

Plant and Wildlife Resources Inventory
of Boggs Mountain Demonstration
State Forest, Lake County
California

Report of Survey Conducted
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Introduction

Purpose

This survey was undertaken to inventory the plant and wildlife resources of Boggs Mountain Demonstration State Forest (BMDSF). Approximately 3,493 acres in size, BMDSF is located 8 miles NW of Middletown in Lake County, California. This study of the plant and vertebrate animal species indigenous to BMDSF was timed to coincide with the establishment by California Department of Forestry and Fire Protection (CDFFP) of 114 permanent plots throughout the Forest designed to monitor changes in the response of timber to a varied program of silvicultural management. In support of BMDSF's initial collection of volume and site quality data, this survey provides additional base line information concerning the diversity and relative abundances of plant and animal species present at the time of permanent plot establishment. Subsequent surveys will then have the opportunity to document changes in diversity patterns and correlate these changes with varying management histories.

Physical Setting

Occupying a northwest-southwest trending ridge, BMDSF ranges in elevation from approximately 2400 feet to 3800 feet above sea level. The higher elevations and southwestern slopes of the forest have developed on andesitic rocks of Quaternary age while the northeastern third of the area occupies part of the Great Valley sequence of Mesozoic Age rocks. Serpentinite rocks appear at the rift zones along the northeastern edge of the study area. Igneous Quaternary age rocks have formed soils grouped into the Collayomi, Aiken and Whispering soil series occupying the central and southwestern slopes of the forest while Great Valley sequence rocks have formed soils most recently mapped as belonging to the Speaker-Marpa-Sanhedrin Complex and Maymen-Millsholm-Bressa Association and associated complexes with Hopland, Woodin and Etsel soil series. Pockets of serpentinite soils along the northeastern border of the Forest. (Soil Survey of Lake County, 1983)

Dominant Vegetation

The majority of habitats occurring within the boundaries of BMDSF are dominated by trees of the coniferous tree genera *Pinus* and *Pseudotsuga* and the broadleaf tree genus *Quercus*. The relatively flat central ridge as well as south- and west-facing slopes of the forest are occupied by ponderosa pine forest dominated by the latter species but occurring with scattered sugar pine and oak together with an understory of several species of manzanita and other shrubs. The more

mesic northeast facing slopes are occupied by a less homogeneous assemblage of conifer and hardwood species, with Douglas-fir, black oak, interior live oak and sugar pine predominating. These stands tend to be less open and understory vegetation more diverse. Utilizing the recently completed classification system devised as a part of the Wildlife Habitat Relations system (California State Department of Fish and Game, 1991), these two major community types are designated as Ponderosa pine and Douglas-fir habitats respectively. For consistency this terminology will be utilized in the rest of the report. Serpentine outcrops are occupied by chaparral-brush communities of dramatically different character with scattered knobcone and digger pine providing a sparse canopy. Two small meadow habitats also occur at the northeastern edge of the forest.

Management History

Boggs Mountain Demonstration State Forest was purchased by the State from the Calso Company in 1949. Before this date, the area had been homesteaded and lightly logged as evidenced by three known mill sites and the presence of old stumps. As part of the negotiated sale to the state, all trees between 16 and 23 inches DBH plus one million boardfeet of standing seed trees between 23 and 29 inches DBH were to be a part of the acquisition of BMDSF as a new state forest. The remainder of the commercial forest resources was cut by Setzer Forest Products Inc. as a contingency of the sale, leaving only those trees sold to the state, small pockets of inaccessible timber and rough old growth culls (Brief History of BMDSF, 1968).

No further logging operations were conducted on the forest until 1967 when the State sold two timber sales covering 530 acres of scattered old growth timber along the northeast side of the forest. These stands represented, for the most part, portions of the forest previously untouched by the heavy cut in the 1940s.

In addition to a history of logging, BMDSF, like most of the Inner Coast Range localities in California, has experienced a severe fire history. These fires apparently did not do a great deal of damage to the old growth pine stands on the flatter areas of the forest, although undoubtedly the stocking level was held down. However on the steeper northeastern slopes of the forest, Douglas-fir habitats suffered more severe fire damage, reducing stocking and scarring residual old growth Douglas-fir timber. The most recent of these wild fires was in 1945 according to a CDFFP summary history of the area (CDFFP, 1968).

Between 1949 and 1965, state management policy was mainly protective and custodial. A limited amount of mapping and inventory was accomplished by the Region 1 Headquarters Forester. However, in 1965 a permanent Forest Manager was assigned to the forest. He completed the forest inventory and began experimental and demonstrational manipulations within the forest. Since 1965 projects have included studies of growth determination, disease control, comparative

and noncommercial vegetation management. The present survey of noncommercial plant and wildlife diversity is designed to provide a source of baseline information to allow for the assessment of relative impacts of future forest operations on wildlife and vegetation diversity.

Study Plan

The sampling strategy utilized for this study is an adaptation of the wildlife and wildlife habitat inventory system described by M. Dedan and R. H. Barrett (1982). In order to provide wildlife reconnaissance data of maximum utility to BMDSF, sample plots were located to coincide with the plot centers of the ongoing BMDSF permanent plot study of timber resources. Fifty-eight of the 120 timber study plots were chosen, such that a representative (systematic) coverage of forest habitats was accomplished. Two additional plots were located within meadow habitats at lower elevations near the northeastern edge of the forest.

At each of these sixty locations, a .25 ha sampling unit was established for the collection of habitat and diversity data. Although this systematic sampling grid did not constitute a random sampling design and necessarily meant sacrificing the eventual opportunity for between site statistical comparisons, the pairing of sequential wildlife and vegetation diversity information with the periodic collection of forest inventory data will give BMDSF personnel a unique opportunity to study the impacts of a wide range of silvicultural manipulations on the forest diversity mosaic over time.

Sampling of Plant Resources - Methodology

Sensitive plant species:

Utilizing California Natural Diversity Data Base records and species descriptions from the botanical literature, a list of sensitive plant species indigenous to the Boggs Mountain region was prepared. Provided with this list, together with descriptions of likely habitats for these taxa, the spring and summer field seasons of 1991 were devoted to a systematic search of the Forest for these target species. In addition to a detailed monitoring of permanent plot localities, intervening areas, together with unique sites such as serpentine outcrops, vernal pools, meadows and spring habitats, were searched over the May-September period for sensitive plant occurrences. Transects averaging 10 feet in width were run across likely sites allowing for complete coverage of potential species habitat.

As a part of the search process, a tally was maintained of all plant species encountered during this survey for sensitive taxa. A list of plant species identified during this study occurs as Appendix 3 to this report.

Target species for this search:

<i>Eryngium constancei</i>		Loch Lomond Button Celery
Status	Federal	Endangered
	State	Endangered
Habitat	Vernal pools in volcanic ash	

<i>Streptanthus brachiatus</i> ssp. <i>brachiatus</i>		Socrates Mine Jewel Flower
Status	Federal	Category 1
	State	None
Habitat	Serpentine ridges; closed cone pine forest, chaparral	

<i>Legenere limosa</i>		Legenere
Status	Federal	Category 2
	State	None
Habitat	Vernal pools	

<i>Hesperolinon adenophyllum</i>		Glandular Dwarf Flax
Status	Federal	Category 3C
	State	None
Habitat	Serpentine chaparral and grassland	

<i>Eriogonum nervulosum</i>		Snow mountain buckwheat
Status	Federal	Category 3C
	State	None
Habitat	Serpentine outcrops in chaparral	

<i>Navarretia pauciflora</i>		Few-flowered navarretia
Status	Federal	Category 2
	State	Threatened
Habitat	Vernal pools in volcanic ash	

<i>Navarretia plieantha</i>		Many-flowered navarretia
Status	Federal	Category 1
	State	Endangered
Habitat	Vernal pools in volcanic gravel	

<i>Ceanothus divergens</i>		Calistoga ceanothus
Status	Federal	Category 2
	State	None
Habitat	Oak/pine woodland, chaparral	

<i>Ceanothus confusus</i>		Rincon Ridge ceanothus
Status	Federal	Category 2
	State	None
Habitat	Granitic outcrop surrounded by serpentine woodland	

<i>Antirrhinum subcordatum</i>		Dimorphic snapdragon
Status	Federal	Category 3C
	State	None
Habitat	Serpentine chaparral	

<i>Carex albida</i>		White sedge
Status	Federal	Category 1
	State	Endangered
Habitat	Freshwater marsh	

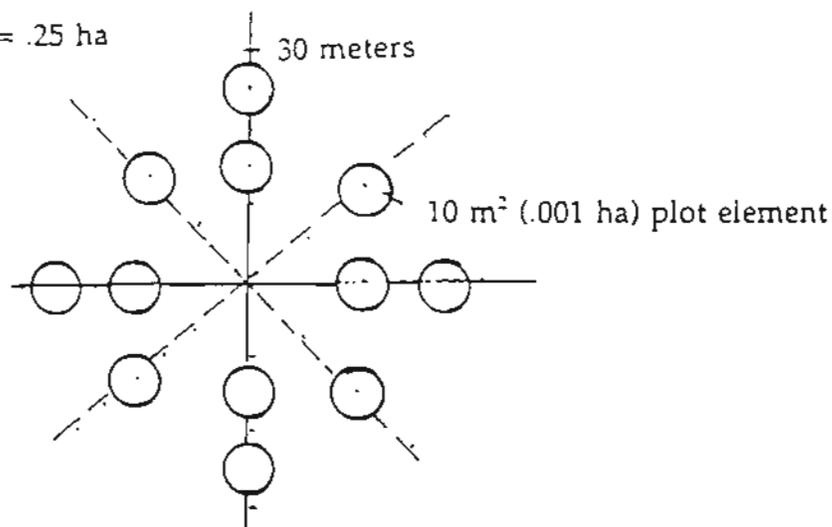
<i>Dichanthelium lanuginosum</i> var. <i>thermale</i>		Geyser's dichanthelium
Status	Federal	Category 2
	State	Endangered
Habitat	Hydrothermally altered soils	

Permanent plot study:

A total of sixty plot locations were sampled for understory vegetational components; fifty-eight plots were located within the established grid of CDFFP permanent plots and two additional plots were placed within vernal pool and meadow localities outside the permanent plot grid. Map 3 depicts the locations of these plot centers. At each plot location a total of twelve 10 m² (.001 ha) plot elements were flagged for detailed vegetation sampling (see Figure 1 for plot element orientation).

Figure 1

approximate area of sample = .25 ha



Location of 12 plot elements with respect to the permanent plot center of one of the sixty sample plots

At each of the twelve plot elements, plant species occurrences were recorded and an estimate made of each species' aerial coverage on the plot. These percent coverage data were used as an estimate of each species' relative importance at a given location.

In addition to obtaining plant species diversity and coverage data, each of the fifty-eight permanent plots were categorized using the Wildlife Habitat Relations classification system (Mayer, K. E. and W. F. Laudenslayer, Jr., eds., 1988). Survey results were then used as inputs into the Wildlife Diversity Model as predictors of potential vertebrate diversity. A total of 106 habitat descriptors were recorded for each of the fifty-eight permanent plot locations. This study plan represents a departure from our original sampling strategy: Originally survey teams had planned to gather physiognomy data at six strata between 0-20 meters within each stand (plot location). These data were found to be duplicated, however, by CDFFP's current data collection procedures, and further efforts to gather data on vegetational components above approximately 2 meters from ground level were therefore terminated.

Survey of Vertebrate Animal Diversity - Methodology

Species occurrence data were gathered for birds, mammals, reptiles and amphibians and different sampling methods were used for each group of animals.

Birds and certain mammals (such as squirrels) were sampled with a "time area" count. The bird census was carried out during two periods in 1992 - a winter period (Feb 1-24) and a spring-summer period (April 15-June 30). These sampling dates allowed for a sampling of overwintering bird species as well as breeding bird populations occupying each habitat. Each of the sixty plots was visited three times during each seasonal sampling period (sampling times were separated by approximately 10 day intervals). The observers recorded the number of species heard and seen within the confines of the represented community over a 15-minute period. A 10-minute acclimation period was utilized at each site prior to beginning each data collection episode. Counts were restricted to the period between sunrise and approximately 10 AM each morning. Tables 1, 2 and 3 provide summarized data of bird occurrences at each plot during the two sampling seasons.

Small mammals were sampled with Sherman live traps. A single trap was positioned within each of the twelve 0.001 ha plot elements in each of the 60 plots and monitored for three consecutive trap nights. Oatmeal and peanut butter were used as bait. The total trapping effort was accomplished during the summer of 1991. However, poor trapping success at some localities this first season persuaded us to retrap localities with no trap success in 1991 the following year. Larger mammals (principally carnivores and omnivores) were detected using aluminum track plates. A can of cat food (mackerel) was secured to the center of the meter

square smoked plate and the tracks of visitors were recorded at 2-3 day intervals for seven consecutive days. A total of 60 track plates were monitored (one per plot) for a total of 420 plate nights. Certain mammal groups were not sampled effectively during this survey. Ungulates (deer) were to be inventoried by counting accumulated fecal pellet groups in each of the 12 plot elements at each plot. Although visual sightings of deer were frequent, no fecal pellet groups were ever seen within the permanent plots. Bats were not surveyed during this study and they remain one of the most understudied group of mammals in California. Special expertise as well as methodologies are required to effectively sample bat populations, and their monitoring at BMDSF must await a separate study designed specifically for this purpose.

Reptiles, amphibians and shrews were sampled initially utilizing a system of paired 5-gallon pit traps connected by drift fences and erected perpendicular to the slope at each of the sixty plot locations. Marginal trapping success during the first summer persuaded us to visit each plot a second time the following spring and attempt to search each habitat as completely as possible by overturning rocks and logs and exploring all likely habitats in evidence. Herpetological survey results are included with the data on mammals in Tables 4, 5 and 6.

Results and Discussion

Plant Resources

Sensitive plant species

A systematic search of likely habitats located no populations of sensitive plant species within the boundaries of BMDSF. Particular attention was paid to forest openings, meadow habitats and outcrops of serpentine soil as these were habitats recorded as most likely to provide environments for the target species of this survey. Two areas were found to support vernal pool flora: (1) a clearing across the road from (north of) the Heliport and (2) a meadow habitat adjacent to and west of permanent plot No. 57. The first of these localities was scarified by heavy equipment during a timber harvesting operation during the spring months of 1992. An earlier reconnaissance of this site found no sensitive species of vernal pool plants, but with a return to other than drought conditions in subsequent years, this site may exhibit an interesting endemic flora. This locality should be monitored by botanically trained personnel to determine if special protection in the future is warranted.

The second of these vernal pool localities is located west of Plot 57, west of the junction of Road 100 and the road leading out of the Forest to the north. This pool habitat together with the adjacent meadow environment is more extensive and less disturbed than the first site. Although it has incurred considerable vehicular

disturbance in the past, its potential as a restored wet meadow habitat should be utilized by BMDSF and further human disturbance discouraged. Species of vascular plants encountered at this site (M1) during the June 1992 survey are recorded in Table 8.

A second meadow area dominated by perennial grasses and forbs occurs downslope to the east and north of M1. This site (M2) also should receive protection from inadvertent human disturbance. Although no vernal pools occur at this location, moist meadow habitats are rare in this region and support an assemblage of plant species uncommon to the rest of the Forest. A census of M2 occurs in Table 8 as well.

Permanent Plot Study:

A total of 23 species of trees, 41 species of shrubs and 185 species of herbaceous plants were recorded from the study of permanent plots and adjacent habitats. The flora of BMDSF is representative of middle coast range forest areas in Northern California and is relatively free of weedy human introductions more prevalent in more highly disturbed habitats. The highest numbers of non-native plant species were recorded in the vicinity of the Heliport near the entrance of the Forest, a pivotal area of high human and vehicular traffic. Permanent spring habitats providing a year round source of moisture such as Houghton Spring, Grouse Spring, Bluff Spring and Big Spring had the highest numbers of native plant species, but areas of relatively undisturbed open forest both within Ponderosa Pine and Douglas-fir communities were comparatively rich in species numbers as well.

Raw data on ground cover and understory plant constituents were averaged for each plot giving a mean importance value for each species out of 12 elements. Data on mean importance values, as measured by percent cover, were compared and analyzed using a Bray and Curtis Ordination program. This procedure calculates a matrix of plot dissimilarity values, comparing each plot with every other plot and then projects each onto a two-dimensional graphical space reflective of these calculated patterns of dissimilarity. Figure 2 depicts the relative relationship between forty-eight of the permanent plots (twenty-six classified by CDFFP as Ponderosa pine sites and twenty-two that were classified as Douglas-fir habitats). Spatial proximity, i.e., closeness of relationship seen on this projection, is a reflection of similar ground cover and/or understory plant constituents. Given the diverse management history of all of these stands, the loose clustering of Ponderosa pine plots is likely more reflective of similar topographic and microsite conditions than of a taxonomically similar overstory. Those plots classified as Douglas-fir habitat show a more discordant pattern, perhaps reflective of the wide range of environments falling into this vegetation type.

As mentioned in the methods section, in addition to obtaining specific coverage data by species, surveyors also assembled information on habitat constituents (a total

of 106 descriptors were tallied for each plot). These data were used to provide a multidimensional description of habitat resources and ultimately input for the WHR (Wildlife Habitat Relationships) Model. One possible model output is a projection of predicted animal species occurrences given a specific set of habitat descriptors. Raw data sheets showing the tabulation of habitat descriptors are included as Appendix 4. Modal values for major vegetation descriptors were chosen to predict species occurrences in each of the two major habitats. Values used for other habitat descriptors represent a composite of those occurring in all plots of that habitat type.

Survey of Vertebrate Animal Diversity

Birds:

A total of fifty-nine species of breeding birds (present in the habitat during the late spring-early summer sample period) were recorded from permanent plots. Forty-eight species of birds were counted during the winter survey as well. These numbers compare with a total of eighty-nine bird species predicted by the WHR Model as likely to occur given the array of habitat descriptors utilized for this analysis. As mentioned above, modal values for major habitat descriptors were used as inputs into the model. A composite, however, of all other habitat descriptors was generated to complete the predictive input. Inadvertently, this estimate of total habitat diversity for all the plots of one vegetation type (for example Ponderosa pine habitat) may overestimate the importance of rare habitat descriptors as predictors of the mix of species found in any particular area. Sixteen of the bird species recorded for BMDSF were not predicted by the model to occur there and eight of these species represented breeding populations. Recently, Verner and Larson (1989) reported on their studies of richness of breeding bird species in mixed conifer forests of the Sierra Nevada. Sampling over a wider range of elevations (1,650-2,300m), these investigators found a total of fifty-two species of birds to be actual or probable breeders on 51 study sites. Species numbers were lowest in clearcut sites and increased with development of shrub and tree layers reaching a peak in stands of mature forest with crown cover ca. 45-55%. It then declined slightly on sites where little or no timber had been removed and canopy cover exceeded 65%.

D. A. Airola and R. H. Barrett (1985), K. E. Franzreb and R. D. Ohmart (1978), and D. C. Hagar (1960) comparing logged and unlogged plots in mixed coniferous as well as Douglas-fir forest habitats found bird densities to increase as sites recovered from logging and increased in foliage density. Actual species diversity was highest in more open mid successional stages.

Verner and Larson's data on bird species richness compare favorably with species numbers recorded during the BMDSF survey. Their data demonstrate a high correlation with canopy volume and suggest this parameter may be the most valuable predictor of bird species richness. The drop in species richness seen to

coincide with higher crown cover values (greater than 65%) is explained by the reduction in stratification seen in highly shaded forests and this reduction negatively impacting total crown cover values. At BMDSF, lowest bird species numbers were recorded from clear cuts and sites most recently thinned and burned (Table 7). Reductions in species numbers were also seen in plots having heavy shade and reduced understory. Highest species numbers were seen in sites having a partial overstory of mature trees and relatively dense understory of shrubs and herbaceous vegetation. Obviously, management for maximization of species numbers is only one dimension of the problem of preserving species diversity. Some species require old growth forest conditions or open clear cuts, i.e., meadows, and only by the maintenance of a rich mosaic of all habitat types will a manager preserve the highest species diversity.

Airola et al. (1985) suggest that both even- and uneven-aged forest management techniques be applied to encourage a variety of tree species. These investigators also recommend the planting of a mixture of trees in clear cuts and the retaining of oaks, managing for their replacement over time as a means to maximize the diversity of insect gleaning species of forest birds.

Mammals:

Mammal species were surveyed at permanent plot locations using a variety of methods. Squirrels were noted by direct observation during bird surveys. Shrews were monitored with pit traps designed to capture amphibians and reptiles. Other small flightless mammals were live trapped using Sherman live traps while evidence of the presence of larger carnivores was obtained by smoked tracking plates baited with cat food. The presence of deer was noted if fecal pellet piles were observed within the radius of a plot element. Together, these methods may have achieved only marginal success in reflecting the total mammal diversity occurring at BMDSF. Deer mice were captured most frequently with Sherman live traps, but even this species was only observed on sixteen of the sixty plots.

Ramirez and Hornocker (1981) and Tevis (1986) found that *Peromyscus maniculatus* (the deer mouse) increased dramatically in the first few years following clear cutting but then decreased as increased cover shaded out herbaceous seed sources. A managed forest floor relatively free of an herbaceous understory following mechanical thinning or control burning would not be expected to support high densities of small seed-eating mammals. Low levels of rodent species would necessarily impact carnivore populations as well.

A single brush mouse was observed on plot 33. One ornate shrew was collected from plot 113 in a pit trap. Smoked plates appeared to be more successful in detecting the presence of mammals, but this method as well did not reflect large mammal diversities within sample plots. The most common carnivore was the gray fox occurring in twenty-nine of the sixty plots. A single bobcat and

a raccoon were also recorded, but these numbers appear surprisingly low for coniferous forest habitats. Additional mammal data appear in tables 4-6. Anecdotal information on mammal occurrences within the area such as personal sightings of animals by surveyors as they moved from plot to plot or information received from Forest employees occurs in these tables as well.

Reptiles and Amphibians:

Pit trapping success for reptiles and amphibians was also lower than expected. Western fence lizards and sagebrush lizards were frequently seen and were successfully sampled with the pit trap design. Snakes and amphibians, however, were all but absent from our survey data, a fact that caused us to return to each plot during the spring and early summer of 1992 and search microhabitats for organisms perhaps evading traps the previous year. These subsequent efforts turned up no previously unrecorded occurrences. In addition to the fence and sagebrush lizards, southern alligator lizard, western skink and western rattlesnake were the only other reptiles observed on permanent plots. A single ensatina salamander from one plot (29) was the only amphibian recorded for the forest. A complete listing of all vertebrates observed during the survey occurs in Tables 4, 5, and 6.

Discussion

Permanent plot survey data reveal the existence of a diverse assemblage of herbaceous and woody plants coexisting with forest management practices at BMDSF. Ground cover and understory plants appear to form two inter-grading assemblages of species occurring within the Ponderosa pine and Douglas-fir forest types respectively. Recent cutting events tend to blur the distinction between these two community types - ecotonal or successional plots occupy intermediate positions within the ordinal plot.

Vertebrate populations apart from birds appear to be less resilient to the effects of a man managed habitat. Wintering and Breeding bird species numbers compare favorably with those seen in similar forest habitats in the Sierra Nevada. Actual numbers of each bird species were not measured, but plant and insect resources together with potential nesting sites appear reasonably adequate to sustain viable populations of species observed.

Other vertebrates (mammals, reptiles and amphibians) appear to be underrepresented at BMDSF. Several explanations may be offered for this phenomenon.

As a group terrestrial vertebrates are secretive and notoriously difficult to sample efficiently. Sampling methodologies may not have been adequate to accurately estimate the occurrences of these organisms. Contradicting this point

however is the fact that all personnel taking part in this survey were experienced with the sampling methods utilized, having obtained positive results with these same methods in other parts of California. Perhaps larger samples and longer sampling periods would have increased trapping success in these particular habitats. Budgetary constraints prevented us from sampling more intensely.

Geographically, the position of the BMDSF in western Lake County at the eastern edge of the inner coast ranges should not in itself contribute to the apparent paucity in numbers of vertebrate animals found there. Boggs Mountain is likely more arid than forested habitats to the west and the prolonged drought conditions may have adversely affected amphibian populations requiring temporary ponds for reproduction. Other vertebrates (reptiles and mammals) should not have been adversely affected by either the location or the relative aridity of the site. A search of the literature concerned with endemism in groups of Northern California vertebrates reveals no documentation of reductions in species numbers associated with the relative isolation of the western Lake County habitats.

Finally the unique history of BMDSF itself may indeed be a determinant of the relatively low diversity of vertebrate populations. Clear cutting forty years ago leaving only relatively few seed trees must have had an immediate local effect on habitat suitability for a number of small forest vertebrates. Subsequent recovery of the forest has been relatively rapid and apart from the ongoing silvicultural demonstrations such as thinning and controlled burning operations, the majority of the Forest appears to offer suitable habitat for a wide range of vertebrate species.

Actual species numbers at BMDSF must also be viewed against a background of increasing human disturbance associated with the rapid urbanization of the Cobb Region. Although land surrounding the Forest underwent a human population decline during the 1960s and early 1970s, the later part of the 1970s saw an increase in population growth associated with geothermal development in the area. This trend continued during the 1980s, fueled by influxes of people from Sonoma and Napa counties seeking affordable housing. "What were once undeveloped wildlands and lightly used seasonal residential areas bordering or near the southwest and west boundaries of the State Forest have become high density full-time residential areas with homes, yards, people, dogs and cats. Stray dogs and cats are a common sight in the Forest, the dogs often run in small packs and have been observed chasing deer. It is likely other indigenous animals are influenced by feral animal activity as well (S. Sayers, personal comm.).

In addition to these indirect effects of the area's increasing human population, hunting pressure over the past forty years must also be considered to have a direct negative impact on vertebrate population densities. Steve Sayers, Forest Manager at BMDSF observes that in the past, opening day of squirrel and deer season saw 200-300 hunters converge on the Forest. However, for the past two years, because of poor hunter success and the large numbers of hunters and other forest users, the numbers of hunters appearing on opening day have decreased.

The WHR projection of likely vertebrate occupants of ponderosa pine and Douglas-fir habitats in the county (Appendixes 1 and 2) lists twenty-nine species of mammals, excluding bats, twelve reptiles and six amphibians. Some of these species can be rejected as unlikely residents because of the absence of large permanent water supplies (bull frog and western aquatic garter snake) and significant human disturbance (elk, fisher). But the remainder of the taxa in this projection should be considered potentially likely given the existing habitat descriptors and some reduction in human related predation pressure. Additional regional surveys and long term periodic resampling of the diversity at BMDSF are needed to clarify this apparent diminished diversity in terrestrial vertebrates within the Forest.

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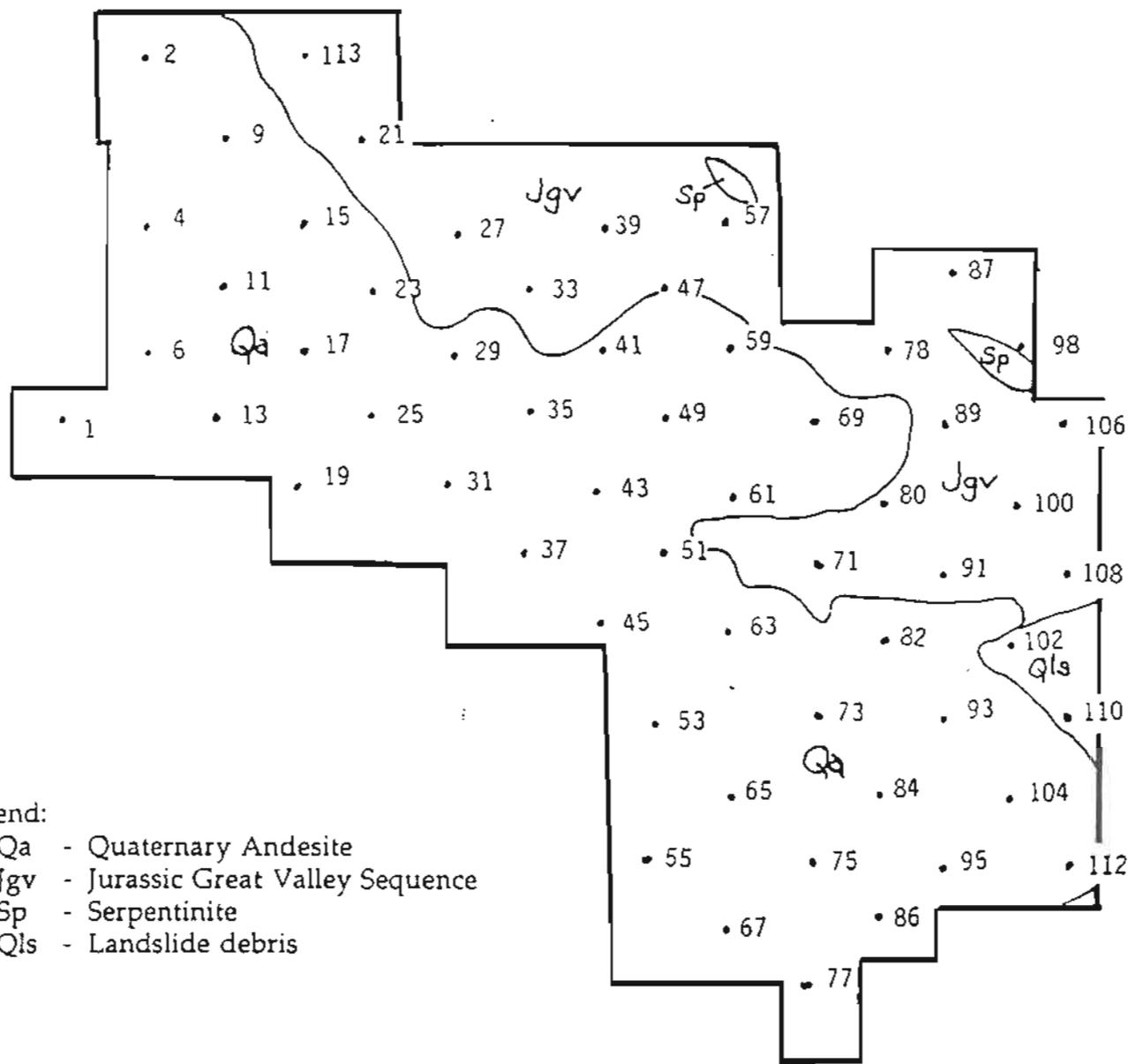
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Map 1

Geologic Map of Boggs Mountain
Demonstration State Forest

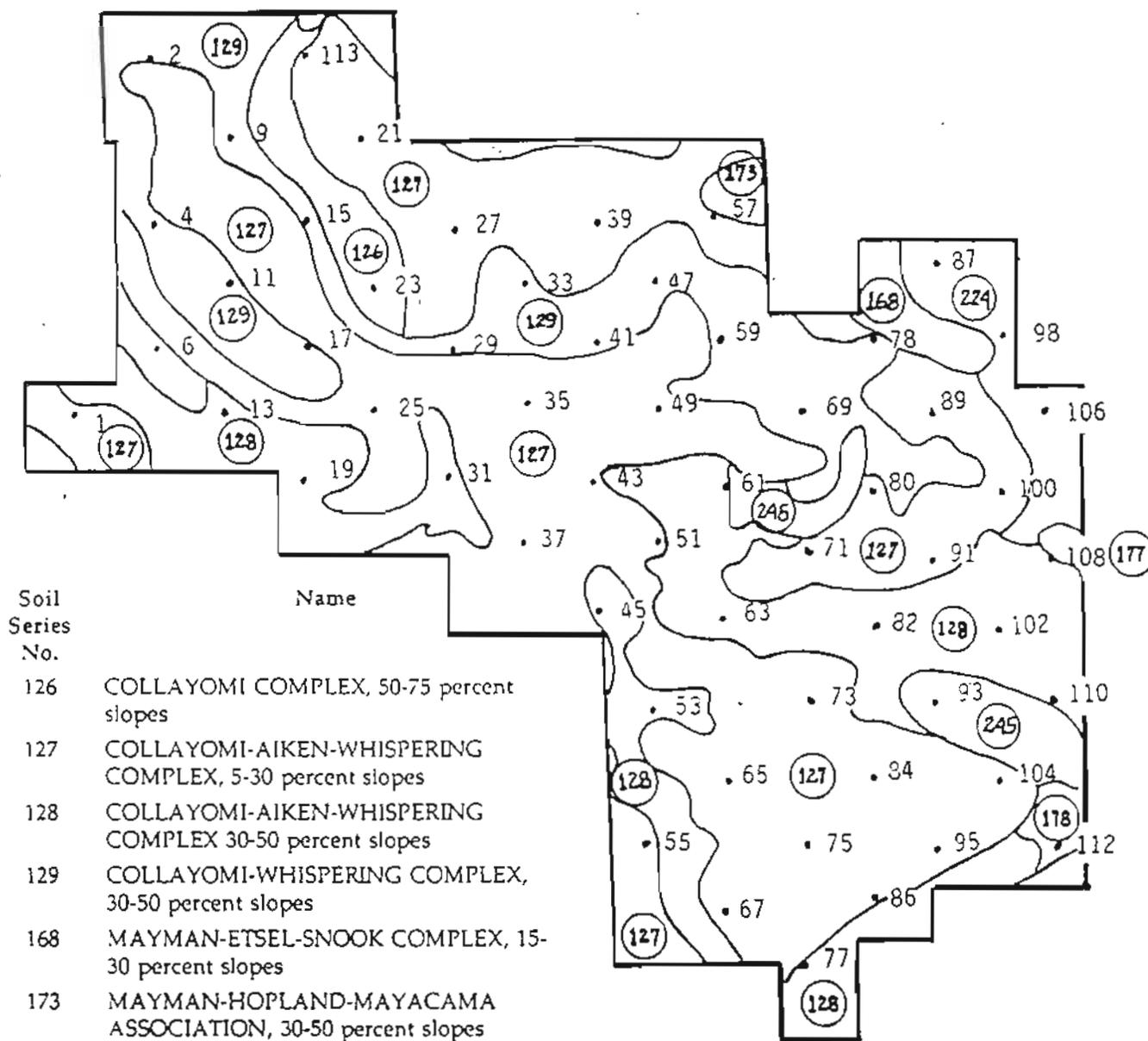
Legend:

- Qa - Quaternary Andesite
- Jgv - Jurassic Great Valley Sequence
- Sp - Serpentinite
- Qls - Landslide debris

Scale = 1 mile

Map 2

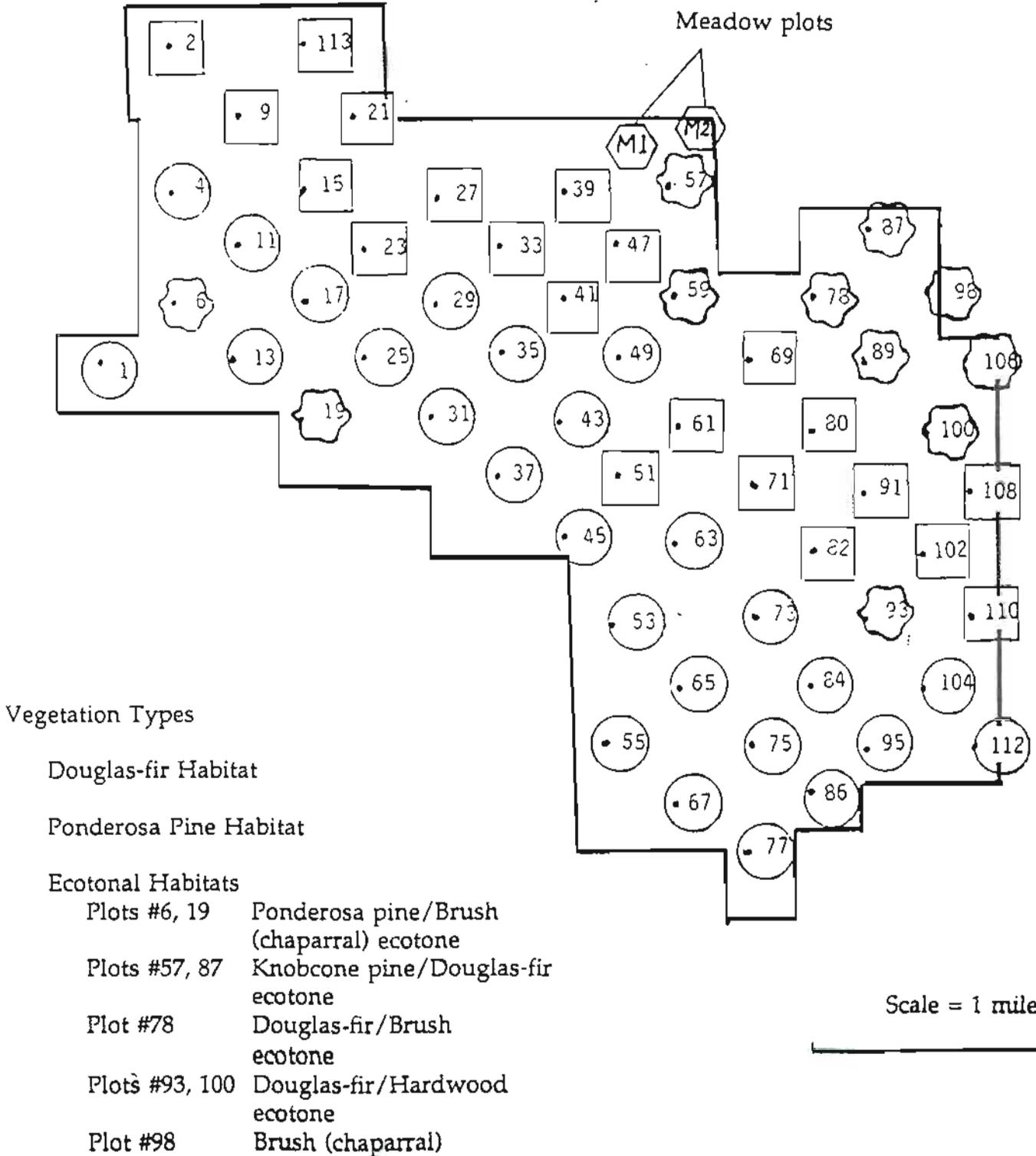
Soils Map of Boggs Mountain Demonstration State Forest



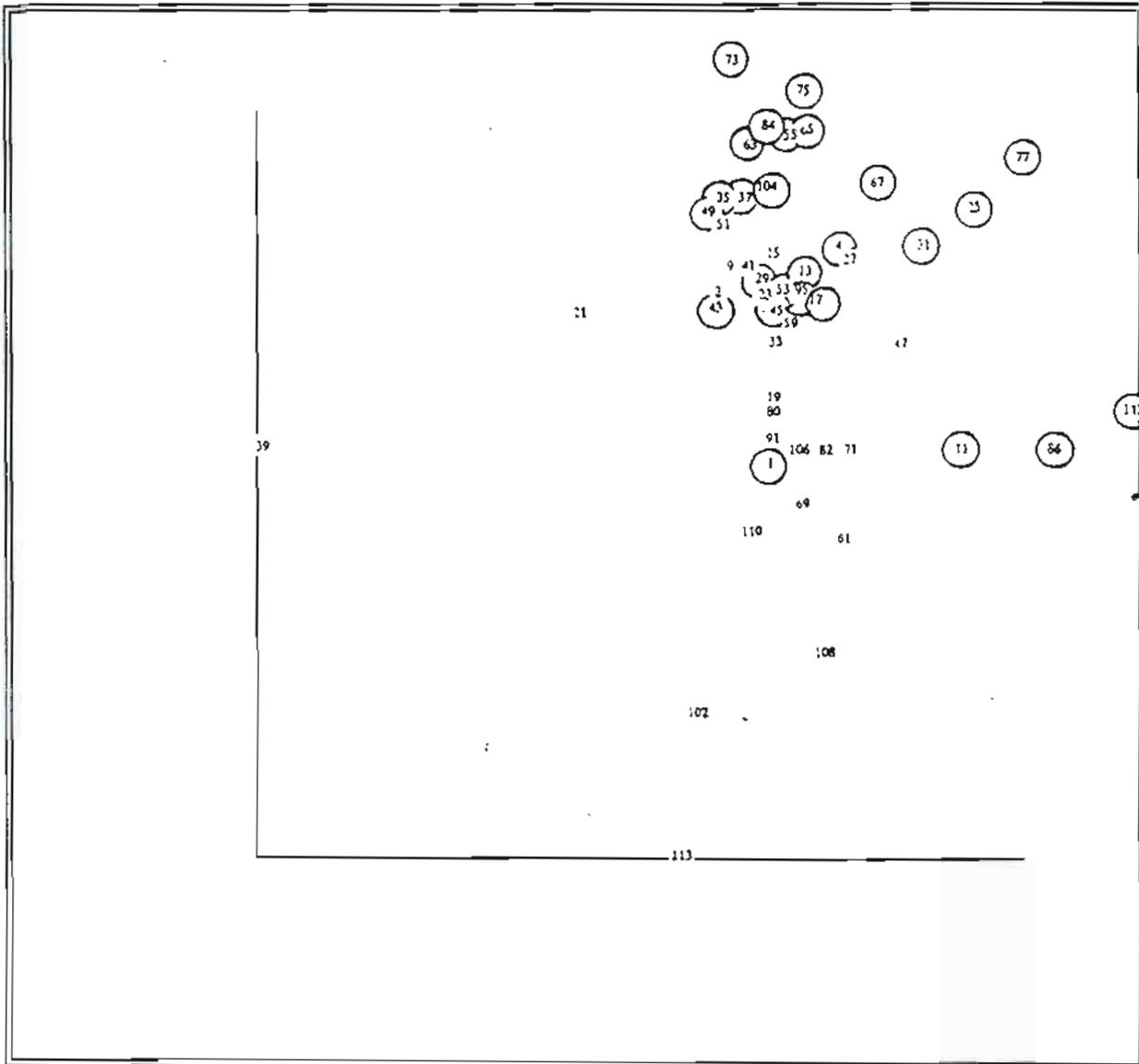
Soil Series No.	Name
126	COLLAYOMI COMPLEX, 50-75 percent slopes
127	COLLAYOMI-AIKEN-WHISPERING COMPLEX, 5-30 percent slopes
128	COLLAYOMI-AIKEN-WHISPERING COMPLEX 30-50 percent slopes
129	COLLAYOMI-WHISPERING COMPLEX, 30-50 percent slopes
168	MAYMAN-ETSEL-SNOOK COMPLEX, 15-30 percent slopes
173	MAYMAN-HOPLAND-MAYACAMA ASSOCIATION, 30-50 percent slopes
177	MILLSHOLM-BRESSA LOAMS, 30-50 percent slopes
178	MILLSHOLM-BRESSA-HOPLAND ASSOCIATION, 30-50 percent slopes 5-30 percent slopes
224	SPEAKER-MARPA-SANHEDRIN GRAVELLY LOAMS, 30-50 percent slopes
245	WHISPERING-COLLAYOMI COMPLEX, 50-75 percent slopes

Scale = 1 mile

Vegetation Map for Boggs Mountain
 Demonstration State Forest
 Locations of Permanent Plots Monitored During Diversity
 Study Indicated by Numbered Dots



Two-dimensional Bray and Curtis Ordination Analysis of
 Ground Cover Vegetation in Ponderosa Pine and
 Douglas Fir Stands
 Ordination of Species Importance Values from
 Fifty Permanent Plots.
 Boggs Mountain Demonstration State Forest



In spite of different management histories, Ponderosa pine stands (circled plots) exhibit a degree of differentiation from Douglas-fir stands based on an analysis of differences between their combined ground cover constituents. Major overriding physical environmental factors apparently exert a significant control over the make up of understory vegetation.

Table 1
 Bird Species Observed During Survey within Permanent Plots
 Ponderosa Pine Habitat
 (W and S denote winter and spring-summer sightings respectively)

Species name	Plot Number																									
	1	4	11	13	17	25	29	31	35	37	43	45	49	53	55	63	65	67	73	75	77	84	86	95	104	112
Lewis's woodpecker																										
Acorn woodpecker	S		S	WS					W					S	W					WS		W				S
Downy woodpecker	S		S			S	WS	W	WS					W	W				W	W		W				S
Hairy woodpecker							S																			
Northern flicker	S		WS		WS	W	S	WS	W	S		S	W			W				W	W		W	S	S	W
Pileated woodpecker						S																				WS
Steller's jay	WS	S	WS	S	S	WS	W	WS	S	S	S	WS	WS	W	S	S	S		S		S			S	S	WS
Scrub jay						S																				WS
American crow		S						S																		
Common raven			WS		W	WS				W	W	W		W		W	W	W	W	W		W	S	W	W	W
Chestnut-backed chickadee		W			S		WS																	S		
Red breasted nuthatch	S		S				W							W												
White breasted nuthatch	W			W					W					WS		W									S	

Species name	Plot Number																										
	1	4	11	13	17	25	29	31	35	37	43	45	49	53	55	63	65	67	73	75	77	84	86	95	104	112	
Pygmy nuthatch	W	W	WS	W		W	WS	W	W	WS	W	W	WS	WS		WS	W	WS	WS	W	WS	S	WS	S	WS	S	
Brown creeper	W			S			WS				S					WS			S						S		
Winter wren																											
Golden crowned kinglet		W																									
Ruby crowned kinglet	WS		WS	W	WS	W	W		W	W	W		W	S		W			W				W			W	
Western bluebird	W																	W									
Hermit thrush		W	W		W	W	W				W	W							W				W				
American robin	W	WS	S	S	S	W	WS	S	WS	S	S	S	S	S	W			S	W		WS		W	S	S		
Varied thrush	W	W			W	W	W		W		W		W	W	W											W	
Wren tit																S			S		S					S	
Cedar waxwing	W			W		W																					
Hutton's vireo	S	S	WS		WS	S			S				W	S										S			
Yellow rumped warbler	W								S		S	S	WS						S	S	S	S	S		S	S	W
Townsend's warbler						W	W																				
Rufous sided towhee	S			WS	S	W	S	S	S						S							WS		W		S	

Species name	Plot Number																									
	1	4	11	13	17	25	29	31	35	37	43	45	49	53	55	63	65	67	73	75	77	84	86	95	104	112
Dark-eyed junco	WS	S	S		S	S	WS	S	WS		S		WS		WS	S	S	S	S	S	S	S	W	S	WS	
Pine siskin	WS	W			WS	W	S	W	S			S		S	W							W				
Lesser goldfinch	S						S		S		S															
Mourning dove											WS											W				
Plain titmouse												S											S	S		
Red crossbill							W		W	W	W			S		W	W	WS	W	W	W	W			W	
Sharp shinned hawk				W																						
Turkey vulture									S				W													
Golden eagle																										
Band tailed pigeon					S					W																
Nuttall's woodpecker		S										S											S			
Purple finch		WS	W		W						S	S	S					S			S	S			S	S
Bushtit	S		W	S	S		S													S				S		
Anna's hummingbird											S											S				
Red tailed hawk				S																						
Northern pygmy owl													S													

Species name	Plot Number																										
	1	4	11	13	17	25	29	31	35	37	43	45	49	53	55	63	65	67	73	75	77	84	86	95	101	112	
Red shouldered hawk	WS																								S		
Townsend's solitaire																											
Mt. quail																								S			S
California quail	S																										
Dusky flycatcher	S		S	S	S		S						S	S	S	S				S	S			S		S	
Swainson's thrush		S																									
Black throated gray warbler	S	S	S	S				S		S	S		S		S					S			S	S	S	S	S
Ash throated flycatcher	S							S						S										S			
Solitary vireo	S		S	S	S		S		S	S	S	S					S			S			S	S	S	S	
Audubon's warbler	S	S	S		S		S						S														
Western tanager	S	S					S	S					S						S		S	S				S	
Black headed grosbeak		S	S	S			S	S		S			S														S
White crowned sparrow																											
Orange crowned warbler	S			S				S		S	S	S	S	S	S												S

Species name	Plot Number																									
	1	4	11	13	17	25	29	31	35	37	43	45	49	53	55	63	65	67	73	75	77	84	86	95	104	112
Yellow warbler,	S																									
Nashville warbler					S								S													
Cooper's hawk																										
Warbling vireo							S										S									
Gnatcatcher							S																			
Brown headed cowbird													S													
Red breasted sapsucker																										
Olive sided flycatcher																										
Wilson's warbler				S																						
Common yellow throat				S														S								
House finch								S					S													
House wren																										
Blue grouse				?																						
California towhee																								S		
American goldfinch																										

Table 2
 Bird Species Observed During Survey within Permanent Plots
 Douglas-Fir Habitat
 (W and S denote winter and spring-summer sightings respectively)

Species name	Plot Number																					
	2	9	15	21	23	27	33	39	41	47	51	59	61	69	71	80	82	91	102	108	110	113
Lewis's woodpecker																						
Acorn woodpecker	S						S	W		S			W	WS		WS		W	WS	WS	WS	WS
Downy woodpecker																			S		W	
Hairy woodpecker	WS	S	S	S	WS			S	WS		S	S	WS	S		S	W		W		WS	S
Northern flicker	S	W	S	S	S		WS	W	S	S			WS	WS	W	S		S	S			S
Pileated woodpecker				W	S							S							W			
Steller's jay	S	WS	S	WS	WS		WS	WS	W	WS	S	S	WS	WS	WS	WS	S	S	WS	WS	S	WS
Scrub jay				S		S	S													W		S
American crow																						
Common raven		S	WS		W	W	W	W	W	W		WS	W		W	W		W	W			W
Chestnut-backed chickadee		S	W	WS	W	W	S		W	S		WS	S	WS		S	S			W	W	
Red breasted nuthatch		W	W	WS	W	WS	W			WS		S	WS	S		WS			W		W	W
White breasted nuthatch																	S	WS	W	W	W	W
Pygmy nuthatch	S	W	W	WS	W	S	W	W	W	W	WS	WS	S	WS	W				W	W		
Brown creeper	WS			WS		WS				S	S	W	WS	W	S		WS	W				W
Winter wren																	W					W
Golden crowned kinglet			W											W		W					W	
Ruby crowned kinglet	S	S	W	WS		WS			W	W	S	W	W	W	W		W	W	W	WS	W	W
Western bluebird			S																			
Hermit thrush																				S		

Species name	Plot Number																						
	2	9	15	21	23	27	33	39	41	47	51	59	61	69	71	80	82	91	102	108	110	113	
American robin	S		S	WS	W	S		S		S	S	S	S	W		S	S			S		WS	
Varied thrush							W		W	W			W		W					W	W		
Wren tit																							
Cedar waxwing																	W						
Hutton's vireo		WS	W	W		W			WS	W		W	WS	W	W	W						W	
Yellow rumped warbler																	S						
Townsend's warbler																				W			
Rufous sided towhee		S	S			S				S			S	WS		S			S	WS	W	WS	
Dark-eyed junco	WS	W	WS	WS	W	S	S	WS	W	WS	S	S	WS	WS	S	S	S	S	S	S	S		S
Pine siskin		WS		S				W			S				W								S
Lesser goldfinch	S	S	S			S				S			W			S							S
Mourning dove	W			W		S						WS		S		W							
Plain titmouse			W							S							S			S			
Red crossbill	S					W									W								
Sharp shinned hawk						W										W							
Turkey vulture		S	S																				S
Golden eagle																		W					
Band tailed pigeon					S									W					W		W	W	
Nuttall's woodpecker																							
Purple finch		W	W	W	W		W	W	W	W		W		W									W
Bushtit						S				S						S							S
Anna's hummingbird						W													S		S		
Red tailed hawk				S	W							W											
Northern pygmy owl									S				S										W

Species name	Plot Number																					
	2	9	15	21	23	27	33	39	41	47	51	59	61	69	71	80	82	91	102	108	110	113
Red shouldered hawk		S	S																			
Townsend's solitaire																						
Mt. quail					S									S								S
California quail									S													
Dusky flycatcher	S			S			S	S		S			S			S	S		S	S		S
Swainson's thrush												S										
Black throated gray warbler	S	S	S	S		S				S	S											
Ash throated flycatcher			S																S		S	
Solitary vireo		S	S			S	S	S		S	S						S		S	S		S
Audubon's warbler		S	S	S		S					S	S	S	S		S						
Western tanager	S	S	S	S			S	S		S							S		S			
Black headed grosbeak	S	S	S	S		S	S				S		S				S		S			S
White crowned sparrow		S																				
Orange crowned warbler	S	S		S		S					S		S									S
Yellow warbler																						
Nashville warbler			S			S											S					
Cooper's hawk					S										S							
Warbling vireo							S															
Gnatcatcher																						
Brown headed cowbird											S											
Red breasted sapsucker																			S			S
Olive sided flycatcher																						S
Wilson's warbler																			S			
Common yellow throat																						

Species name	Plot Number																						
	2	9	15	21	23	27	33	39	41	47	51	59	61	69	71	80	82	91	102	108	110	113	
House finch																							
House wren																			S				
Blue grouse																							
California towhee																							
American goldfinch																							

Table 3
 Bird Species Observed During Survey within Permanent Plots
 Ecotonal Habitats
 (W and S denote winter and spring-summer sightings respectively)

Species name	Plot Number and Description												
	Ponderosa Pine/Brush Ecotone		Knobcone Douglas-Fir Ecotone		Douglas-Fir/Brush Ecotone		Douglas-Fir/Ponderosa Pine Ecotone		Douglas-Fir/Hardwood Ecotone		Brush (chaparral)	Meadow Habitats	
	6	19	57	87	78	106	93	100	59	89	98	M1	M2
Lewis's woodpecker											W		
Acorn woodpecker	W	S	WS	WS	WS	WS		WS		WS	WS		
Downy woodpecker					W	W							
Hairy woodpecker	W		S		WS	W			S	S	W		
Northern flicker	W		W	S	WS			W		S	W		S
Pileated woodpecker									S				
Steller's jay	WS	S	WS	S	WS	WS	S		S	WS	WS	WS	W
Scrub jay	W		W	S	WS					WS	WS		S
American crow	W												
Common raven	W				S	W		W	WS		S		
Chestnut-backed chickadee			S	S	WS				WS	W		W	
Red breasted nuthatch		W	S	S				W	S				
White breasted nuthatch	W	S		W	S	W		W			W		
Pygmy nuthatch	W	W	W		S			W	WS				
Brown creeper		S	W						W	W			
Winter wren			S										
Golden crowned kinglet													
Ruby crowned kinglet	W		W	W	W	W	W	W	W	W	WS	W	
Western bluebird	S												

Species name	Plot Number and Description												
	Ponderosa Pine/Brush Ecotone		Knobcone Douglas-Fir Ecotone		Douglas-Fir/Brush Ecotone		Douglas-Fir/Ponderosa Pine Ecotone		Douglas-Fir/Hardwood Ecotone		Brush (chaparral)	Meadow Habitats	
	6	19	57	87	78	106	93	100	59	89	98	M1	M2
Hermit thrush			W	W	W					W	W	S	S
American robin	S	S		WS	W	W	S	W	S		W		
Varied thrush	W		W		W	W		W		W	W		
Wren tit			W	W		S				W	WS		
Cedar waxwing													
Hutton's vireo				WS	W				W	W	S		
Yellow rumped warbler	W			W	W								
Townsend's warbler										W			
Rufous sided towhee	WS	S	WS	WS	WS	WS		S		W	WS	WS	W
Dark-eyed junco	WS	W	WS	W	S	S	S	S	S		WS		
Pine siskin										W		W	
Lesser goldfinch			W	S	S	WS					WS	WS	S
Mourning dove	WS		S	S	S	W		W	WS	S			
Plain titmouse		W		WS	W	S		S		W	WS		
Red crossbill							W			W			
Sharp shinned hawk													
Turkey vulture	W				S					W			
Golden eagle													
Band tailed pigeon			S			S							
Nuttall's woodpecker										W			
Purple finch			S					S	W				
Bushtit			S		W								

Species name	Plot Number and Description												
	Ponderosa Pine/Brush Ecotone		Knobcone Douglas-Fir Ecotone		Douglas-Fir/Brush Ecotone		Douglas-Fir/Ponderosa Pine Ecotone		Douglas-Fir/Hardwood Ecotone		Brush (chaparral)	Meadow Habitats	
	6	19	57	87	78	106	93	100	59	89	98	M1	M2
Anna's hummingbird													
Red tailed hawk			W	S					W				
Northern pygmy owl	S												
Red shouldered hawk													
Townsend's solitaire													
Mt. quail		S			S					S		S	WS
California quail	S					S					S	W	W
Dusky flycatcher	S					S	S	S		S	S	S	
Swainson's thrush									S				
Black throated gray warbler		S		S			S						
Ash throated flycatcher	S										S		
Solitary vireo	S				S	S	S	S					
Audubon's warbler					S				S				
Western tanager		S	S					S					
Black headed grosbeak			S				S						
White crowned sparrow												WS	W
Orange crowned warbler		S	S	S		S					S		
Yellow warbler													
Nashville warbler				S									
Cooper's hawk													
Warbling vireo								S					
Gnatcatcher											S		

Species name	Plot Number and Description												
	Ponderosa Pine/Brush Ecotone		Knobcone Douglas-Fir Ecotone		Douglas-Fir/Brush Ecotone		Douglas-Fir/Ponderosa Pine Ecotone		Douglas-Fir/Hardwood Ecotone		Brush (chaparral)	Meadow Habitats	
	6	19	57	87	78	106	93	100	59	89	98	M1	M2
Brown headed cowbird						S							S
Red breasted sapsucker													
Olive sided flycatcher												S	
Wilson's warbler													
Common yellow throat													
House finch													
House wren													
Blue grouse											S		
California towhee												S	S
American goldfinch								S				W	

Table 4
 Amphibian, Reptile and Mammal Species Observed During Survey
 Within Permanent Plots - Ponderosa Pine Habitat

Species name	Plot Number																									
	1	4	11	13	17	25	29	31	35	37	43	45	49	53	55	63	65	67	73	75	77	84	86	95	104	112
Amphibians: Ensatina							✓																			
Reptiles: Western fence lizard		✓			✓	✓		✓	✓		✓		✓				✓		✓		✓	✓				
Sagebrush lizard		✓						✓					✓						✓		✓			✓	✓	
Southern alligator lizard			✓																							
Western skink						✓							✓													
Western rattlesnake													✓													
Mammals: Raccoon	✓											✓														
Ornate shrew																										
Gray fox	✓		✓		✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓		✓	✓						
Deer mouse				✓					✓	✓				✓									✓			
Brush mouse																										
Chipmunk					✓									✓												
Dusky footed woodrat																										

Species name	Plot Number																										
	1	4	11	13	17	25	29	31	35	37	43	45	49	53	55	63	65	67	73	75	77	84	86	95	104	112	
Black-tailed hare																											
Western gray squirrel																											
Bobcat	Bobcat were flushed twice while moving from one location to another, but none visited the smoked plate sampling apparatus.																										
Mountain lion	Mountain lion undoubtedly move through the forest, tracks of a large cat (paw width 3.1 inch) were observed at Houghton Spring.																										
Mule deer	Deer appear to be abundant within the forest but the sampling procedure designed to detect their presence within the permanent plots gave no positive results.																										
Wild pig	Wild pig do occur in the forest although no specific evidence of activity was recorded from sample plots.																										

Table 5
Amphibian, Reptile and Mammal Species Observed During Survey
Within Permanent Plots - Douglas Fir Habitat

Species name	Plot Number																					
	2	9	15	21	23	27	33	41	47	51	59	61	69	71	80	82	91	102	106	108	110	113
Amphibians: Ensatina																						
Reptiles: Western fence lizard		✓						✓	✓			✓				✓		✓		✓		✓
Sagebrush lizard					✓				✓			✓			✓	✓	✓	✓				✓
Southern alligator lizard				✓			✓				✓		✓									
Western skink			✓										✓		✓	✓	✓			✓	✓	
Garter snake											✓											
Western rattlesnake		✓																				
Mammals: Raccoon										✓												
Ornate shrew																						✓
Gray fox	✓	✓		✓	✓	✓		✓	✓		✓			✓	✓							✓
Deer mouse			✓		✓			✓	✓		✓			✓		✓						✓
Brush mouse							✓															
Chipmunk											✓											
Dusky footed woodrat																						
Black-tailed hare																						
Western gray squirrel		✓	✓																			✓
Bobcat	Bobcat were flushed twice while moving from one location to another, but none visited the smoked plate sampling apparatus.																					
Mountain lion	Mountain lion undoubtedly move through the forest; tracks of a large cat (paw width 3.1 inch) were observed at Houghton Spring.																					
Mule deer		✓																				
Wild pig																						

Table 6
 Ecotonal and Brush (Chaparral) Habitats
 Amphibian, Reptile and Mammal Occurrences
 Within Permanent Plots

Species name	Plot Number and Description												
	Ponderosa pine/Brush ecotone		Knobcone Douglas - fir ecotone		Douglas-fir/Brush ecotone		Douglas-fir/ Ponderosa Pine ecotone		Douglas-fir/ Hardwood ecotone		Brush (chaparral)	Meadow Habitats	
	6	19	57	87	78	106	93	100	59	89	98	M1	M2
Amphibians: Ensatina	✓												
Reptiles: Western fence lizard		✓	✓				✓		✓			✓	✓
Sagebrush lizard							✓						
Southern alligator lizard									✓			✓	
Western skink													
Western rattlesnake													
Mammals: Raccoon													
Ornate shrew													
Gray fox													
Deer mouse													
Brush mouse													
Chipmunk													
Dusky footed woodrat													
Black-tailed hare													
Western gray squirrel			An undersampled species on the plots, but relatively abundant throughout the forest.										
Bobcat	Bobcat were flushed twice while moving from one location to another, but none visited the smoked plate sampling apparatus.												
Mountain lion	Mountain lion undoubtedly move through the forest; tracks of a large cat (paw width 3.1 inch) were observed at Houghton Spring.												

Species name	Plot Number and Description												
	Ponderosa pine/Brush ecotone		Knobcone Douglas fir ecotone		Douglas fir/Brush ecotone		Douglas fir/Ponderosa Pine ecotone		Douglas fir/Hardwood ecotone		Brush (chaparral)	Meadow Habitats	
	6	19	57	87	78	106	93	100	59	89	98	M1	M2
Mule deer	Deer appear to be abundant within the forest but the sampling procedure designed to detect their presence within the permanent plots gave no positive results.												
Wild pig	Wild pig do occur in the Forest although no specific evidence of activity was recorded from sample plots.												

Table 7
Vertebrate Species numbers Observed on Recently Thinned Plots
Ponderosa Pine Habitat

	Plot Number and Recent Management History				
	Average and (St. Dev.) for habitat n=22	35 Manually thinned .. 1985 Control burned 1986 Reburned 1990	77 Manually thinned .. 1986 Control-burned 1988 Chem-released 1990	75 Mechanically thinned 1985 Control burned 1985 Chem-released 1989	67 Mechanically thinned 1990
Birds:					
Winter	7.04 (3.01)	11	8	4	4
Summer	11.64 (4.32)	10	11	5	9
Amphibians:	.05 (.213)	0	0	0	0
Reptiles:	.86 (1.04)	1	2	0	0
Mammals:	.95 (.72)	2	0	1	0

Table 8
Vascular Plant Species Encountered During Survey
of Two Meadow Habitats

Plot M1 - West of Permanent Plot 57

Latin name	Common name
<i>Aira caryophyllea</i>	Hair grass
<i>Boisduvalia densiflora</i>	Boisduvalia
<i>Briza minor</i>	Quaking grass
<i>Bromus diandrus</i>	Ripgut grass
<i>Bromus mollis</i>	Soft chess
<i>Carex multicaulis</i>	Sedge
<i>Epilobium paniculatum</i>	Willow herb
<i>Eryngium aristulatum</i>	Coyote thistle
<i>Hesperolinum micranthum</i>	Annual flax
<i>Hypochoeris glabra</i>	Cat's paw
<i>Lotus purshianus</i>	Trefoil
<i>Lotus subpinnatus</i>	Yellow annual lotus
<i>Madia madioides</i>	Tarweed
<i>Perideridia gairdneri</i>	Squaw root
<i>Ranunculus californica</i>	Buttercup
<i>Tillaea erecta</i>	Pygmy weed

Plot M2 - North of Permanent Plot 57

Latin name	Common name
<i>Agoseris retroflexa</i>	Mountain dandelion
<i>Avena fatua</i>	Wild oat
<i>Bromus diandrus</i>	Rip cut grass
<i>Bromus mollis</i>	Soft chess
<i>Bromus orcuttianus</i>	Brome
<i>Bromus tectorum</i>	Cheat grass
<i>Elymus glaucus</i>	Wheat grass
<i>Epilobium paniculatum</i>	Willow herb
<i>Festuca californica</i>	California fescue
<i>Gnaphalium microcephalum</i>	Cudweed
<i>Madia elegans</i>	Madia-tarweed
<i>Melica geyeri</i>	Melic grass
<i>Perideridia gairdneri</i>	Squaw root
<i>Psoralea macrostachya</i>	Psoralea

Appendix 1

Prediction and Comparison of Species of Vertebrate Animals Likely to Occur in Two Different Habitats

Ponderosa Pine Forest and Douglas-Fir
Forest Habitats

Boggs Mountain Demonstration State Forest

Combinations of Habitat Descriptors used to make each
prediction represent modal values for all
plots in each of two habitat types.

Key to Habitat and Successional Stage Descriptors

Tree Habitat		Habitat Stage																			
		1	2S	2P	2M	2D	3S	3P	3M	3D	4S	4P	4M	4D	5S	5P	5M	5D	6		
SMC	Sierran Mixed Conifer	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
MHC	Montane Hardwood-Conifer	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
MHW	Montane Hardwood	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
PPN	Ponderosa Pine	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
DFR	Douglas-Fir	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
Standards For Tree Size					Standards For Canopy Closure																
WHR	WHR Size Class	Conifer Crown Diameter	Hardwood Diameter	dbh	WHR	WHR Closure Class	Ground Cover (Canopy Closure)														
1	Seedling Tree	n/a	n/a	<1"	S	Sparse Cover	10-24%														
2	Sapling Tree	n/a	1-15"	1"-6"	P	Open Cover	25-39%														
3	Pole Tree	1-2'	1.5'-30'	5"-11"	M	Moderate Cover	40-59%														
4	Small Tree	2'-24'	30'-45'	11"-24"	D	Dense Cover	60-100%														
5	Medium/Large Tree	24'	45'	24"																	
5	Multi-Layered Tree	Size class 5 trees over a distinct layer of size class 4 or 3 trees, total tree canopy exceeds 60% closure																			
Shrub Habitat		Habitat Stage																			
		1	2S	2P	2M	2D	3S	3P	3M	3D	4S	4P	4M	4D							
MCP	Montane Chaparral	•	•	•	•	•	•	•	•	•	•	•	•	•							
MCH	Mixed Chaparral	•	•	•	•	•	•	•	•	•	•	•	•	•							
Standards For Shrub Size					Standards For Canopy Closure																
WHR	WHR Size Class	Crown Decadence			WHR	WHR Closure Class	Ground Cover (Canopy Closure)														
1	Seedling Shrub	(seedlings or sprouts <3 years)			S	Sparse Cover	10-24%														
2	Young Shrub	None			P	Open Cover	25-39%														
3	Mature Shrub	1-25%			M	Moderate Cover	40-59%														
4	Decadent Shrub	>25%			D	Dense Cover	60-100%														
Herbaceous Habitat		Habitat Stage																			
		1S	1P	1M	1D	2S	2P	2M	2D												
AGS	Annual Grassland	•	•	•	•	•	•	•	•												
PGS	Perennial Grassland	•	•	•	•	•	•	•	•												
WTM	Wet Meadow	•	•	•	•	•	•	•	•												
Standards For Height Classes					Standards For Canopy Closure																
WHR	WHR Height Class	Plant Height at Maturity			WHR	WHR Closure Class	Ground Cover (Canopy Closure)														
1	Short Herb	<12"			S	Sparse Cover	2-9%														
2	Tall Herb	>12"			P	Open Cover	10-39%														
					M	Moderate Cover	40-59%														
					D	Dense Cover	60-100%														

Habitats:
1 PONDEROSA PINE

Habitats:
2 DOUGLAS-FIR

SMALL TREE OPEN 25-39% (4P)

POLE TREE OPEN 25-39% (3P)

Elements Included:

- ACORNS
- AMPHIBIANS
- BANK
- BARREN
- BERRIES
- BIRDS, SMALL
- CAYE
- CONES
- DUFF
- FERN
- FLOWERS
- FORBS
- FRUITS
- GRAIN
- GRAMINOIDS
- INSECTS, FLYING
- INSECTS, TERRESTRIAL
- LITHIC
- LITTER
- LOG, LARGE Rotten
- LOG, LARGE Sound
- LOG, LARGE Hollow
- LOG, MEDIUM Rotten
- LOG, MEDIUM Sound
- LOG, MEDIUM Hollow
- MOSS
- NECTAR
- REPTILES
- RIPARIAN INCLUSION
- SEEDS
- SHRUBS
- SLASH, LARGE Rotten
- SLASH, LARGE Hard
- SLASH, LARGE Sound
- SNAG, LARGE Rotten
- SNAG, LARGE Sound
- SNAG, MEDIUM Rotten
- SNAG, MEDIUM Sound
- SNAG, SMALL Rotten
- SNAG, SMALL Sound
- SOIL, AERATED
- SOIL, FRIABLE
- SOIL, GRAVELLY
- STREAMS, PERMANENT
- STUMP Sound
- STUMP Rotten
- TREE LEAVES
- TREE, BROKEN TOP LIVE
- TREE, WITH CAVITIES
- TREE, WITH LOOSE BARK
- TREES, FIR
- TREES, HARDWOOD
- TREES, PINE

Elements Included:

- ACORNS
- ALGAE
- AMPHIBIANS
- BANK
- BARREN
- BERRIES
- BIRDS, MEDIUM
- BIRDS, SMALL
- BOGS
- CONES
- DUFF
- FERN
- FLOWERS
- FORBS
- FRUITS
- GRAIN
- GRAMINOIDS
- INSECTS, FLYING
- INSECTS, TERRESTRIAL
- LITTER
- LOG, MEDIUM Rotten
- LOG, MEDIUM Sound
- LOG, MEDIUM Hollow
- MOSS
- NECTAR
- REPTILES
- RIPARIAN INCLUSION
- ROOTS
- SEEDS
- SHRUBS
- SLASH, LARGE Rotten
- SLASH, LARGE Hard
- SLASH, LARGE Sound
- SLASH, SMALL
- SNAG, MEDIUM Rotten
- SNAG, MEDIUM Sound
- SNAG, SMALL Rotten
- SNAG, SMALL Sound
- SOIL, AERATED
- SOIL, FRIABLE
- SOIL, GRAVELLY
- SPRINGS
- STREAMS, INTERMITTENT
- STREAMS, PERMANENT
- STUMP Sound
- STUMP Rotten
- TREE LEAVES
- TREE, BROKEN TOP LIVE
- TREE, WITH CAVITIES
- TREE, WITH LOOSE BARK
- TREES, FIR
- TREES, HARDWOOD
- TREES, PINE

CALIFORNIA DEPARTMENT OF FISH AND GAME WILDLIFE HABITAT RELATIONSHIP SYSTEM
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SPECIES COMPARISON REPORT

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Element reproduction level required: P Situation One = Ponderosa Pine Forest
Element feeding level required: P
Element cover level required: P Situation Two = Douglas-Fir Forest

SITUATION ONE	SITUATION TWO	ID	SPECIES NAME	SCIENTIFIC NAME	STATUS	
					FFCCCFBH ETETPSS	CAL SC
	X	A004	#PACIFIC GIANT SALAMANDER	Dicamptodon ensatus		
	X	A006	#ROUGH-SKINNED NEWT	Taricha granulosa		
X	X	A020	#BLACK SALAMANDER	Aneides flavipunctatus		
	X	A022	#ARBOREAL SALAMANDER	Aneides lugubris		
X	X	A039	#PACIFIC TREEFROG	Hyla regilla		
X		A046	#BULLFROG	Rana catesbeiana		8
X	X	B108	#TURKEY VULTURE	Cathartes aura		
X		B110	#OSPREY	Pandion haliaetus	6	2
X		B113	#BALD EAGLE	Haliaeetus leucocephalus	1 3 5	
X	X	B115	#SHARP-SHINNED HAWK	Accipiter striatus		
X	X	B116	#COOPER'S HAWK	Accipiter cooperii		
X		B117	#NORTHERN GOSHAWK	Accipiter gentilis	6	
X	X	B123	#RED-TAILED HAWK	Buteo jamaicensis		
X		B126	#GOLDEN EAGLE	Aquila chrysaetos	56	
X	X	B127	#AMERICAN KESTREL	Falco sparverius		
X	X	B128	#MERLIN	Falco columbarius		1
X	X	B129	#PEREGRINE FALCON	Falco peregrinus	1 3 5	
X	X	B131	#PRAIRIE FALCON	Falco mexicanus	6	
	X	B134	#BLUE GROUSE	Dendragapus obscurus	5 8	
X		B138	#TURKEY	Meleagris gallopavo	8	
X	X	B140	#CALIFORNIA QUAIL	Callipepla californica	8	
X	X	B141	#MOUNTAIN QUAIL	Oreortyx pictus	8	
X	X	B251	#BAND-TAILED PIGEON	Columba fasciata	8	
X	X	B255	#MOURNING DOVE	Zenaidura macroura	8	
X		B262	#COMMON BARN OWL	Tyto alba		
X	X	B263	#FLAMMULATED OWL	Otus flammeolus		
X		B264	#WESTERN SCREECH OWL	Otus kennicottii		
X	X	B265	#GREAT HORNED OWL	Bubo virginianus		
X	X	B267	#NORTHERN PYGMY OWL	Glaucidium gnoma		
X		B272	#LONG-EARED OWL	Asio otus		2
X	X	B274	#NORTHERN SAW-WHET OWL	Aegolius acadicus		
X	X	B281	#VAUX'S SWIFT	Chaetura vauxi		
X	X	B282	#WHITE-THROATED SWIFT	Aeronautes saxatalis		
X		B287	#ANNA'S HUMMINGBIRD	Calypte anna		
X		B294	#LEWIS' WOODPECKER	Melanerpes lewis		
X		B296	#ACORN WOODPECKER	Melanerpes formicivorus		
X	X	B299	#RED-BREADED SAPSUCKER	Sphyrapicus ruber		
X		B302	#NUTTALL'S WOODPECKER	Picoides nuttallii		
X	X	B303	#DOWNY WOODPECKER	Picoides pubescens		
X	X	B304	#HAIRY WOODPECKER	Picoides villosus		

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SPECIES COMPARISON REPORT

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SITUATION			ID	SPECIES NAME	SCIENTIFIC NAME	STATUS	
ONE	TWO					FFCCCF8H	CAL
						ETETPSS	SC
X			8305	*WHITE-HEADED WOODPECKER	Picoides albolarvatus		
X	X		8307	*NORTHERN FLICKER	Colaptes auratus		
X	X		8309	*OLIVE-SIDED FLYCATCHER	Contopus borealis		
X	X		8311	*WESTERN WOOD-PEWEE	Contopus sordidulus		
X	X		8318	*DUSKY FLYCATCHER	Empidonax oberholseri		
X	X		8320	*WESTERN FLYCATCHER	Empidonax difficilis		
X			8339	*TREE SWALLOW	Tachycineta bicolor		
X	X		8340	*VIOLET-GREEN SWALLOW	Tachycineta thalassina		
X			8341	*NORTHERN ROUGH-WINGED SWALLOW	Stelgidopteryx serripennis		
X			8343	*CLIFF SWALLOW	Hirundo pyrrhonota		
X			8344	*BARN SWALLOW	Hirundo rustica		
X	X		8345	*GRAY JAY	Perisoreus canadensis		
X	X		8346	*STELLER'S JAY	Cyanocitta stelleri		
X	X		8354	*COMMON RAVEN	Corvus corax		
X	X		8356	*MOUNTAIN CHICKADEE	Parus gambeli		
X	X		8357	*CHESTNUT-BACKED CHICKADEE	Parus rufescens		
X			8358	*PLAIN TITMOUSE	Parus inornatus		
X	X		8361	*RED-BREADED NUTHATCH	Sitta canadensis		
X	X		8362	*WHITE-BREADED NUTHATCH	Sitta carolinensis		
X			8363	*PYGMY NUTHATCH	Sitta pygmaea		
X	X		8364	*BROWN CREEPER	Certhia americana		
X	X		8375	*GOLDEN-CROWNED KINGLET	Regulus satrapa		
X	X		8376	*RUBY-CROWNED KINGLET	Regulus calendula		
X	X		8380	*WESTERN BLUEBIRD	Sialia mexicana		
X			8381	*MOUNTAIN BLUEBIRD	Sialia currucoides		
X			8382	*TOWNSEND'S SOLITAIRE	Myadestes townsendi		
X	X		8386	*HERMIT THRUSH	Catharus guttatus		
X	X		8389	*AMERICAN ROBIN	Turdus migratorius		
X	X		8390	*VARIED THRUSH	Ixoreus naevius		
X	X		8407	*CEDAR WAXWING	Bombycilla cedrorum		
X			8411	*EUROPEAN STARLING	Sturnus vulgaris		
X	X		8415	*SOLITARY VIREO	Vireo solitarius		
X	X		8418	*WARBLING VIREO	Vireo gilvus		
X			8425	*ORANGE-CROWNED WARBLER	Vermivora celata		
X	X		8426	*NASHVILLE WARBLER	Vermivora ruficapilla		
X			8430	*YELLOW WARBLER	Dendroica petechia		2
X	X		8435	*YELLOW-RUMPED WARBLER	Dendroica coronata		
X			8436	*BLACK-THROATED GRAY WARBLER	Dendroica nigrescens		
X	X		8437	*TOWNSEND'S WARBLER	Dendroica townsendi		
X	X		8438	*HERMIT WARBLER	Dendroica occidentalis		
X	X		8460	*MACGILLIVRAY'S WARBLER	Oporornis tolmiei		
X	X		8463	*WILSON'S WARBLER	Wilsonia pusilla		
X	X		8471	*WESTERN Tanager	Piranga ludoviciana		
X			8475	*BLACK-HEADED GROSBEAK	Pheucticus melanocephalus		
X	X		8483	*RUFOUS-SIDED TOWHEE	Pipilo erythrophthalmus		
X	X		8489	*CHIPPING SPARROW	Spizella passerina		
X	X		8504	*FOX SPARROW	Passerella iliaca		

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SITUATION ONE	SITUATION TWO	ID	SPECIES NAME	SCIENTIFIC NAME	STATUS 12345678 FFCCCFBH CAL ETETPSS SC
	X	3505	#SONG SPARROW	Melospiza melodia	
X	X	3512	#DARK-EYED JUNCO	Junco hyemalis	
	X	3521	#WESTERN MEADOWLARK	Sturnella neglecta	
X	X	3524	#BREWER'S BLACKBIRD	Euphagus cyanocephalus	
X		3532	#NORTHERN ORIOLE	Icterus galbula	
X	X	3536	#PURPLE FINCH	Carduelis purpureus	
X		3539	#RED CROSSBILL	Loxia curvirostra	
X	(	3542	#PINE SISKIN	Carduelis pinus	
(	(	#001	#VIRGINIA OPOSSUM	Didelphis virginiana	
(		#006	ORNATE SHREW	Sorex ornatus	
(		#012	#TROWBRIDGE'S SHREW	Sorex trowbridgei	
(	X	#021	#LITTLE BROWN MYOTIS	Myotis lucifugus	
(		#023	#YUMA MYOTIS	Myotis yumanensis	
(	(	#025	#LONG-EARED MYOTIS	Myotis evotis	
(		#027	#LONG-LEGGED MYOTIS	Myotis volans	
(	X	#030	#SILVER-HAIRED BAT	Lasionycteris noctivagans	
(	X	#032	#BIG BROWN BAT	Eptesicus fuscus	
(	X	#033	#RED BAT	Lasiurus borealis	
(	X	#034	#HOARY BAT	Lasiurus cinereus	
(	(	#051	#BLACK-TAILED HARE	Lepus californicus	3
(	X	#055	YELLOW-PINE CHIPMUNK	Tamias amoenus	
(		#057	#ALLEN'S CHIPMUNK	Tamias senex	
(		#072	#CALIFORNIA GROUND SQUIRREL	Sciurus harrisi	
(	(	#075	#GOLDEN-MANTLED GROUND SQUIRREL	Sciurus lateralis	
(		#077	#WESTERN GRAY SQUIRREL	Sciurus griseus	3
(		#113	#WESTERN HARVEST MOUSE	Reithrodontomys megalotis	
(	(	#117	DEER MOUSE	Peromyscus maniculatus	
(		#119	BRUSH MOUSE	Peromyscus boylii	
(		#120	#PINYON MOUSE	Peromyscus truei	
(	X	#127	#DUSKY-FOOTED WOODRAT	Neotoma fuscipes	
(	X	#145	#PORCUPINE	Erethizon dorsatum	
	X	#146	#COYOTE	Canis latrans	8
(	X	#149	#GRAY FOX	Urocyon cinereoargenteus	3
(	X	#151	#BLACK BEAR	Ursus americanus	8
	X	#152	#RINGTAIL	Bassariscus astutus	5
(	X	#153	#RACCOON	Procyon lotor	8
(		#155	#FISHER	Martes pennanti	
(	X	#156	#ERMINE	Mustela erminea	8
(	X	#157	#LONG-TAILED WEASEL	Mustela frenata	8
	X	#161	#WESTERN SPOTTED SKUNK	Spillogale gracilis	3
	X	#162	#STRIPED SKUNK	Mephitis mephitis	8
(	X	#165	#MOUNTAIN LION	Felis concolor	8
(	X	#166	#BOBCAT	Felis rufus	8
	X	#177	#ELK	Cervus elaphus	8
(	X	#181	#MULE DEER	Odocoileus hemionus	8
(X	R022	#WESTERN FENCE LIZARD	Sceloporus occidentalis	
(R023	#SAGEBRUSH LIZARD	Sceloporus graciosus	

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SPECIES COMPARISON REPORT

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=====				STATUS	
SITUATION	SITUATION	ID	SPECIES NAME	SCIENTIFIC NAME	
ONE	TWO				

					12345678
					FPCCCFBH CAL
					ETETPSS SC

X		R036	#WESTERN SKINK	<i>Eumeces skiltonianus</i>	
X		R040	#SOUTHERN ALLIGATOR LIZARD	<i>Gerrhonotus multicarinatus</i>	
X	X	R042	#NORTHERN ALLIGATOR LIZARD	<i>Gerrhonotus coeruleus</i>	
	X	R049	#SHARP-TAILED SNAKE	<i>Contia tenuis</i>	
X	X	R051	#RACER	<i>Coluber constrictor</i>	
X	X	R057	#GOPHER SNAKE	<i>Pituophis melanoleucus</i>	
X	X	R061	#COMMON GARTER SNAKE	<i>Thamnophis sirtalis</i>	
X	X	R062	#WESTERN TERRESTRIAL GARTER SNAKE	<i>Thamnophis elegans</i>	
X	X	R063	#WESTERN AQUATIC GARTER SNAKE	<i>Thamnophis couchi</i>	
X	X	R075	#WESTERN RATTLESNAKE	<i>Crotalus viridis</i>	

TOTAL IN SITUATION 1: 126
 TOTAL IN SITUATION 2: 101
 TOTAL SPECIES: 144

Appendix 2

Comparison Table of Predicted Vertebrate Occurrences
using the Wildlife Habitat Relationship Model,
vs. Actual Species Records Obtained
During 1991-92 Survey

Species Name	Species Predicted to occur at Boggs Mountain using WFR Model	Species occurrences recorded during 1991-1992 Survey	
		Summer	Winter
PACIFIC GIANT SALAMANDER	✓		
ENSATINA		✓	✓
ROUGH SKINNED NEWT	✓		
ARBOREAL SALAMANDER	✓		
BLACK SALAMANDER	✓		
PACIFIC TREEFROG	✓		
BULLFROG	✓		
TURKEY VULTURE	✓	✓	✓
OSPREY	✓		
BALD EAGLE	✓		
SHARP-SHINNED HAWK	✓		✓
COOPER'S HAWK	✓	✓	
NORTHERN GOSHAWK	✓		
RED-SHOULDERED HAWK		✓	✓
RED-TAILED HAWK	✓	✓	✓
GOLDEN EAGLE	✓		✓
AMERICAN KESTREL	✓		
MERLIN	✓		
PEREGRINE FALCON	✓		
PRAIRIE FALCON	✓		
BLUE GROUSE	✓	✓	
TURKEY	✓		
CALIFORNIA QUAIL	✓	✓	
MOUNTAIN QUAIL	✓	✓	
BAND-TAILED PIGEON	✓	✓	✓
MOURNING DOVE	✓	✓	✓
COMMON BARN OWL	✓		
FLAMMULATED OWL	✓		
WESTERN SCREECH OWL	✓		
GREAT HORNED OWL	✓		
NORTHERN PYGMY OWL	✓	✓	✓
LONG-EARED OWL	✓		

Species Name	Species Predicted to occur at Boggs Mountain using WHR Model	Species occurrences recorded during 1991-1992 Survey	
		Summer	Winter
NORTHERN SAW-WHET OWL	✓		
LONG EARED OWL	✓		
NORTHERN SAW-WHET OWL	✓		
VAUX'S SWIFT	✓		
WHITE-THROATED SWIFT	✓		
ANNA'S HUMMINGBIRD	✓	✓	✓
LEWIS' WOODPECKER	✓		✓
ACORN WOODPECKER	✓	✓	✓
PILEATED WOODPECKER			✓
RED-BREASTED SAPSUCKER	✓	✓	
NUTTALL'S WOODPECKER	✓	✓	✓
DOWNY WOODPECKER	✓	✓	✓
HAIRY WOODPECKER	✓	✓	✓
WHITE-HEADED WOODPECKER	✓		
NORTHERN FLICKER	✓	✓	✓
OLIVE-SIDED FLYCATCHER	✓	✓	
WESTERN WOOD-PEWEE	✓		
DUSKY FLYCATCHER	✓	✓	
WESTERN FLYCATCHER	✓		
ASH-THROATED FLYCATCHER		✓	
WESTERN FLYCATCHER	✓		
WESTERN KINGBIRD	✓		
TREE SWALLOW	✓		
VIOLET-GREEN SWALLOW	✓		
NORTHERN ROUGH-WINGED SWALLOW	✓		
CLIFF SWALLOW	✓		
BARN SWALLOW	✓		
GRAY JAY	✓		
STELLER'S JAY	✓	✓	✓
SCRUB JAY	✓	✓	✓
COMMON RAVEN	✓	✓	✓
AMERICAN CROW		✓	✓

Species Name	Species Predicted to occur at Boggs Mountain using WHR Model	Species occurrences recorded during 1991-1992 Survey	
		Summer	Winter
MOUNTAIN CHICKADEE	✓		
CHESTNUT-BACKED CHICKADEE	✓	✓	✓
PLAIN TITMOUSE	✓	✓	✓
BUSHTIT		✓	✓
RED-BREASTED NUTHATCH	✓	✓	✓
WHITE-BREASTED NUTHATCH	✓	✓	✓
PYGMY NUTHATCH	✓	✓	✓
BROWN CREEPER	✓	✓	✓
HOUSE WREN		✓	
WINTER WREN			✓
GOLDEN-CROWNED KINGLET	✓		✓
RUBY-CROWNED KINGLET	✓	✓	✓
GNATCATCHER			✓
WESTERN BLUEBIRD	✓	✓	✓
MOUNTAIN BLUEBIRD	✓		
TOWNSEND'S SOLITAIRE	✓		
HERMIT THRUSH	✓	✓	✓
VARIED THRUSH			✓
SWAINSON'S THRUSH		✓	
AMERICAN ROBIN	✓	✓	✓
EUROPEAN STARLING	✓		
SOLITARY VIREO	✓	✓	
HUTTON'S VIREO		✓	✓
WARBLING VIREO	✓	✓	
ORANGE-CROWNED WARBLER	✓	✓	
NASHVILLE WARBLER	✓	✓	
YELLOW WARBLER	✓	✓	
YELLOW-RUMPED WARBLER	✓	✓	✓
COMMON YELLOW THROAT		✓	
BLACK-THROATED GRAY WARBLER	✓	✓	
TOWNSEND'S WARBLER	✓		✓
HERMIT WARBLER	✓		

Species Name	Species Predicted to occur at Boggs Mountain using WHR Model	Species occurrences recorded during 1991-1992 Survey	
		Summer	Winter
MACGILLIVRAY'S WARBLER	✓		
WILSON'S WARBLER	✓	✓	
AUDOBON'S WARBLER		✓	
WESTERN TANAGER	✓	✓	
BLACK-HEADED GROSBEAK	✓	✓	
CEDAR WAXWING		✓	
RUFOUS-SIDED TOWHEE	✓	✓	✓
CALIFORNIA TOWHEE		✓	✓
CHIPPING SPARROW	✓		
FOX SPARROW	✓		
SONG SPARROW	✓		
WHITE-CROWNED SPARROW		✓	✓
DARK-EYED JUNCO	✓	✓	✓
WESTERN MEADOWLARK	✓		
BREWER'S BLACKBIRD	✓		
COWBIRD		✓	
NORTHERN ORIOLE	✓		
PURPLE FINCH	✓	✓	✓
HOUSE FINCH			✓
LESSER GOLDFINCH			✓
AMERICAN GOLDFINCH			✓
RED CROSSBILL	✓	✓	✓
PINE SISKIN	✓	✓	✓
VIRGINIA OPOSSUM	✓		
ORNATE SHREW	✓	✓	✓
TROWBRIDGE'S SHREW	✓		
LITTLE BROWN MYOTIS	✓		
YUMA MYOTIS	✓		
LONG-EARED MYOTIS	✓		
LONG-LEGGED MYOTIS	✓		
SILVER-HAIRED BAT	✓		
BIG BROWN BAT	✓		

Species Name	Species Predicted to occur at Boggs Mountain using WFR Model	Species occurrences recorded during 1991-1992 Survey	
		Summer	Winter
RED BAT	✓		
HOARY BAT	✓		
BLACK-TAILED HARE	✓		
YELLOW-PINE CHIPMUNK	✓	✓	✓
ALLEN'S CHIPMUNK	✓	✓	✓
SONOMA CHIPMUNK		✓	✓
CALIFORNIA GROUND SQUIRREL	✓		
GOLDEN-MANTLED GROUND SQUIRREL	✓		
WESTERN GRAY SQUIRREL	✓	✓	✓
WESTERN HARVEST MOUSE	✓		
DEER MOUSE	✓	✓	✓
BRUSH MOUSE	✓	✓	✓
PINYON MOUSE	✓		
DUSKY-FOOTED WOODRAT	✓	✓	✓
PORCUPINE	✓		
COYOTE	✓		
GRAY FOX	✓	✓	✓
BLACK BEAR	✓		
RINGTAIL	✓		
RACCOON	✓	✓	✓
FISHER	✓		
ERMINE	✓		
LONG-TAILED WEASEL	✓		
WESTERN SPOTTED SKUNK	✓		
STRIPED SKUNK	✓		
MOUNTAIN LION	✓		
BOBCAT	✓		
ELK	✓		
MULE DEER	✓	✓	✓
WESTERN FENCE LIZARD	✓	✓	✓
SAGEBRUSH LIZARD	✓	✓	✓
WESTERN SKINK	✓	✓	✓

Species Name	Species Predicted to occur at Boggs Mountain using WHR Model	Species occurrences recorded during 1991-1992 Survey	
		Summer	Winter
SOUTHERN ALLIGATOR LIZARD	✓	✓	✓
NORTHERN ALLIGATOR LIZARD	✓		
SHARP-TAILED SNAKE	✓		
RACER	✓		
GOPHER SNAKE	✓		
WESTERN TERRESTRIAL GARTER SNAKE	✓	✓	✓
WESTERN AQUATIC GARTER SNAKE	✓	✓	✓
WESTERN RATTLESNAKE	✓	✓	✓

Appendix 3

Vascular Plant Species Encountered During
Biological Survey of Boggs Mountain
Demonstration State Forest
1991-1992

(Nomenclature and Descriptions follow those of
Munz and Keck 1968, 1973)

Trees	
Latin Name	Common Name
<i>Acer macrophyllum</i>	Big leaf maple
<i>Aesculus californica</i>	California buckeye
<i>Ailanthus altissima</i>	Tree-of-Heaven
<i>Alnus rhombifolia</i>	White alder
<i>Arbutus menziesii</i>	Madrone
<i>Calocedrus decurrens</i>	Incense cedar
<i>Cornus nuttallii</i>	Pacific dogwood
<i>Fraxinus dipetala</i>	Flowering ash
<i>Pinus attenuata</i>	Knob cone pine
<i>Pinus lambertiana</i>	Sugar pine
<i>Pinus ponderosa</i>	Ponderosa pine
<i>Pinus sabiniana</i>	Digger pine
<i>Populus fremontii</i>	Fremont cottonwood
<i>Pseudotsuga menziesii</i>	Douglas fir
<i>Quercus chrysolepis</i>	Canyon live oak
<i>Quercus douglasii</i>	Blue oak
<i>Quercus dumosa</i>	Scrub oak
<i>Quercus durata</i>	Leatherleaf oak
<i>Quercus garryana</i>	Oregon oak
<i>Quercus kelloggii</i>	Black oak
<i>Salix lasiolepis</i>	Arroyo willow
<i>Torreya californica</i>	California nutmeg
<i>Umbellularia californica</i>	California laurel

Shrubs	
Latin Name	Common Name
<i>Adenostoma fasciculata</i>	Chamise
<i>Arctostaphylos canescens</i>	Hoary manzanita
<i>Arctostaphylos glandulosa</i>	Eastwood manzanita
<i>Arctostaphylos manzanita</i>	Parry's manzanita
<i>Arctostaphylos stanfordiana</i>	Stanford manzanita
<i>Baccharis pilularis</i>	Coyote brush
<i>Berberis dictyota</i>	Barberry
<i>Calycanthus occidentalis</i>	Spice bush
<i>Ceanothus cuneatus</i>	Buck brush
<i>Ceanothus integerrimus</i>	Deer brush
<i>Ceanothus jepsonii</i> var. <i>albiflorus</i>	Jepson's ceanothus
<i>Ceanothus prostratus</i>	Squaw carpet
<i>Cercis occidentalis</i>	Red bud
<i>Cercocarpus betuloides</i>	Mountain mahogany
<i>Cornus glabrata</i>	Creek dogwood
<i>Cornus stolonifera</i>	Red osier dogwood
<i>Cytisus monspessulanus</i>	French broom
<i>Dendromecon rigida</i>	Bush poppy
<i>Eriodictyon californica</i>	Yerba Santa
<i>Heteromales arbutifolia</i>	Toyon
<i>Holodiscus discolor</i>	Ocean spray
<i>Lonicera ciliosa</i>	Honeysuckle
<i>Lonicera hispidula</i>	Honeysuckle
<i>Lonicera interrupta</i>	Honey suckle
<i>Osmaronia cerasiformis</i>	Oso berry
<i>Penstemon brevisflorus</i>	Bearded tongue

Shrubs	
Latin Name	Common Name
<i>Pickeringia montanum</i>	Chaparral pea
<i>Prunus emarginata</i>	Bitter cherry
<i>Rhamnus californica</i>	Coffee berry
<i>Rhus diversiloba</i>	Poison oak
<i>Ribes divaricatum</i>	Gooseberry
<i>Rosa californica</i>	Wild rose
<i>Rosa pisocarpa</i>	Cluster rose
<i>Rosa spithamea</i>	Wild rose
<i>Rubus sp.</i>	Black berry
<i>Rubus vitifolius</i>	Blackberry
<i>Sambucus callicarpa</i>	Red elderberry
<i>Sambucus mexicana</i>	Elderberry
<i>Spartium junceum</i>	Spanish broom
<i>Symphoricarpos rivularis</i>	Snow berry
<i>Vitis californica</i>	Wild grape

Herbs	
Latin name	Common name
<i>Achillea millefolium</i>	Yarrow
<i>Adenocaulon bicolor</i>	Trail plant
<i>Agoseris grandiflora</i>	Sierran dandelion
<i>Agoseris retrorsa</i>	Mountain dandelion
<i>Aira caryophyllea</i>	Hair grass
<i>Allium sp.</i>	Onion
<i>Allophyllum divaricatum</i>	Annual phlox
<i>Angelica tomentosa</i>	Angelica

Herbs	
Latin name	Common name
<i>Anthoxanthum odoratum</i>	Sweet vernal grass
<i>Antirrhinum virga</i>	Wild snapdragon
<i>Apocynum medium</i>	Dogbane
<i>Apocynum pumilum</i>	Indian hemp
<i>Aquilegia formosa</i>	Columbine
<i>Aralia californica</i>	Elk's clover
<i>Arnica discoidea var cradiata</i>	Arnica
<i>Artemisia douglasiana</i>	Wormwood
<i>Asclepius cordifolius</i>	Milkweed
<i>Aster chilensis</i>	Aster
<i>Avena fatua</i>	Wild oat
<i>Brassica geniculatus</i>	Mustard
<i>Briza minor</i>	Quaking grass
<i>Brodiaea congesta</i>	Congested brodiaea
<i>Brodiaea elegans</i>	Elegant brodiaea
<i>Brodiaea hyacinthina</i>	White brodiaea
<i>Brodiaea laxa</i>	Ethereal spear
<i>Bromus rubens</i>	Red brome
<i>Cacaliopsis nardosmia</i>	Cacaliopsis
<i>Calochortus amabilis</i>	Fairy lantern
<i>Calochortus coeruleus</i>	Mariposa lily
<i>Calochortus tolmiei</i>	Mariposa lily
<i>Calystegia malacophylla</i>	Morning glory
<i>Calystegia occidentalis</i>	Morning glory
<i>Calystegia subacaulis</i>	Morning glory
<i>Camassia leichtlinii</i>	Camass

Herbs	
Latin name	Common name
<i>Camassia quamash</i>	Camass
<i>Carex sp.</i>	Sedge
<i>Castilleja applegatei</i>	Paintbrush
<i>Centaurea solstitialis</i>	Star thistle
<i>Chimaphila umbellata</i>	Pipsissewaw
<i>Chlorogalum pomeridianum</i>	Soap plant
<i>Chlorogalum purpureum</i>	Soap plant
<i>Chrysopsis oregona compacta</i>	Golden aster
<i>Cirsium andersonii</i>	Scarlet thistle
<i>Cirsium vulgare</i>	Thistle
<i>Clarkia purpurea</i>	Farewell-to-spring
<i>Clarkia rhomboidea</i>	Farewell-to-spring
<i>Convolvulus arvensis</i>	Bindweed
<i>Cryptantha sp.</i>	Popcorn flower
<i>Cuscuta sp.</i>	Dodder
<i>Cynodon dactylon</i>	Bermuda grass
<i>Cynoglossum grande</i>	Hounds tongue
<i>Cynosurus echinatus</i>	Dogtail grass
<i>Dactylis glomerata</i>	Barnyard grass
<i>Delphinium nudicaule</i>	Red larkspur
<i>Disporum hookeri</i>	Fairy bells
<i>Downingia concolor</i>	Downingia
<i>Eburophyton austinae</i>	Phantom orchid
<i>Elymus glaucus</i>	Wheat grass
<i>Epilobium paniculatum</i>	Willow herb
<i>Equisetum arvense</i>	Horsetail

Herbs	
Latin name	Common name
<i>Eriophyllum lanatum</i>	Sierra sunflower
<i>Erodium cicutarium</i>	Filaree
<i>Eryngium aristulatum</i>	Coyote thistle
<i>Eshscholzia californica</i>	California poppy
<i>Festuca californica</i>	Fescue
<i>Frasera albicaulis var. nitida</i>	Frasera
<i>Fritillaria lanceolata</i>	Fritillary
<i>Galium ambiguum</i>	Bedstraw
<i>Galium nuttallii</i>	Bedstraw
<i>Geranium dissectum</i>	Wild geranium
<i>Gnaphalium beneolens</i>	Cudweed
<i>Gayophytum nuttallii</i>	Gayophytum
<i>Grindelia camporum</i>	Gumplant
<i>Habenaria elegans</i>	Rein orchid
<i>Habenaria unalascensis</i>	Habenaria
<i>Helianthella californica</i>	Small sunflower
<i>Hernacleum lanatum</i>	Cow parsnip
<i>Hesperolinum clevelandii</i>	Flax
<i>Hesperolinum micranthum</i>	Flax
<i>Hieracium albiflorum</i>	Hawkweed
<i>Hordeum stebbinsii</i>	Wild barley
<i>Horkelia elata</i>	Horkelia
<i>Hypericum concinnum</i>	Gold wire
<i>Hypochoeris radicata</i>	Cats paw
<i>Iris macrosiphon</i>	Iris
<i>Juncus effusus</i>	Rush

Herbs	
Latin name	Common name
<i>Juncus sp.</i>	Rush
<i>Juncus xiphioides</i>	Rush
<i>Lactuca serriola</i>	Wild lettuce
<i>Lathyrus traceyi</i>	Pea
<i>Lilium pardalinum</i>	Lily
<i>Limnanthes douglasii</i>	Meadow foam
<i>Lithophragma heterophylla</i>	Woodland star
<i>Lotus crassifolius</i>	Trefoil
<i>Lotus oblongifolius</i>	Trefoil
<i>Lotus purshianus</i>	Lotus, trefoil
<i>Lotus stipularis</i>	Trefoil
<i>Lotus subpinnatus</i>	Annual yellow lotus
<i>Lupinus latifolius</i>	Lupine
<i>Lupinus sellulus</i>	Blue bonnet
<i>Luzula divaricata</i>	Woodrush
<i>Lythrum hyssopifolia</i>	Loosestrife
<i>Madia elegans</i>	Tarweed
<i>Madia gracilis</i>	Madia
<i>Madia mndioides</i>	Tarweed
<i>Medicago hispida</i>	Bur clover
<i>Melica californica</i>	Melic grass
<i>Mentzelia dispersa</i>	Blazing star
<i>Microseris lindleyi</i>	Microseris
<i>Microsteris gracilis</i>	Microsteris
<i>Mimulus moschatus</i>	Monkey flower
<i>Mimulus rubra</i>	Bane berry

Herbs	
Latin name	Common name
<i>Monardella odoratissima</i>	Penny royal
<i>Monardella villosa</i>	Coyote mint
<i>Montia gypsophiloides</i>	Montia
<i>Montia perfoliata</i>	Miner's lettuce
<i>Navarretia sp.</i>	Navarrete
<i>Nemophila parviflora</i>	Nemophila
<i>Nemophila heterophylla</i>	Nemophila
<i>Orobancha fasciculata</i>	Broom rope
<i>Osmorhiza chilensis</i>	Sweet cicely
<i>Pedicularis densiflorus</i>	Indian warrior
<i>Penstemon heterophyllus</i>	Bearded tongue
<i>Perideridia gardneri</i>	Squaw root
<i>Phacelia heterophylla</i>	Fiddleneck
<i>Phacelia imbricata</i>	White fiddleneck
<i>Phleum pratense</i>	Timothy
<i>Plagiobothrys nothofulvus</i>	Popcorn flower
<i>Plantago lanceolata</i>	Plantain
<i>Poa bulbosa</i>	Blue grass
<i>Polygala cornuta</i>	Milkwort
<i>Polygonum hydropiperoides</i>	Knotweed
<i>Potentilla glandulosa</i>	Cinquefoil
<i>Prunella vulgaris</i>	Self heal
<i>Psoralea macrostachya</i>	Psoralea
<i>Psoralea physoides</i>	California tea
<i>Pyrola aphylla</i>	Shinleaf
<i>Pyrola picta</i>	Shinleaf

Herbs	
Latin name	Common name
<i>Rafinesquia californica</i>	Rafineque
<i>Ranunculus californicus</i>	Buttercup
<i>Ranunculus uncinatus</i>	Buttercup
<i>Rumex crispus</i>	Curly dock
<i>Sanicula crassicaulis</i>	Common sanicle
<i>Scutellaria bolanderi</i>	Skull cap
<i>Senecio integerrimus</i>	Groundsel
<i>Sidalcea oregana</i>	Checkers
<i>Silene californica</i>	Catch fly
<i>Sisymbrium altissimum</i>	Tumble mustard
<i>Sisyrinchium bellum</i>	Blue eyed grass
<i>Smilacina racemosa</i>	False soloman's seal
<i>Solidago californica</i>	Golden rod
<i>Sonchus asper</i>	Sow thistle
<i>Sonchus oleraceus</i>	Sow thistle
<i>Stachys rigida</i>	Hedge nettle
<i>Stephanomeria virgata</i>	Stephanomeria
<i>Stipa Lemmonii</i>	Needle grass
<i>Tauschia hartwegii</i>	Tauschia
<i>Thalictrum fendleri</i>	Meadow rue
<i>Thermopsis macrophyllus</i>	False indigo
<i>Tillnea erecta</i>	Pygmy weed
<i>Torilis arvensis</i>	Hedge parsley
<i>Trichostema lanceolatum</i>	Vinegar weed
<i>Trientalis latifolia</i>	Starflower
<i>Trifolium dubium</i>	Clover

Herbs	
Latin name	Common name
<i>Trifolium repens</i>	White clover
<i>Trifolium tridentatum</i>	Tom cat clover
<i>Trillium chloropetalum</i>	Trillium
<i>Urtica holosericea</i>	Nettle
<i>Verbascum blattaria</i>	Moth mullein
<i>Verbascum thapsus</i>	Mullein
<i>Verbena hastata</i>	Verbena
<i>Veronica americana</i>	Speedwell
<i>Veronica anagallis-aquatica</i>	Speedwell
<i>Vicia americana</i>	Vetch
<i>Vinca major</i>	Periwinkle
<i>Viola lobata</i>	Violet
<i>Viola purpurea</i>	Violet
<i>Wyethia angustifolia</i>	Mule ears
<i>Wyethia helenioides</i>	Mule ears

Ferns	
Latin name	Common name
<i>Dryopteris arguta</i>	Wood fern
<i>Equisetum laevigatum</i>	Horsetail
<i>Pityrogramma triangularis</i>	Golden back fern
<i>Polystichum munitum</i>	Sword fern
<i>Pteridium aquilinum</i>	Bracken fern
<i>Woodwardia fimbriata</i>	Chain fern

Appendix 4

Examples of Field Data Sheets Used to Tabulate
Habitat Descriptors Needed as Inputs into
the WHR Model

Boggs Mt State Demonstration Forest
 ENVIRONMENTALIST: Wildlife Habitat Relationships Classification

Plot Number	Vegetative Diet cat.						Animal Diet Elements											Man-made		Habitat Stressor for the survival of these species											
	Seeds x	Acorns x	Grain x	Berries x	Fruits x	Nuts	Ones x	Flowers	Nectar x	Invertebrates	Used, terrestrial	Insect, flying	Aquatic invertebrates	Fish	Amphibians x	Reptiles	Birds, small x	Birds, medium	Birds, large		Mammals, small	Mammals, medium	Mammals, large	Carion	Eggs	Nest box	Transmission lines	Buildings	Fences	Campgrounds	Water
1																															
4																															
7																															
11																															
13																															
17																															
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121																															

5 14 4 2 19 14 2 22 24 28 14

Boggs Mt State Demonstration Forest
 FAALIST. Wildlife Habitat Relationships Classification

PLOT NUMBER	Habitat	Live Vegetation Elements											Dead or dead-end Veg Elements																						
		Tree-Dominated	Shrub-Dominated	Herbaceous-Dominated	Hardwood	Kanifer	Hardwood-conifer	Mixed conifer	Tree layer	Shrub layer	Herbaceous layer	Trees, hardwood	Trees, pine	Trees, fir	Trees, live @ broken top	Trees @ loose bark	Trees @ cavities	Epiphytic inclusions	Aquatics, submerged	Aquatics, emergent	Snags sound	Snags rotten	Snag small	Snag medium	snag large	Stump	Duff	Litter	Slash, small	Slash, large	Log, medium	Log, large			
2	4M																																		
9	3P																																		
113	6M																																		
15	3P																																		
21	5P																																		
23	5M																																		
27	5P																																		
33	4D																																		
39	4P																																		
41	5M																																		
47	3M																																		
51	4M																																		
59	3D																																		
61	3P																																		
69	5S																																		
71	4D																																		
80	4M																																		
82	3P																																		
91	4D																																		
102	5D																																		
106	5P																																		
108	5D																																		
110	4P																																		

25
 23 7 8 8 10 13 15 17 22 5 7 5 3 1 7 2 5 11 18 19 12 5 |

Habitat Edge Elements	Physical Elements										Aquatic Elements										Vegetative Diet Elements										Count						
	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10		1	2	3	4	5	6
Deciduous forest																																					2
Shrub/grass forest																																					9
Shrub/outer forest																																					13
Soil fracture																																					15
Soil organic																																					21
Soil gravelly																																					23
Soil sandy																																					27
Soil aspen forest																																					33
Bark																																					39
Burrow																																					41
Cave																																					47
Cliff																																					51
Lentic																																					57
Talus																																					61
Steep slope																																					69
Water																																					71
Ponds																																					80
Loticans, intermittent																																					82
Loticans, permanent																																					91
Rivers																																					102
Springs																																					106
Mineral springs																																					110
Boggs																																					
Water slow																																					
Water fast																																					
Fungi																																					
Lichens																																					
Moss																																					
Ferns																																					
Algae																																					
Gammarids																																					
Fungi																																					
Shrubs																																					
Tree leaves																																					
Sap																																					
Roots																																					

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