland (11) portions of the Mesa; populations are 2-4 times larger in grassland and low brush along the frontage cliffs (16,19), flat open grasslands of the Mesa surface (22) and wet grassland-willow and willow-road edge habitats (20,23). The highest densities observed (54,66) were on steep slopes in Sweet Fennel-Coyote Brush and at the contact between open grassland and oak woodland.

Comparison between can-trap and observational data illustrates the utility of the former method. Visual censusing gave the impression that

Fence Lizards were most abundant along the road edge near Line I and along the cliffs near Lines VII and IX, when in fact these areas support intermediate densities. Few lizards were observed near Lines II, III, IV, and VIII, and none was seen in the vicinity of lines V and X; trapping shows densities of 20, 66, 54 and 11 in the first group, thought to be homogenous and low by observation, and 6 and 22 near Lines V and X where observation would indicate that no fence lizards were present.

These data also suggest that fence lizards are more active through the winter on and near the beachfront cliffs than is the case in other habitats surveyed.

Southern Alligator Lizard (Gerrhonotus multicarinatus). Alligator Lizards are widespread and common in southern coastal California, and are frequently abundant on coastal mesas and bluffs. They tend to favor brushy habitats (Sweet Fennel-Coyote Brush, coastal sage, young chaparral, and open woodlands) over grasslands or densely-wooded areas. These lizards are usually inconspicuous, foraging by slowly moving through dense vegetation, and seldom appearing in the open.

Surprisingly little is known concerning the reproductive biology of Alligator Lizards. Females deposit a single clutch of 8-15 eggs in early summer, hatchlings making their appearance in early August. Apparently they nest underground (at least sometimes in disused mammal burrows), and females appear to remain with the eggs until they hatch. Few adult females can be found from late May into August, when they reappear at the same time as hatchlings. Alligator Lizards are relatively long-lived, requiring 3-4 years to reach sexual maturity; individuals whose size indicates ages greater than 5 years make up about a third of the population in many areas. Birds of prey and mammals such

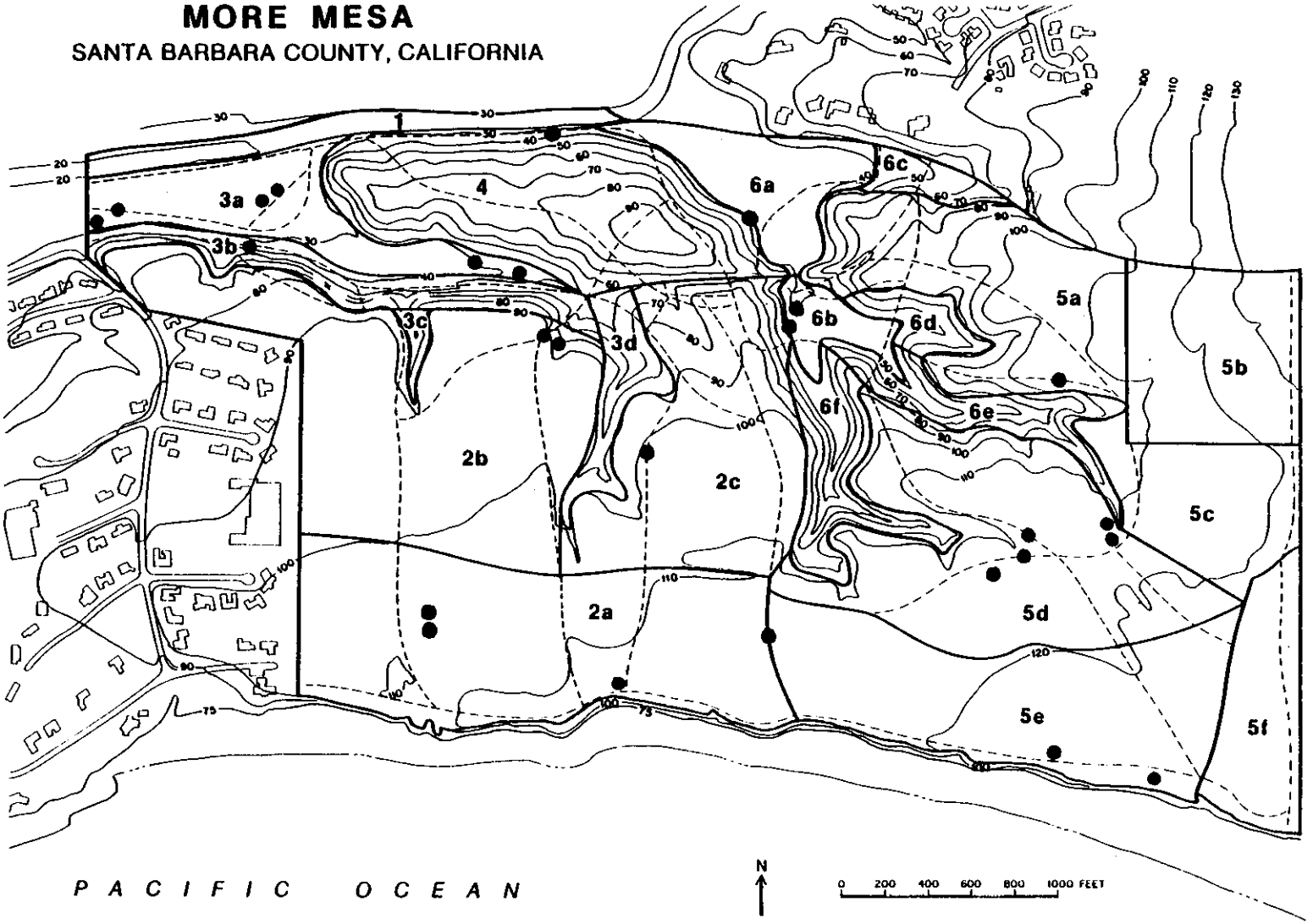
as weasels, skunks, foxes and cats appear to be their chief predators: Alligator Lizards put up a spirited defense and are usually avoided by snakes.

As noted previously, Alligator Lizards are less common on More Mesa than experience in similar nearby areas would suggest. Most of the records shown in Figure 52 are from trash piles and mats of dead vegetation, only 18 of a total of 66 individuals being secured in can traps. Normally such traps are highly effective in catching Alligator Lizards, and their evident scarcity in the traps indicates low population densities. Records are evenly distributed throughout the study area, with no evident habitat preferences within. Eleven of the eighteen trap records came from the 2-29 May sampling interval, indicating increased activity during this time. I do not have can-trapping records for Alligator Lizards from other coastal sites, but on the basis of collecting experience nearby and can-trapping in inland chaparral and riparian areas I did not expect to see many lizards after mid-April. Usually their activity peaks in March, and few are seen again until the hatchlings appear in late summer. The lateness of spring warming this year may be a factor.

Field experience in other local coastal sites shows these lizards to be abundant in Sweet Fennel, Baccharis grasslands and the edges of oak and willow thickets, and less common but present in grasslands and marshy areas. No evident feature of the present habitats on More Mesa accounts for their scarcity, which may result from previous land use patterns such as extensive plowing or use of pesticides.

Gopher Snake (Pituophis melanoleucus). Gopher Snakes are the most abundant and conspicuous members of the local snake fauna. In coastal

Fig. 52. SOUTHERN ALLIGATOR LIZARD
Gerrhonotus multicarinatus



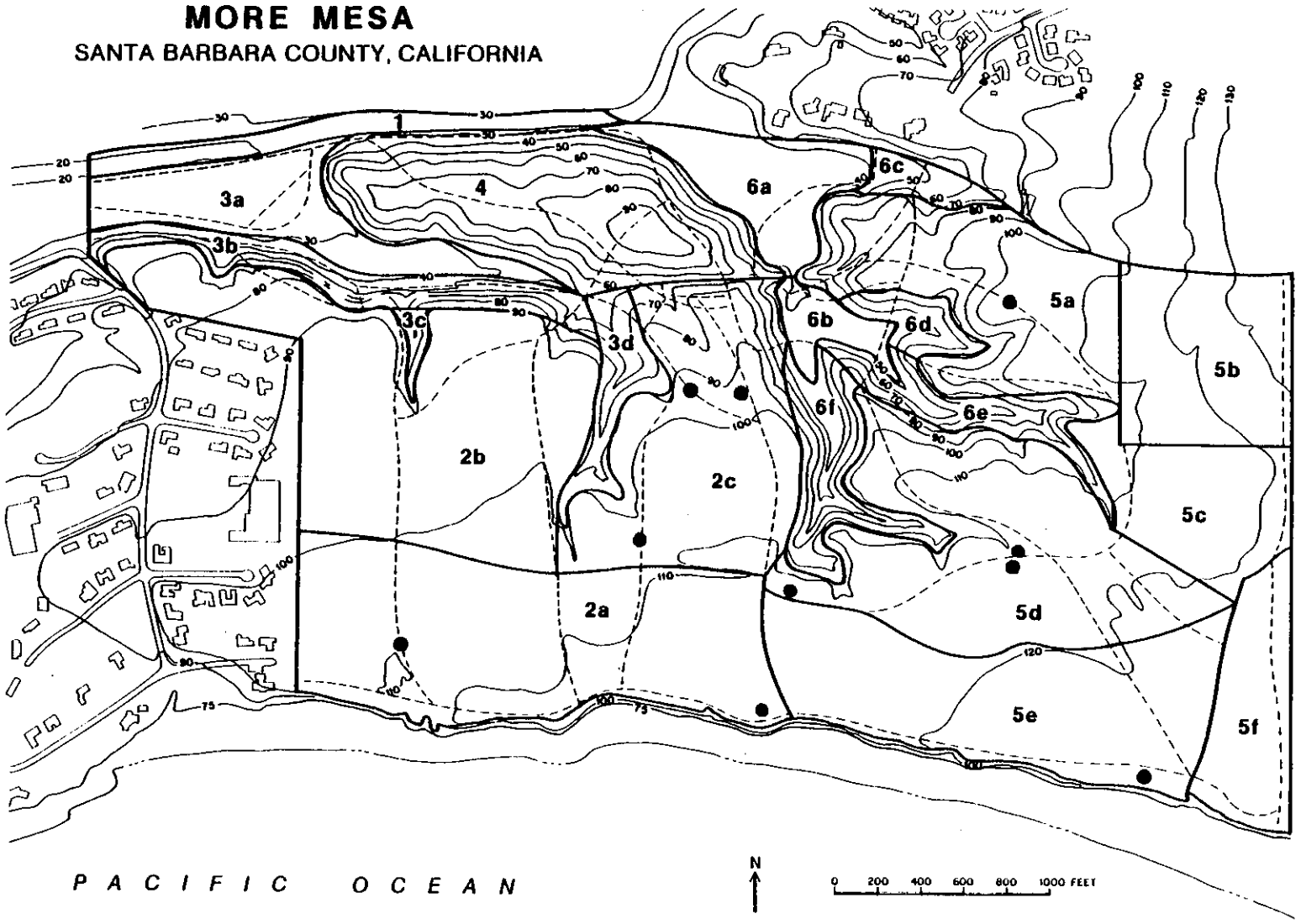
southern California they are typically inhabitants of grassland and brushy grassland, and are active by day from late March through early October, with peak activity for adults in May and early June, and for recent hatchlings in late September.

Females deposit 10-20 eggs in loose soil or in disused mammal burrows in early July, with an incubation period of about 80 days. Hatchlings emerge from the nest in mid to late September, and appear to disperse to overwintering sites without feeding. The young grow rapidly during their first summer, and some may breed in their second year, although most require three years to reach maturity at a length of about 90 cm.

Gopher Snakes feed almost entirely upon small mammals and bird's eggs, actively foraging in mammal trailways and burrows, low bushes and the like. The snakes often rest in the sun on roads and trails, and are frequently encountered and killed. They are less common on More Mesa than in comparable habitats nearby, probably as a consequence of human activity. Six of the ten records from More Mesa (Figure 53) represent snakes which had been killed by vehicles or hikers; all were adults over 3 years of age. Other than humans, gopher snakes have few predators in areas such as More Mesa, basically amounting to Red-tailed, Red-shouldered and Marsh Hawks for adults, and these species plus Crows, Kestrels, skunks and cats for juveniles.

Gopher Snakes are tolerant of a fair amount of habitat modification, as attested by their abundance on the UCSB campus and in Isla Vista, and are wholly beneficial in controlling populations of gophers and mice. Their relative scarcity on More Mesa seems to result from the presence there of a less tolerant segment of the human population.

Fig. 53. GOPHER SNAKE
Pituophis melanoleucus



As Figure 53 indicates, Gopher Snakes are largely restricted to the grasslands and brush of the Mesa proper. They would be expected to occur in other habitats mostly as individuals in transit to other grassland areas.

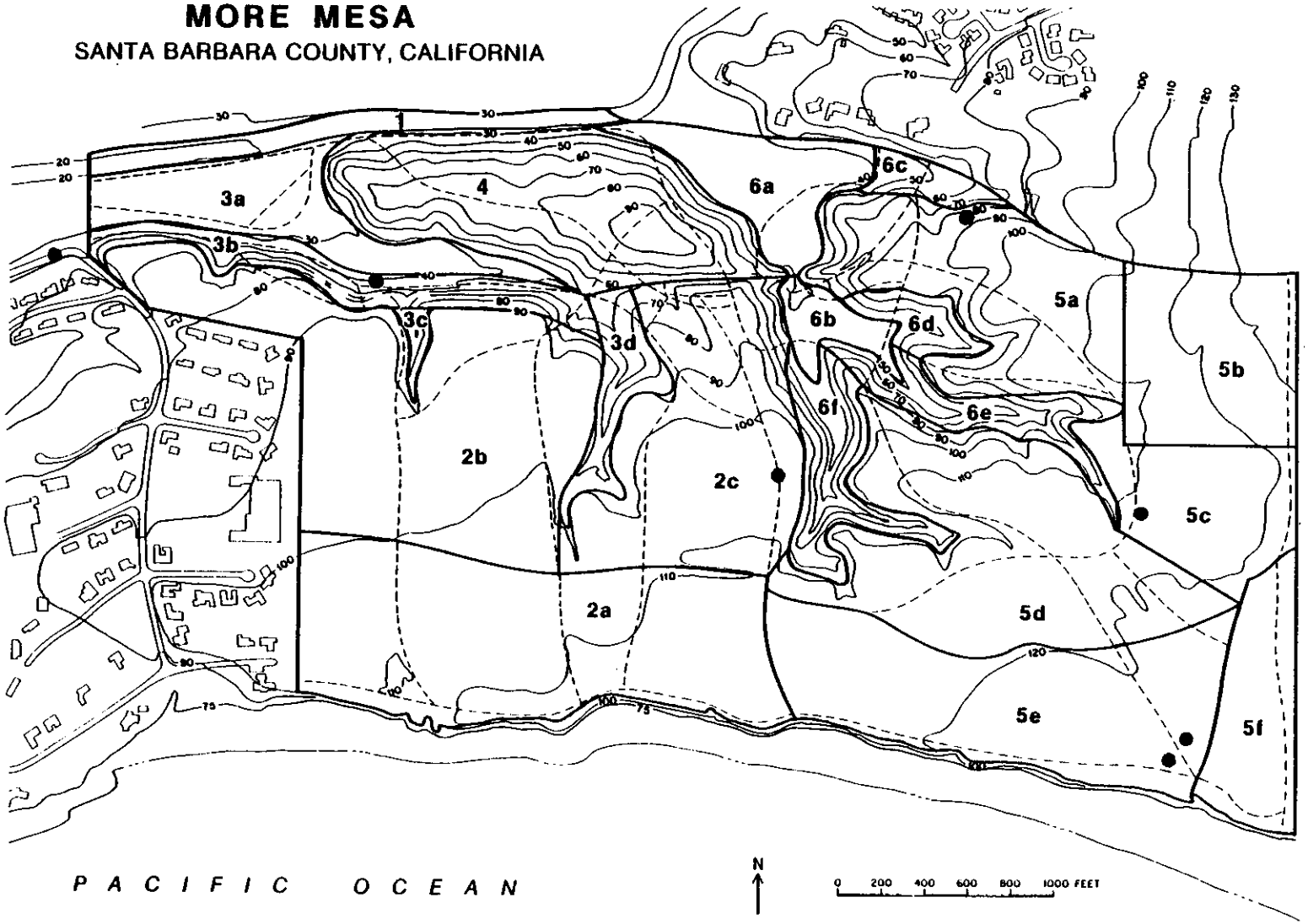
California Kingsnake (Lampropeltis getulus). Kingsnakes are less abundant but still common inhabitants of coastal areas in Southern California. They frequent a wider range of habitats than do gopher snakes, and are especially likely to be found in wetlands including marshes, willow thickets and the environs of vernal pools.

Like gopher snakes, Kingsnakes depost 8-15 eggs in loose soil in late June through July, the young emerging, after about 80 days incubation, in September. Most individuals appear to reach sexual maturity in the third year of life. Kingsnakes are more catholic in their diet than are gopher snakes, feeding on frogs, lizards, other snakes, small mammals and bird's eggs and young. They are typically active early and late in the day, and seem to be indisposed to remain long in the open after the manner of Gopher Snakes.

Only 5 Kingsnakes (plus one nearby - see Figure 54) were found in the course of field work on More Mesa. Experience in other local areas indicates this to be a low density, particularly in view of the presence of relatively undisturbed wetland areas. Human influence is suspected here as well, though less in terms of snakes being killed than being removed as pets or for sale (though illegal since 1978, there is a considerable market for these snakes outside of California, pet dealers commonly asking $30-45.00 for an adult).

Kingsnakes are less tolerant of development than are gopher snakes, and they usually decline in abundance as soon as large tracts of

Fig. 54. CALIFORNIA KINGSNAKE
Lampropeltis getulus



grassland or brush are broken up. By way of example, I recorded 19 reports of Kingsnakes in 1978-80 from the area between Francisco Torres apartments and Los Carneros Road in Isla Vista. Subsequent to the development of the Santa Ynez Apartments I have not had a single report from this area, which still includes about one half of the previously undeveloped brushy grassland. Unlike Gopher Snakes, Kingnakes are seldom reported from Isla Vista or the developed portions of the UCSB Campus

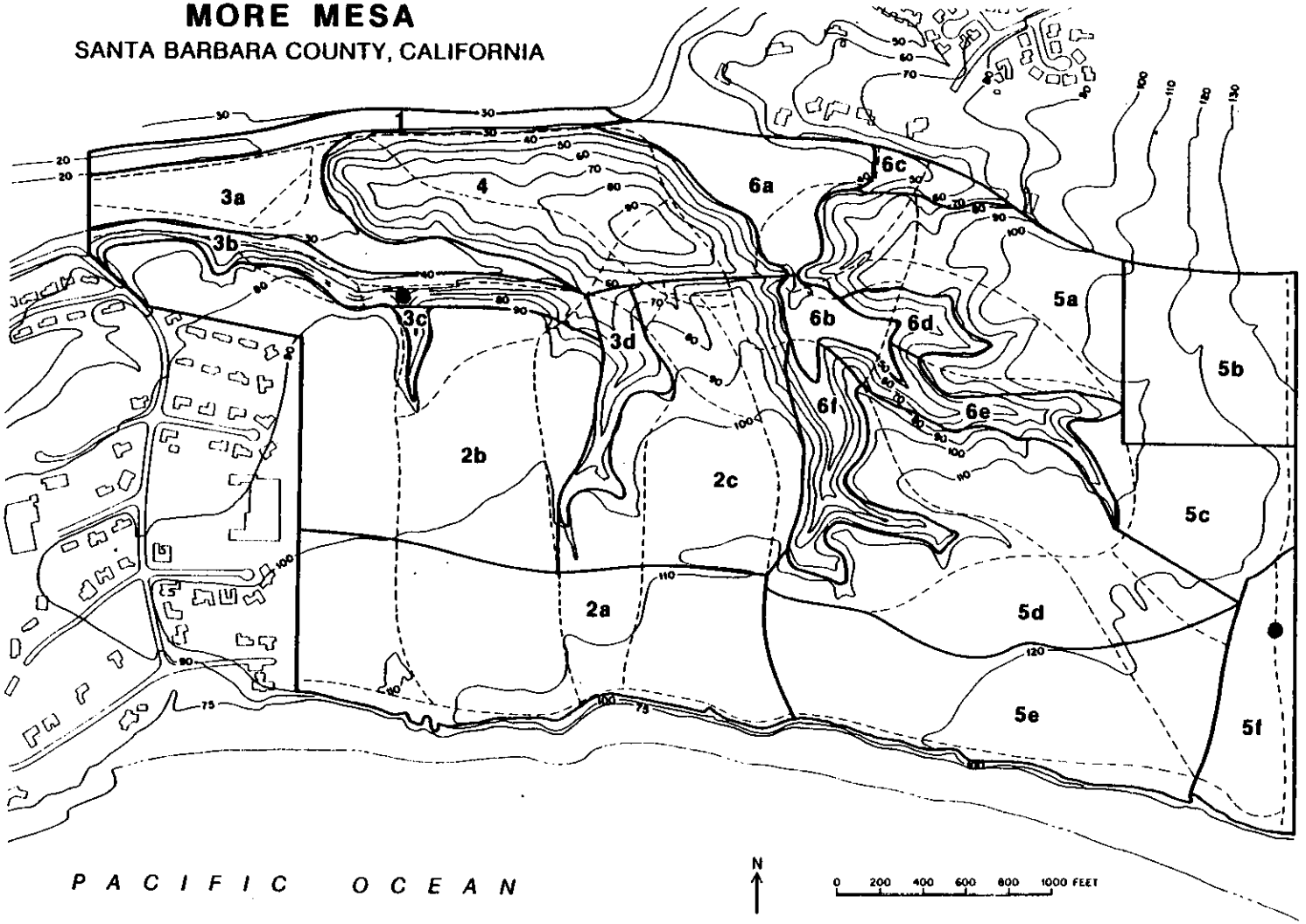
Ringnecked Snake (Diadophis punctatus). Ringnecked Snakes are uncommon in coastal areas with habitats such as those represented on More Mesa (Fig. 55). They are typically snakes of undisturbed oak woodland or rocky riparian woodland and chaparral, and are rarely found in grasslands. These are small, secretive snakes whose activity peaks in January-March, corresponding to peak activity by the Slender Salamanders which comprise their principal prey. Larger individuals also feed on juvenile lizards and very small snakes.

More Mesa is poor in habitats suitable for Ringnecked Snakes, and Slender Salamanders appear to be uncommon. The woodland portions of areas 3b and 4 are the only good sites, although a few may occupy the ravines in areas 3d, 6e and 6f. The individuals found in area 5f probably came from adjacent woodlands in Hope Ranch.

8. Species of possible occurrence on More Mesa.

Other species of amphibians and reptiles potentially occur on More Mesa, but were not noted in the course of the field study or during previous investigations. Each is briefly treated below, with indications of suitable habitats on the study area based on field experience else-

Fig. 55. RINGNECKED SNAKE
Diadophis punctatus



where in the coastal zone of Santa Barbara County.

Arboreal Salamander (Aneides lugubris). These salamanders are most frequently associated with oak trees, in whose cavities they reside and breed. Limited oak stands in areas 3b and 4 may be occupied by these salamanders.

Ensatina (Ensatina eschscholtzii). This terrestrial salamander might be expected to occur in oak woodlands and the denser portions of the main ravines (areas 3b, 4, 3d, 6e, 6f). Deep leaf litter, large logs, and woodrat nests are frequented microhabitats, all of these being poorly represented on the Mesa.

Red-legged Frog (Rana aurora). This large, fully aquatic native frog was formerly common in the drainages of Goleta Slough, but has now been displaced by introduced bullfrogs. It surely once occurred in Atascadero Creek and the wetter parts of areas 3a, 6a and 6e.

Western Skink (Eumeces skiltonianus). This small, secretive lizard was expected to be common on More Mesa, as it is frequently encountered in similar habitats nearby. The can-trapping survey failed to secure them, and none could be found, despite directed efforts, by other means. The apparent absence of this species is difficult to explain on the basis of present habitats, and may be due to previous land-use patterns.

Coast Horned Lizard (Phrynosoma coronatum). There are a few small populations of horned lizards on the sandy tops of bluffs west of More Mesa (UCSB Campus, Isla Vista, Coal Oil Point). Similar habitats in the western part of area 2a and eastern area 5e were checked on 2 and 29 May, but no horned lizards were noted, nor were any secured in trapline VII, which was placed with the possibility of finding this species in mind. The coastal bluff populations are isolated from the main

distribution farther inland. Available habitat on More Mesa is very restricted, and the lizards seem to be absent.

California Legless Lizard (Anniella pulchra). Legless Lizards are abundant in protected coastal dunes, and widespread but apparently uncommon in sandy soils with a diversity of vegetation types. These are burrowing lizards, and are not found where the soil is hard or wet, nor do they occur on beaches where even rare tidal flooding may occur. Most of More Mesa is unsuitable habitat, though a few sandy areas along the top of the oceanfront cliff, and on the north slope of the hill in area 4 provide proper conditions. These areas were checked in February and March (peak of activity) without result, though negative evidence is not very secure for this species. They are known from Goleta Point, Hope Ranch, and the Mesa area of Santa Barbara, and may yet be shown to occur on More Mesa.

Blue Racer (Coluber constrictor). This medium-sized diurnal snake is very uncommon in Southern California. Locally it has been found in Sweet Fennel-grassland on the Mesa in Santa Barbara, and in Coyote Brush-grassland near Lake Los Carneros and several other sites westward along the coast. Much of More Mesa seems to offer suitable habitat for this snake, and it may be found to occur on the site.

Striped Racer (Masticophis lateralis). Another active diurnal snake, this species is common in coastal sage and Coyote Brush-grassland near the coast west of Goleta, and in undisturbed parts of the Mesa in Santa Barbara. It favors steep open slopes and sparse brush, such as found along the north edges of areas 2b, 2c, 4 and 5d on More Mesa. [Note: Sighted in 5d during June 1982.]

Common Garter Snake (Thamnophis sirtalis). Yet another diurnal

species in the 2-3' size range, this snake favors stream edges, marshes and wet grassland. There are several records for the vicinity of Goleta Slough, and the snake probably still occurs along Atascadero Creek and in the wetlands of areas 3a and 6a. It is generally uncommon in Santa Barbara County and usually encountered by chance rather than design.

Night Snake (Hypsiglena torquata). This small, secretive snake is widespread in chaparral and oak woodland areas, where it inhabits rock outcrops, matted dead brush and logs. Individuals are less commonly noted near the coast, but specimens have been found in several coastal sites west of Goleta. The steep slopes of areas 3b and the eastern part of area 4 appear to be suitable habitat, as are parts of ravines 6e and 6f. Night snakes do not appear to tolerate habitat disturbance, and have not been recorded in coastal parts of Goleta or Santa Barbara.

Southern Pacific Rattlesnake (Crotalus viridis). Rattlesnakes are abundant on coastal mesas west of Goleta in habitats essentially identical to those present on More Mesa. For obvious reasons these snakes decline in numbers in populated areas, especially where contiguous undisturbed habitat is absent. Rattlesnakes used to occur on the Mesa in Santa Barbara, but have not been reported there in about 20 years; likewise, they were present on Goleta Point before the University was constructed, but only one has been found there in the past 5 years. This was probably a released captive. These snakes are unlikely to be present on More Mesa currently, but the entire area remains suitable for them.

DISCUSSION - Evaluation of previous work. There have been two previous EIRs conducted for parts of the More Mesa tract. A 1972 investi-

gation (Tyrolean Village, Inc. Cuesta Verde) briefly summarized observational data for 7 species, all of which are still present. In addition I recorded Bullfrogs, Western Toads, Side-blotched Lizards and Southern Alligator Lizards, all of which were probably present but overlooked in 1972. This report concluded that the herpetofauna was depauperate, a conclusion supported here. A second EIR was conducted in 1980 (Casa La Cumbre) but did not consider the herpetofauna.

The only other work on the Mesa herpetofauna is my own, conducted sporadically from 1978-present as part of a general study of the herpetofauna of Santa Barbara and Ventura counties. Results from earlier visits to the site have been incorporated in this report.

General Conclusions. The amphibian and reptile fauna of More Mesa is a depauperate sample of the typical species composition of a coastal mesa in Southern California. Most of the species present are opportunistic colonists, and those which are poor colonists or require stable, specialized microhabitats are largely absent. Only frogs and Western Fence Lizards are present in population densities expected for the habitats available. The low densities of other species observed appear to be due to a pattern of previous habitat disturbance (other lizards, salamanders, small snakes) and/or direct human impact (turtles, large snake species). Of the two influences the former appears to be of greater importance, as collecting and random killing efforts seem to be serendipitous and relatively infrequent whereas the influence of habitat disturbance is continuous. Recovery of the herpetofauna, should the Mesa remain undeveloped, would be very slow and it is likely that many of the presently extirpated species would remain absent.

CHARACTERISTICS AND NOTEWORTHY ASPECTS OF THE PHYSIOGRAPHIC AREAS

Wayne R. Ferren, Jr.

Having reported the results of the individual resource investigations, the team members summarized important, noteworthy, sensitive, or characteristic aspects of their findings according to the various physiographic areas. These aspects are listed below. Descriptions of the physiographic areas were presented previously by Hannan, and a list of plants for each area (Appendix IB) was prepared by Steele.

1. Atascadero Creek

VEGETATION: Rooted Vascular Aquatic Bed, Vegetated Streambed; FLORA: Horned Pondweed; BIRDS: diversity and density dependent on flood control activities, best when shallow water and emergent vegetation present (American Bittern, ducks, rails) and weedy grasses in creekbed best for migrant landbirds; MAMMALS: area visited by a few large natives; HERPETOFAUNA: marginal habitat for frogs, toads and turtles - it is severely disturbed.

2. West Mesa

a. Coastal Section - VEGETATION: Cismontane Introduced Grasses, Southern Coastal Bluff Scrub, and Stabilized Coastal Dunes; FLORA: Beach Primrose, Croton, California Bush-Sunflower; BIRDS: very good for foraging by White-tailed Kite, Marsh Hawk and Short-eared Owl, western 1/4 not used much by these but western 1/2 utilized by Burrowing Owl; MAMMALS: low diversity; HERPETOFAUNA: severely disturbed by previous plowing - of little value for these animals.

b. West Section - VEGETATION: Cismontane Introduced Grasses;

FLORA: Owl's Clover; BIRDS: eastern half good for foraging by White-tailed Kite, Marsh Hawk and Short-eared Owl, important area for Burrowing Owl, particularly western half; MAMMALS: low diversity; HERPETOFAUNA: north slope is good "edge habitat".

c. East Section - VEGETATION: Cismontane Introduced Grasses; FLORA: Dwarf Brodiaea, California Barley, Owl's Clover; BIRDS: good area for foraging by White-tailed Kite, Marsh Hawk and Short-eared Owl, utilized by Burrowing Owl; MAMMALS: low diversity; HERPETOFAUNA: north slope is good "edge habitat".

3. West Drainage System

a. Central Basin - VEGETATION: Seasonally Flooded Persistent Emergent Wetland and Scrub-Shrub/Forested Wetland; FLORA: Bur-reed, Western Goldenrod, Red and Yellow Willow, Cottonwoods; BIRDS: rich species diversity (particularly in willows), occasional foraging by White-tailed Kite and Marsh Hawk; MAMMALS: area of most diversity and apparently used more frequently by large mammals; HERPETOFAUNA: disturbed but potentially good amphibian, turtle and snake habitat.

b. Central Basin Slope - VEGETATION: Southern Coastal Oak Woodland, Scrub-Shrub/Forested Wetland; FLORA: Coast Live Oak, Needlegrass; BIRDS: very rich species diversity; MAMMALS: area of most diversity and apparently used more frequently by large mammals; HERPETOFAUNA: good habitat for amphibians, lizards and some snakes.

c. West Ravine - VEGETATION: Southern Coastal Oak Woodland; FLORA: Christmas Berry; BIRDS: moderate to low riparian diversity; MAMMALS: adjacent to area of highest diversity; HERPETOFAUNA: low habitat value.

d. East Ravine - VEGETATION: Cismontane Introduced Grasses; FLORA: Wood Fern, Coffeeberry; BIRDS: adjacent to Burrowing Owl area; MAMMALS:

adjacent to area of highest diversity; HERPETOFAUNA: lower significance than ravines of East Drainage System.

4. Central Hill

VEGETATION: Cismontane Introduced Grasses (including native Bromus/Hordeum dominance type), Southern Coastal Oak Woodland, Scrub-Shrub/Forested Wetland; FLORA: Coast Live Oak, California Brome, California Barley; BIRDS: good for foraging by White-tailed Kite and occasionally for Marsh Hawk and Short-eared Owl, oaks on east side are site of a nesting pair of kites each year; MAMMALS: nothing special; HERPETOFAUNA: oaks on east slope are good salamander habitat.

5. East Mesa

a. Northwest Section - VEGETATION: Cismontane Introduced Grasses; FLORA: Owl's Clover, Lupine; BIRDS: good area for foraging by White-tailed Kite, Marsh Hawk, and Short-eared Owl; one sighting of a Grasshopper Sparrow from western half; MAMMALS: relatively low diversity, one of the least special areas; HERPETOFAUNA: area disturbed, of little value.

b. Northeast Section - VEGETATION: recently abandoned cultivated area; FLORA: Alkali Mallow, Aster; BIRDS: numerous Goldfinches, nesting Red-winged Blackbirds, important buffer for nearby nesting and roosting sites of White tailed Kite; MAMMALS: relatively low diversity, one of the least special areas; HERPETOFAUNA: severely disturbed area of little value.

c. East Central Section - VEGETATION: Cismontane Introduced Grasses, Seasonally Flooded Persistent Emergent Wetland, Vernal Alkaline Flat; FLORA: California Brome, Frankenia, Willow Dock, Tule, Bulrush, Cat-tail, Alkali Mallow, Sand-spurrey; BIRDS: Gold Finches and Nesting

Red-winged Blackbirds, important buffer to White-tailed Kite nesting and roosting area; MAMMALS: low diversity; HERPETOFAUNA: disturbed area of little value, but ravine edges are good habitats.

d. West Central Section - VEGETATION: Cismontane Introduced Grasses; FLORA: California Brome, Coyote Brush, Lupine, Owl's Clover; BIRDS: very important hunting area for White-tailed Kite, Marsh Hawk, and Short-eared Owl, important buffer area to kite roosts; MAMMALS: low diversity; HERPETOFAUNA: disturbed area of little value, but ravine edges are good habitat.

e. Coastal Section - VEGETATION: Cismontane Introduced Grasses; Southern Coastal Bluff Scrub; FLORA: California Sage Brush, California Bush-Sunflower, Seacliff Buckwheat; BIRDS: very important hunting area for White-tailed Kite, Marsh Hawk, and Short-eared Owl, western portion is an important buffer for main kite roost; MAMMALS: low diversity; HERPETOFAUNA: disturbed area of little value.

f. Southeast Section - VEGETATION: Cismontane Introduced Grasses, Vernal pool, Southern Coastal Bluff Scrub; FLORA: Pacific Foxtail, Eryngium, Canary Grass, Popcorn Flower, Spike Rush, Crassula aquatica; BIRDS: of little value except as buffer area; MAMMALS: low diversity; HERPETOFAUNA: vernal pond area useful for Treefrogs and Kingsnakes.

6. East Drainage System

a. North Basin - VEGETATION: Seasonally Flooded Persistent Emergent Wetland, Scrub-Shrub/Forested Wetland; FLORA: Aster, Cressa, Frankenia, Pickleweed, Tule, Bulrush, Arroyo Willow, Western Goldenrod; BIRDS: foraging area for White-tailed Kite and adjacent to oak woodland nesting site of kite; MAMMALS: wetland areas best for diversity, site includes shrews, moles, and others; HERPETOFAUNA: potentially good for

amphibians and snakes.

b. South Basin - VEGETATION: Seasonally Flooded Persistent Emergent Wetland, Scrub-Shrub/Forested Wetland; FLORA: Aster, Frankenia, Jaumea, Bulrush, Alkali Mallow, Sand-spurrey; BIRDS: foraging area for White-tailed Kite and occasionally Marsh Hawk and Short-eared Owl; MAMMALS: wetland areas best for diversity, site includes shrews, moles, and others, also highest density of small mammals; HERPETOFAUNA: potentially good for amphibians and snakes.

c. North Ravine -VEGETATION: Cismontane Introduced Grasses, Scrub-Shrub/Forested Wetland; FLORA: Coast Live Oak, Cottonwood, Sycamore, Arroyo Willow; BIRDS: good diversity; MAMMALS: moderate diversity, HERPETOFAUNA: disturbed, low quality ravine.

d. North Central Ravine - VEGETATION: Cismontane Introduced Grasses; FLORA: Coyote Brush, Arroyo Willow; BIRDS: foraging by White-tailed Kite, Marsh Hawk and Short-eared Owl, area buffer to kite roost; MAMMALS: relatively low diversity; HERPETOFAUNA: moderate quality amphibian habitat.

e. South Central Ravine - VEGETATION: Southern Coastal Oak Woodland, Scrub-Shrub/Forested Wetland; FLORA: Coast Live Oak, Arroyo Willow, Wood Fern, Christmas Berry, Coffee Berry; BIRDS: location of secondary White-tailed Kite roost, second kite nesting pair during study, buffer area to main roost site; MAMMALS: wetland areas best for diversity, site includes shrews, moles and others; HERPETOFAUNA: excellent habitat.

f. South Ravine - VEGETATION: Cismontane Introduced Grasses, Scrub-Shrub/Forested Wetland; FLORA: Arroyo Willow; BIRDS: location of principal White-tailed Kite roost; MAMMALS: wetland areas best for

diversity, site includes shrews, moles, others; HERPETOFAUNA: excellent habitat.

ENVIRONMENTAL SENSITIVITY OF MORE MESA

Wayne R. Ferren Jr.

INTRODUCTION - The goal of this biological evaluation of More Mesa is to provide an analysis of the sensitivity of habitats to the potential impacts of residential development. Previous sections of this report have included presentations of baseline data, gathered by the UCSB biological team, upon which a determination of environmental sensitivity is based. Inventories of the vascular plants and terrestrial vertebrate animals were conducted with particular attention paid to species of special concern - i.e., those organisms that are either rare, threatened, endangered or whose status is either uncertain or potentially vulnerable. Physiographic areas, habitats, and vegetation were inventoried, classified and mapped. Appendices containing much of the baseline data are provided herein; a summary of the history and land use activities is presented to place the current status of More Mesa in perspective; and brief summaries of significant features of the various physiographic areas are made to integrate some of the findings. It is this information and the interpretation of it by this team that provided the foundation upon which the environmental sensitivity of More Mesa was determined.

ENVIRONMENTALLY SENSITIVE HABITAT AREAS - The entire study area occurs within the Coast Zone as defined by the Santa Barbara County Local Coastal Program (Santa Barbara County, 1980). Thus, zoning, land use practices, and other environmental concerns are governed by the mandates of the California Coastal Act (State of California, 1976). The

Coastal Act defines environmentally sensitive areas or habitat areas as follows:

> "'Environmentally sensitive area' means any area in which plant or animal life or their habitats are either rare or especially valuable because of their special nature or role in an ecosystem and which could be easily disturbed or degraded by human activities and developments."

In the section on Physiographic Areas, Habitats, and Vegetation, Hannan provides descriptions of the variety of habitats on More Mesa and their relationship to the physiography of the marine terrace. Furthermore, he divided the vegetation into numerous upland and wetland units. Thus, environmentally sensitive areas for the biota of More Mesa can be discussed in terms of physiographic area or plant communities that occur in these areas. Of importance for many areas are the specific guidelines adopted by the California Coastal Commission (1981) for interpreting wetlands and other wet environmentally sensitive habitat areas. The Coastal Commission has included the following among them: "...wetlands, streams, riparian habitats, lakes and portions of open coastal waters ... because of the especially valuable role of these habitat areas in maintaining the natural ecological functioning of many coastal habitat areas and because these areas are easily degraded by human developments."

Thus, the determination of the environmental sensitivity of portions or all of More Mesa depends on the biological evidence as interpreted according to the definitions and guidelines of the California Coastal Commission. Therefore, we have used these tools to ask the following question of More Mesa:

> Are there areas in which plant or animal life is either rare or especially valuable 1) because of their special nature; or 2) because of their role in an ecosystem; and 3) if such areas exist

could they be easily disturbed or degraded by residential development or activities associated with residential development?

Answers to this question have determined the locations of environmentally sensitive habitats.

ENVIRONMENTAL SENSITIVITY OF MORE MESA - The extensive data gathered by the UCSB team has been invaluable in determining the occurrence of environmentally sensitive habitat areas on More Mesa from the perspectives of vascular plant species and communities and terrestrial-vertebrate animal species and communities. In fact, the data presented herein clearly delineate the locations of specific areas of sensitivity as well as address the overall sensitivity of the More Mesa ecosystem. Using our three part sensitivity question and applying it to the physiographic areas of More Mesa as defined by this team, conclusions on sensitivity can be stated.

1. Special nature of plant or animal life. Throughout this report various species or communities of special concern have been listed and mapped. Plant communities included are wetlands and riparian areas (Fig. 26) of the East and West Drainage Systems and Atascadero Creek; wetlands in areas 5c and 5f (vernal pool); oak woodland (Fig. 10) in areas 3b, 3c, 4 and 6e; and Coastal Bluff and Coastal Dune Scrub (Fig. 10) in areas 2a, 5e, and 5f. Many plant species included here (Pacific Foxtail, Eryngium, Canary Grass, and Popcorn Flower) are restricted to the vernal pool in area 5f, while others such as Horned Pondweed, Dwarf Brodiaea, Western Goldenrod, and Bur-reed are found in other areas (2c, 1, 3a/6a, and 3a, respectively).

Each of the three vertebrate animal groups have some species which occupy areas of sensitivity. Of great sensitivity are those areas that

provide habitats for birds that are candidate species of special concern at the state level. As illustrated by Lehman (Figs. 40-42) much of the Mesa is either utilized for roosting or foraging by one of four such birds (i.e., Marsh Hawk, Merlin, Burrowing Owl, and Short-eared Owl). Furthermore, the White-tailed Kite (Fig. 38-39), one bird of regional concern, nests at More Mesa (4 and 6e), maintains its largest regional winter roost here (6f, and 6e secondarily), and forages over most of the grasslands. Other areas of the study site (e.g., 1, 3a, 3b, 4, 6a, etc.) are significant for wetland or oak woodland communities that support a high diversity of bird species.

While no mammals having special status utilize More Mesa, certain areas are significant as refuges (3a, 6a, 6b, 6e and 6f) during dry periods or are areas of high diversity (3a, 6e, 6f), and are sensitive habitats within the study site. Likewise, herpetofaunal diversity is high in ravines (6e, 6f) and protected slopes (3b, 4) and should be considered sensitive for these animals. Additionally, Pacific Pond Turtles (Fig. 49) are becoming rare in Coastal Southern California, and a few areas (1, 3a) of More Mesa supporting habitats for them are sensitive. All areas significant for mammal and herpetofauna diversity are sensitive areas for plant communities.

2. Role of plant and animal life in an ecosystem. One of the most significant and obvious aspects of the More Mesa ecosystem for which animal life is especially valuable because of its role in the ecosystem is the small mammal populations and their relationship to raptors of special concern, including the White-tailed Kite, Marsh Hawk, Burrowing Owl, and Short-eared Owl. The large number of small mammals at More Mesa provides a sufficient food source to support this significant

diversity of raptors of special concern. Fugle and Lehman identified this relationship previously in this report and have concluded that the grasslands, which provide an unusually large coastal area for foraging by these birds, are of great value to the ecosystem. The winter use of the area by the Short-eared Owl, Burrowing Owl, and great numbers of White-tailed Kites, and the general use of the area by Marsh Hawk and White-tailed Kite is directly dependent upon the foraging areas. Additionally, these same grasslands serve as essential buffer areas for roosts and nesting sites. Thus, the sandy loam and clay soils of the marine terrace, that support grassland vegetation, provide habitats for small mammals which in turn are the major food source for raptors at the Mesa. We conclude that the great majority of the grasslands of the East and West Mesas at More Mesa are environmentally sensitive habitat areas as defined by the Coastal Act.

3. Can the environmentally sensitive areas be easily degraded by residential development or activities associated with residential development? Having established that there are environmentally sensitive areas at More Mesa we need to establish whether or not they would be degraded by residential development of the area. Clearly, wetlands are easily degraded because they require filling for development; oak woodlands and riparian areas require removal of trees and associated undergrowth; Coastal Dune Scrub areas are sensitive to any disturbance of the sand substrates; and the grasslands, while supporting isolated occurrences of plant species of special concern, are vital to the raptors for burrows, foraging areas, and buffers adjacent to roosts and nests. Thus, residential development of these sites would eliminate critical habitats for which the Coastal Act was designed to protect. We

conclude that residential development in the areas of sensitivity would degrade and for the most part eliminate the environmentally sensitive areas of More Mesa.

Conclusion on Sensitivity of More Mesa - We conclude that the entire study site, excepting minor portions of the East and West Mesas (Fig. 56), is an environmentally sensitive area as defined by the Coastal Act. A review of the data collected by this research team, including maps of the occurrences of plant communities, plant species, and vertebrate animals (Figs. 10-55), illustrates clearly that each physiographic area as delineated for this study contains habitats sensitive for at least one and often for a variety of reasons. Only the extreme western portions of the West Mesa and the extreme northeastern corner and central eastern margin of the East Mesa are excluded from our environmentally sensitive habitat designation (Fig. 56). These areas lie beyond the secondary hunting areas for raptors and, in the case of the West Mesa, occur just beyond grasslands used by the Burrowing Owl. However, these non-sensitive areas are critical buffers for those areas that are sensitive, and thus provide essential open space between currently developed areas and the sensitive habitat areas.

RELATIONSHIP OF FINDINGS TO EXISTING DETERMINATIONS - The County of Santa Barbara has previously adopted positions on the biological status of More Mesa. Some of these positions are consistent with our findings and conclusions on sensitivity. For example, in the Conservation Element of the Comprehensive Plan (Santa Barbara County, 1979), the County Board of Supervisors adopted the following recommendation:

> "It is our opinion that the California Department of Fish and Game has prematurely removed the White-tailed Kite from its list of rare