

MANAGEMENT PLAN
FOR THE
HARRISON GRADE ECOLOGICAL RESERVE
SONOMA, CALIFORNIA

Prepared by

Niall F. McCarten
Department of Biology
San Francisco State University
1600 Holloway
San Francisco, California 94132

Prepared for

Endangered Plant Project
California Department of Fish and Game
1416 Ninth Street, Room 1225
Sacramento, California 95814

Funded by

California Department of Fish and Game
Tax Check-off Funds
Contract No. C-2030

December 1, 1987

TABLE OF CONTENTS

LIST OF TABLES iii

LIST OF FIGURES iv

INTRODUCTION 1

INVENTORY 5

 Plant Species 5

 Plant Communities 8

PHYSICAL FEATURES..... 11

 Soils 11

 Geology 12

 Hydrology 13

 Topography 13

CULTURAL FEATURES 13

SPECIES MANAGEMENT GOALS 15

 Baker's manzanita 15

 Sonoma narrow-leaved bird's beak 18

RESERVE MANAGEMENT GOALS 19

 Removal of Refuse 19

 Parking Area 20

 Trail System 22

 Pesticides and Fertilizers 25

 External Impacts 26

 Non-native Plants 27

 Protection 27

REFERENCES CITED 29

APPENDIX I

LIST OF TABLES

<u>Table</u>		<u>Page</u>
1	Vascular Plants Observed at the Harrison Grade Ecological Reserve.	6
2	Management Schedule.	28

LIST OF FIGURES

<u>Figure</u>		<u>Page</u>
1	State and regional location map.	2
2	Location of the Reserve on Camp Meeker Quadrangle.	3
3	Boundary of the Harrison Grade Ecological Reserve and proposed parking area.	4
4	Vegetation map.	9
5	Sonoma narrow-leaved bird's beak distribution map.	10
6	Populations of Baker's manzanita.	16
7	Parking Area Design.	21
8	Trail System.	24

INTRODUCTION

The Harrison Grade Ecological Reserve was acquired for the purpose of preserving populations of the state-listed Rare Baker's manzanita (Arctostaphylos bakeri), as well as other plant species that are part of the serpentinitic soil vegetation. The Harrison Grade Ecological Reserve is located approximately 1 mile north of highway 116 and 16 miles due west of highway 101 and the city of Santa Rosa, Sonoma County, California (Figures 1 and 2). The property is 31.94 acres, nearly rectangular in shape with the eastern property boundary along Harrison Grade Road (Figure 3). Acquisition of the properties was completed on June 27, 1985. The purpose of this plan is: 1) describe the botanical and other features of the reserve, emphasizing rare, threatened, and endangered plants, and plant communities, and 2) to present site improvement and management goals and objectives.

FIGURE 1
Location of the Harrison Grade Ecological Reserve Sonoma County, California

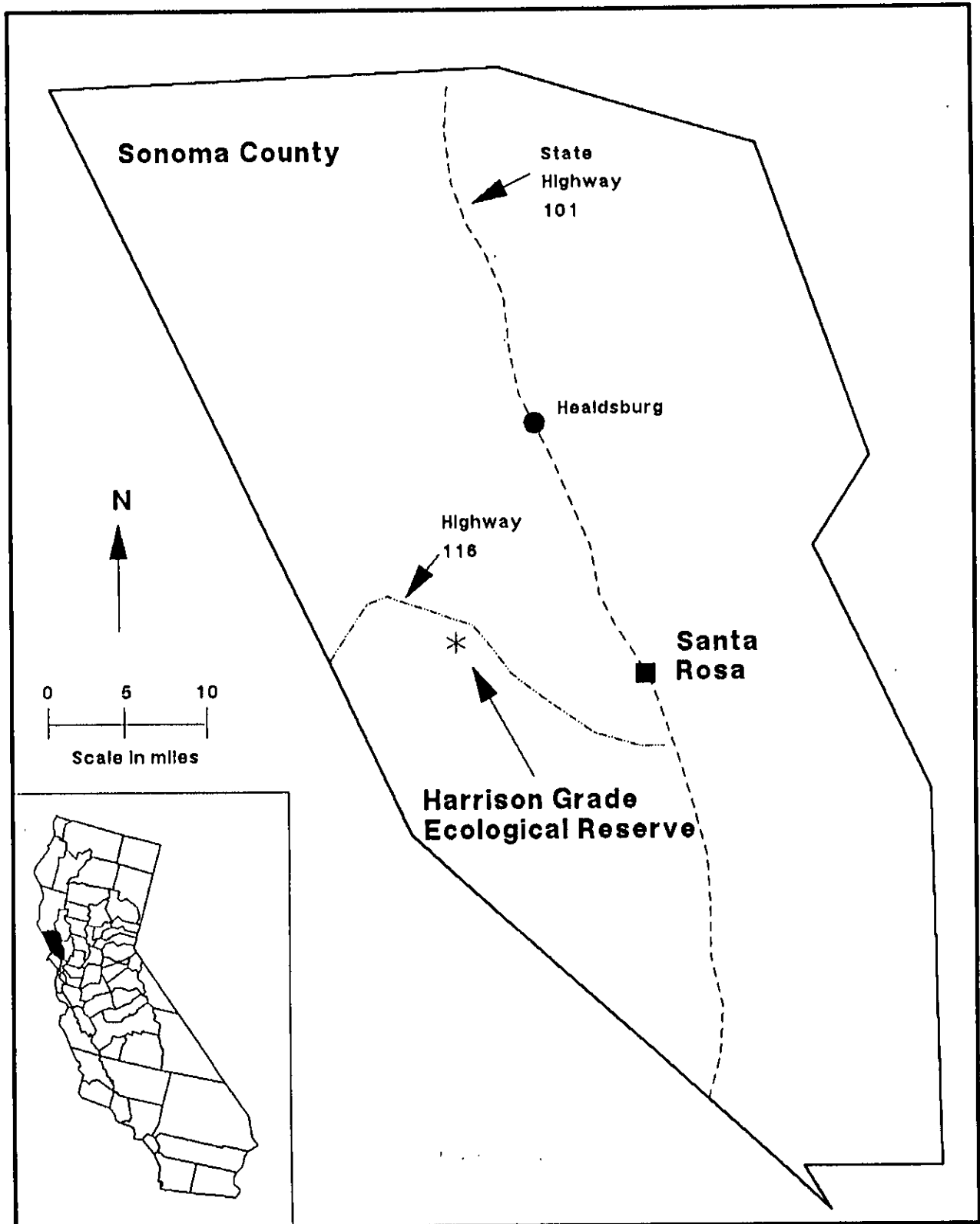


FIGURE 2

Location of the Harrison Grade Ecological Reserve Sonoma County, California

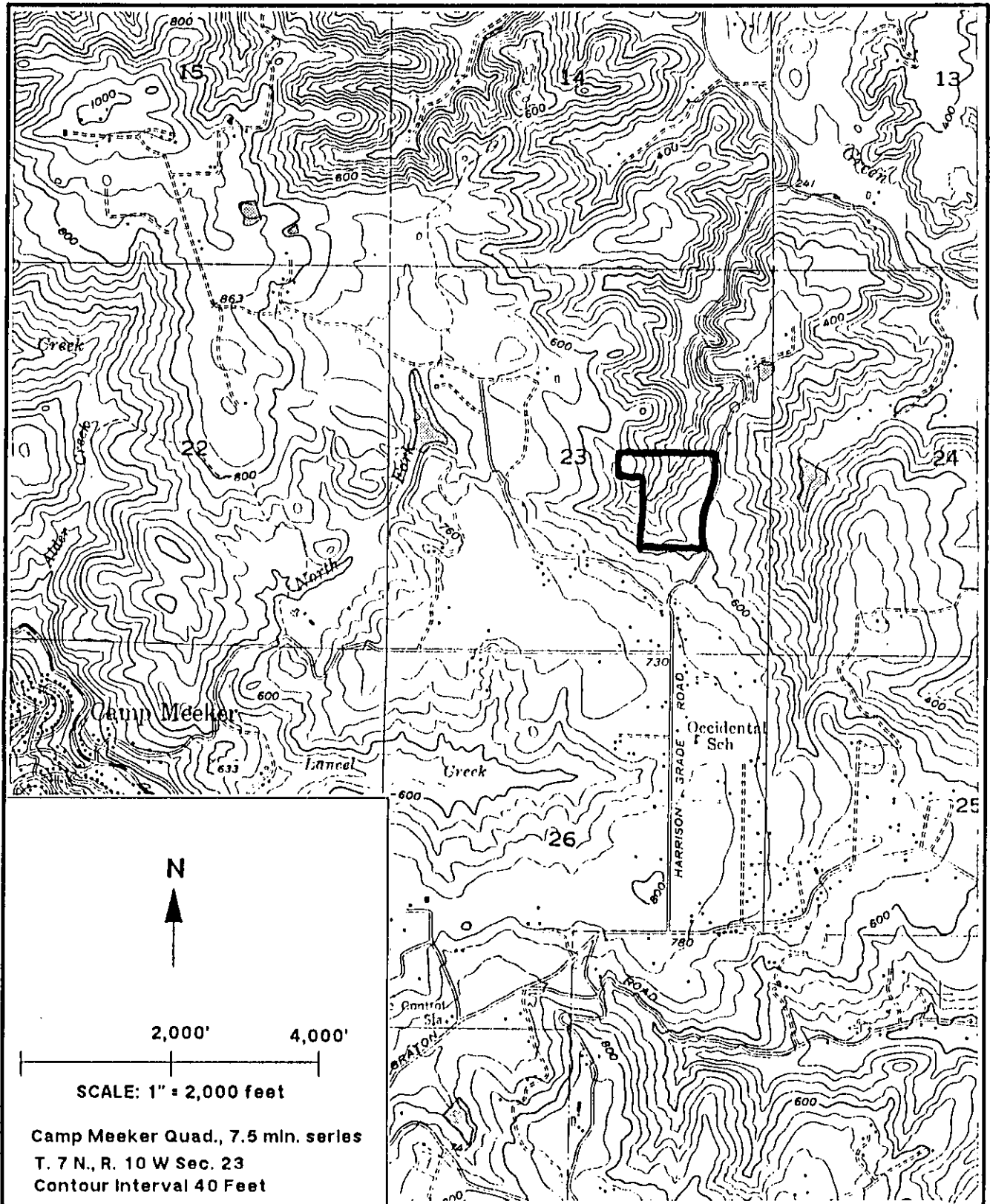
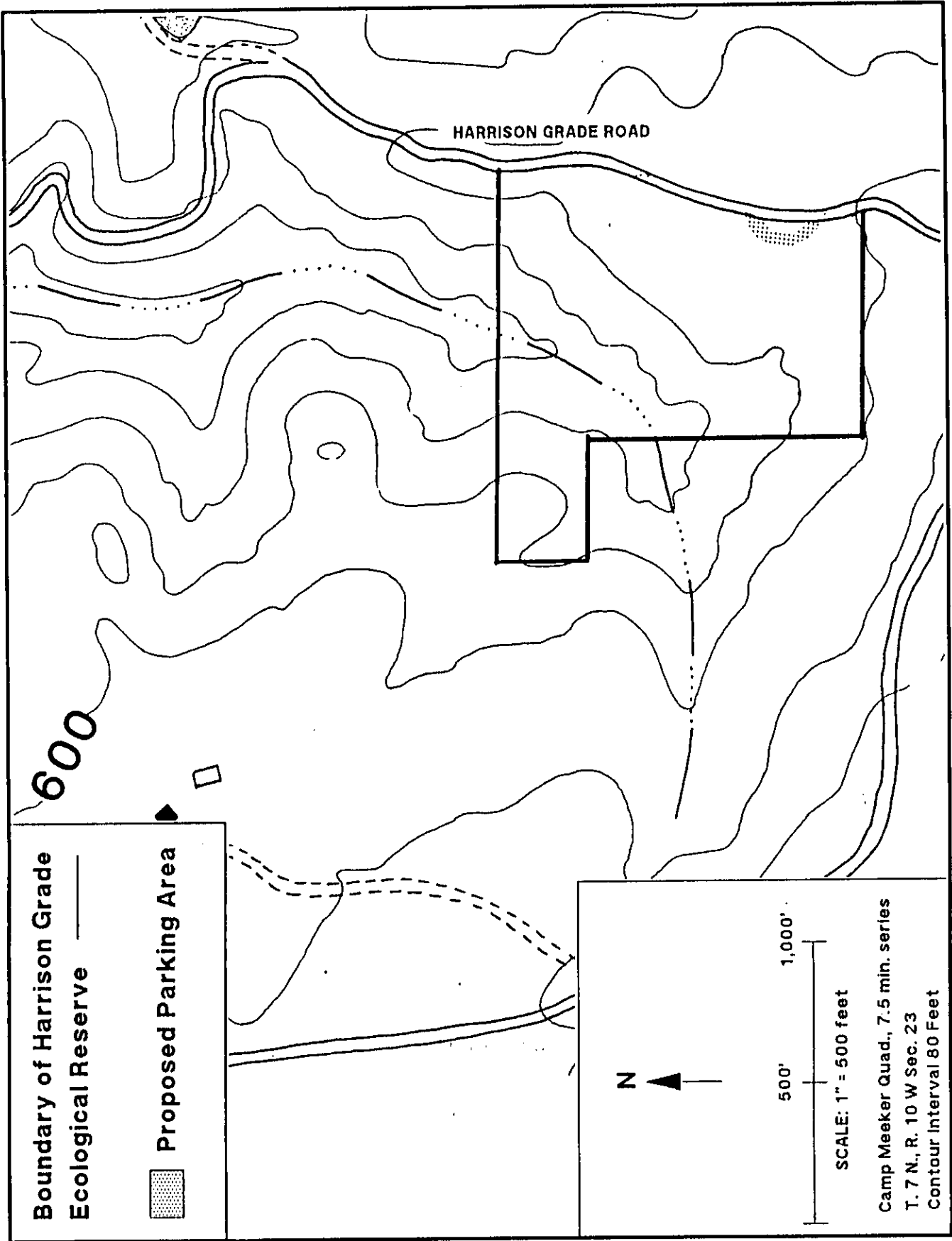


FIGURE 3



INVENTORY OF NATURAL FEATURES

Plant Species

Based on botanical surveys conducted during March, April, June, July, August, September and November of 1987 of the Harrison Grade Ecological Reserve, 73 taxa of vascular plants were observed and identified (Table 1). Plant botanical names follow Munz and Keck (1969) unless otherwise indicated. The majority of the plant taxa in Table 1 are characteristic of the vegetation found growing on soils overlying serpentinitic rock (McCarten 1987). Five taxa, Arctostaphylos bakeri, Ceanothus jepsonii var. albiflorus, Cordylanthus tenuis ssp. capillaris, Hesperolinon spergulinum, and Monardella villosa ssp. neglecta, are considered endemic to the serpentinitic soils (Kruckeberg 1984, Appendix E, p. 153). Of the 73 plant taxa observed in the Reserve, 62 are native to California. Two state-listed as Rare species, Baker's manzanita (Arctostaphylos bakeri) and Sonoma narrow-leaved bird's beak (Cordylanthus tenuis ssp. capillaris) occur in the Reserve.

The 11 non-native plant species do not form a significant component of the Reserve's flora. Two species, Bromus rubens and Lolium multiflorum, are aggressive weeds. These two species, however, mainly occur in areas where there has been human-caused disturbance to the soil and removal of shrub vegetation.

TABLE 1

VASCULAR PLANTS OBSERVED AT THE
HARRISON GRADE ECOLOGICAL RESERVE

SCIENTIFIC NAME	COMMON NAME	FAMILY	Native(N)/ Introduced(I)
<i>Achillea millefolium</i>	Common yarrow	Asteraceae	N
<i>Adiantum jordanii</i>	California maidenhair	Pteridaceae	N
<i>Aira caryophyllea</i>	Silvery hair-grass	Poaceae	N
<i>Anagallis arvensis</i>	Scarlet pimpernel	Primulaceae	I
<i>Arctostaphylos bakeri</i>	Baker's manzanita	Ericaceae	N
<i>Baccharis pilularis</i> var. <i>consanguinea</i>	Dwarf chaparral-broom	Asteraceae	N
<i>Briza maxima</i>	Rattlesnake grass	Poaceae	I
<i>Briza minor</i>	Small quaking-grass	Poaceae	I
<i>Brodiaea pulchella</i>	Blue dicks	Amaryllidaceae	N
<i>Bromus mollis</i>	Soft chess	Poaceae	I
<i>Bromus rubens</i>	Foxtail brome-grass	Poaceae	I
<i>Calycanthus occidentalis</i>	Spice bush	Calycanthaceae	N
<i>Calystegia subacaulis</i>	Hill morning-glory	Convolvulaceae	N
<i>Carex mendocinensis</i>	Mendocino sedge	Cyperaceae	N
<i>Ceanothus jepsonii</i> var. <i>albiflorus</i>	Jepson's ceanothus	Rhamnaceae	N
<i>Cerastium glomeratum</i>	Mouse-eared chickweed	Caryophyllaceae	I
<i>Chlorogalum pomeridianum</i>	Common soap plant	Liliaceae	N
<i>Cordylanthus tenuis</i> ssp. <i>capillaris</i>	Narrow-leaved bird's beak	Scrophulariaceae	N
<i>Cupressus sargentii</i>	Sargent cypress	Cupressaceae	N
<i>Cyperus eragrostis</i>	Umbrella sedge	Cyperaceae	N
<i>Dendromecon rigida</i>	Bush poppy	Papaveraceae	N
<i>Dodecatheon hendersonii</i> ssp. <i>hendersonii</i>	Henderson's shooting-star	Primulaceae	N
<i>Elymus glaucus</i>	Western rye-grass	Poaceae	N
<i>Epilobium minutum</i> var. <i>foliosum</i>	Minute willow-herb	Onagraceae	N
<i>Eriodictyon californicum</i>	California yerba santa	Hydrophyllaceae	N
<i>Eriogonum caninum</i>	Wicker eriogonum	Polygonaceae	N
<i>Eriophyllum lanatum</i> var. <i>achillaeoides</i>	Common woolly sunflower	Asteraceae	N
<i>Erodium obtusiplicatum</i>	Early fillaree	Geraniaceae	I
<i>Festuca californica</i>	California fescue	Poaceae	N
<i>Gallium nuttallii</i>	Climbing bed-straw	Rubiaceae	N
<i>Hesperolinon micranthum</i>	Small-flowered dwarf flax	Linaceae	N
<i>Hesperolinon spergulinum</i>	Dwarf flax	Linaceae	N
<i>Heterocodon rariflorum</i>	Heterocodon	Campanulaceae	N
<i>Heteromeles arbutifolia</i>	Toyon	Rosaceae	N
<i>Hieracium albiflorum</i>	White-flowered hawkweed	Asteraceae	N
<i>Holocarpha virgata</i>	Virgate tarweed	Asteraceae	N
<i>Koeleria macrantha</i>	June-grass	Poaceae	N
<i>Lolium multiflorum</i>	Italian rye-grass	Poaceae	I
<i>Lomatium macrocarpum</i>	Large-fruited lomatium	Apiaceae	N
<i>Lonicera hispidula</i>	Hairy honeysuckle	Caprifoliaceae	N
<i>Lotus micranthus</i>	Small-flowered lotus	Fabaceae	N
<i>Lotus subpinnatus</i>	Chile lotus	Fabaceae	N
<i>Madia exigua</i>	Small tarweed	Asteraceae	N
<i>Madia minima</i>	Opposite-leaved tarweed	Asteraceae	N
<i>Melica torreyana</i>	Torrey's melica	Poaceae	N

TABLE 1

VASCULAR PLANTS OBSERVED AT THE
HARRISON GRADE ECOLOGICAL RESERVE

SCIENTIFIC NAME	COMMON NAME	FAMILY	Native(N)/ Introduced(I)
<i>Mimulus guttatus</i>	Common large monkey-flower	Scrophulariaceae	N
<i>Minuartia douglasii</i>	Douglas' sandwort	Caryophyllaceae	N
<i>Monardella villosa</i> ssp. <i>neglecta</i>	Coyote mint	Lamiaceae	N
<i>Montia perfoliata</i>	Miner's lettuce	Portulacaceae	N
<i>Onychium densum</i>	Cliff-brake	Pteridaceae	N
<i>Pellaea mucronata</i>	Bird's-foot cliff-brake	Pteridaceae	N
<i>Phoradendron flavescens</i> var. <i>villosum</i>	Mistletoe	Loranthaceae	N
<i>Pityrogramma triangularis</i>	Gold-fern	Pteridaceae	N
<i>Polygala californica</i>	Polygala	Polygalaceae	N
<i>Polypogon interruptus</i>	Rabbit's foot	Poaceae	I
<i>Polystichum munitum</i> var. <i>munitum</i>	Sword fern	Aspidiaceae	N
<i>Pseudotsuga menziesii</i>	Douglas fir	Pinaceae	N
<i>Quercus agrifolia</i>	California live oak	Fagaceae	N
<i>Rhamnus californica</i> var. <i>tomentella</i>	California coffeeberry	Rhamnaceae	N
<i>Rhododendron occidentale</i>	Western azalea	Ericaceae	N
<i>Rumex crispus</i>	Dock	Polygonaceae	I
<i>Sanicula tuberosa</i>	Tuberous sanicle	Apiaceae	N
<i>Silene californica</i>	Campion	Caryophyllaceae	N
<i>Sisyrinchium bellum</i>	California blue-eyed-grass	Iridaceae	N
<i>Stachys albens</i>	Hedge nettle	Lamiaceae	N
<i>Streptanthus glandulosus</i> var. <i>secundus</i>	Common vewel flower	Brassicaceae	N
<i>Symphoricarpos mollis</i>	Creeping snowberry	Caprifoliaceae	N
<i>Toxicodendron diversilobum</i>	Pacific poison oak	Anacardiaceae	N
<i>Trichostema lanceolatum</i>	Vineger weed	Lamiaceae	N
<i>Trifolium gracilentum</i>	Pin-point clover	Fabaceae	I
<i>Umbellularia californica</i>	California laurel	Lauraceae	N
<i>Vulpia microstachys</i>	Nuttall's fescue	Poaceae	N
<i>Zygadenus fremontii</i>	Star lily	Amaryllidaceae	N

Plant Communities

Three plant communities occur on the Harrison Grade Ecological Reserve. Two of these communities, Northern Interior Cypress Forest, and Serpentine Chaparral, are considered rare in California and are included in the natural community classification of Holland (1986). The Serpentine Chaparral consists almost entirely of Baker's manzanita and is thus a distinct plant association. Within the Reserve Northern Interior Cypress Forest is composed almost entirely of Sargent cypress (Cupressus sargentii). The third plant community is associated with the ephemeral creek that bisects the Reserve and is composed of California bay (Umbellularia californica), western azalea (Rhododendron occidentale) and spice bush (Calycanthus occidentalis). All plant communities, and the distribution of Baker's manzanita in the Reserve are mapped on Figure 4. Locations of populations of the Sonoma narrow-leaved bird's-beak are mapped on Figure 5.

FIGURE 4

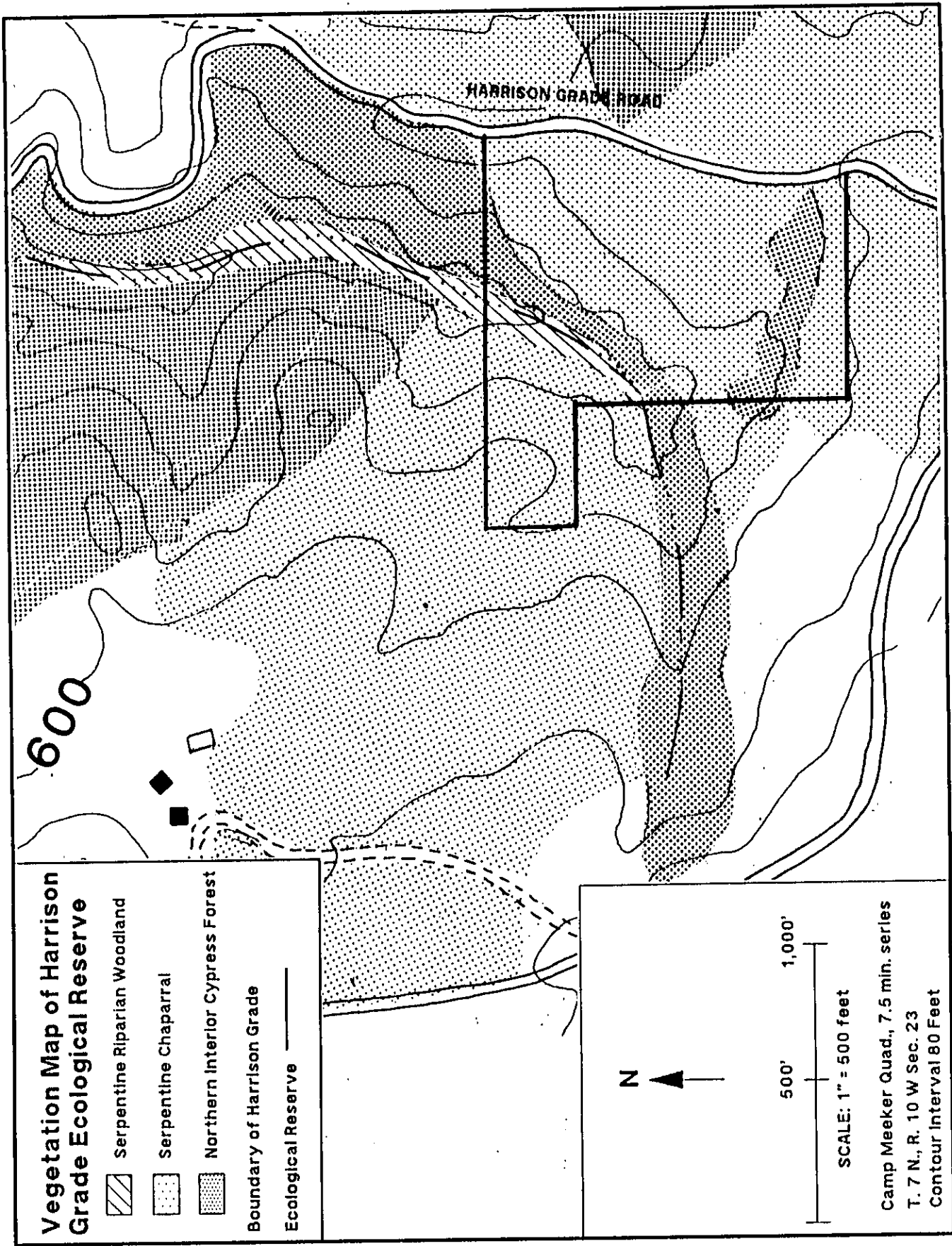
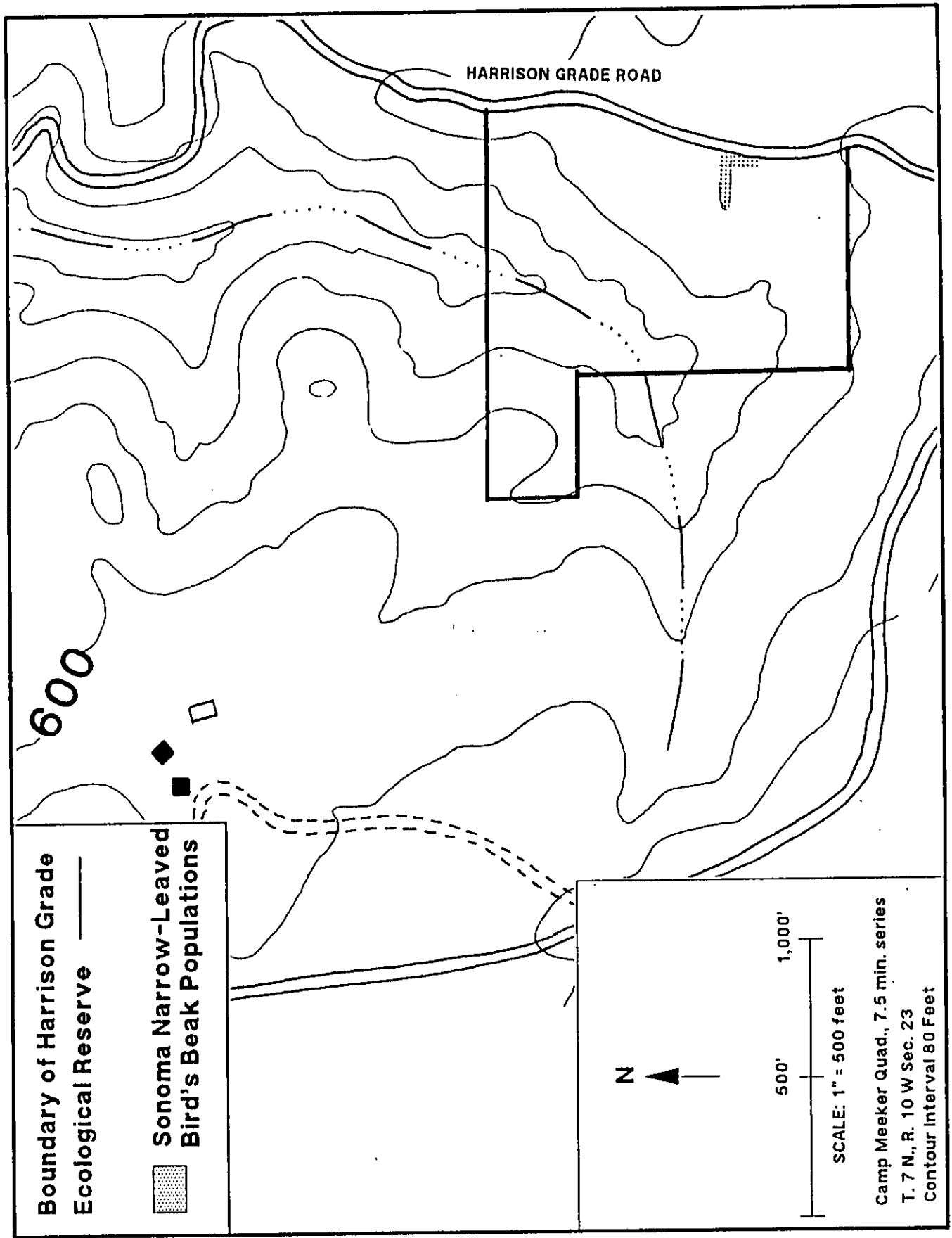



FIGURE 5



Boundary of Harrison Grade Ecological Reserve ———

 Sonoma Narrow-Leaved Bird's Beak Populations

N 

500' 1,000'

SCALE: 1" = 500 feet

Camp Meeker Quad., 7.5 min. series
T. 7 N., R. 10 W Sec. 23
Contour Interval 80 Feet

PHYSICAL FEATURES

Soils

The mapping unit for the Soil Conservation Survey of Sonoma County (Soil Survey 1972), that includes the Harrison Grade Ecological Reserve is referred to as the Hugo soil series. The Hugo soil series is described as a well drained gravelly loam underlain by fine-grained sandstone or shale, and supporting Douglas fir and redwood. However, inclusions of other soil series are common within the mapping units of Soil Surveys. Based on vegetation and geology, the soil series associated with the Harrison Grade Ecological Reserve is probably not the Hugo Series. Instead, the Henneke Series, an excessively drained gravelly loam derived from serpentinite is probably a more appropriate soil series name for most of the reserve. Henneke Series soils commonly support chaparral type vegetation (Soil Survey 1972).

An analysis of soil calcium and magnesium cation concentrations and phosphorus concentrations was done on a sample from a stand of Baker's manzanita on the east side of the Reserve. The results were calcium cations had a concentration of 1080 mg/kg, magnesium cations had a concentration of 6120 mg/kg and phosphorus had a concentration of 5 mg/kg. These data show that calcium concentrations are lower than magnesium concentrations

with a Ca/Mg of 0.18. This ratio is relatively low and within the values characteristic of soils containing serpentine minerals which are defined as having a ratio of < 0.7 (Alexander et al. 1985). The phosphorus concentrations are also very low and show that the soil on the Reserve is nutrient poor.

Geology

The geology of the reserve is predominately serpentinite which is commonly defined as a rock containing serpentine family minerals including chrysotile (asbestos) (Alexander et al. 1985). The mineralogical resources map refers to the area as ultramafic rocks (Bailey and Harden 1975). Ultramafic and serpentinitic are now considered to be interchangeable terms for a broadly defined class of minerals that include serpentine, dunite and peridotite (Alexander et al. 1985). Serpentinite minerals are mostly magnesium-iron silicates (Brooks 1987), but can contain heavy metals such as chromium (chromite), nickel and mercury. Mines have been developed in the vicinity of the reserve for the purpose of extracting both chromite and mercury (Bailey and Harden 1975). The source of the serpentinites throughout Sonoma County is by intrusion into the Jurassic Franciscan Formation, however, the serpentinites are likely to be of Mesozoic origin (Oakeshott 1978).

Hydrology

The reserve is bisected by an unnamed ephemeral creek (Figures 3 and 4), which is the main drainage for the Reserve. The ephemeral creek drains northeast out of the reserve and into Green Valley Creek. Surface water in the reserve's creek appears throughout the rainy season, November through April.

Topography

The Reserve is located in a northeast-facing canyon with the highest point at the 600-foot contour on the southern border (Figure 3). The lowest point of the Reserve is in the bottom of the canyon which lies at an elevation of 480 feet. Major slopes are those of the east-facing and west-facing sides of the canyon. The steepest slopes are west-facing and may have an inclination of up to 30 percent. Approximately 80 percent of the Reserve is moderate to steep slopes (e.g., 10 - 30 percent).

CULTURAL FEATURES

Harrison Grade Road forms the eastern border of the Reserve (Figure 3). Several sections of cyclone fencing and an unlocked gate exist along the eastern border of the property. Fence posts are posted with Department of Fish and Game Ecological Reserve

signs. Previously, there was no specific land use at the site and it was more or less in a natural state at the time of purchase. Some dumping of rubbish has occurred on the site. An area on the east side of the Reserve was cleared presumably for parking by the former owners. The parking area currently has a gate used by Fish and Game personnel. The surrounding land use includes light agriculture including alfalfa, hay and vegetables.

Several sources of disturbance have caused some temporary degradation and may pose future management problems. The most noticeable is trash dumping. The main areas of dumping are on the southeast side of the Reserve where there is ready access from Harrison Grade Road. The refuse includes old furniture, appliances, bottles and cans. Also along the eastern edge are smaller dumping sites under shrubs of Baker's manzanita, immediately next to Harrison Grade Road, that primarily consist of beer bottles and cans. An irrigation apparatus consisting of pvc piping was found on the east side of the Reserve in September 1987 and may have supplied water to a marijuana crop in previous years. The area Fish and Game warden removed all the pvc piping soon after its discovery. Sonoma County narcotics agents were apprised of the potential marijuana problem in September of 1987. Prior to fencing of the preserve, off-road vehicles did enter the few available openings accessible from Harrison Grade Road.

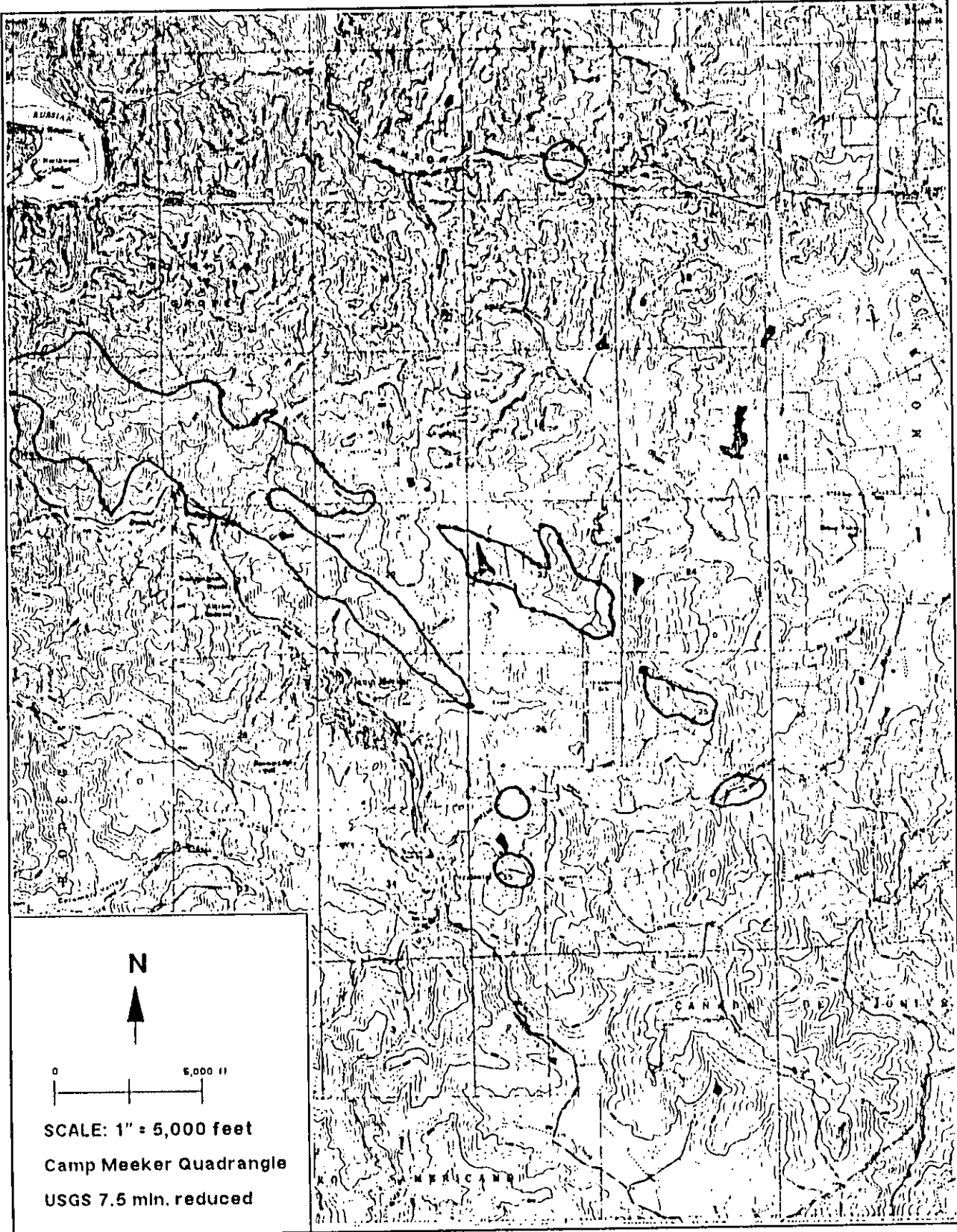
SPECIES MANAGEMENT GOALS

Both Baker's manzanita (Arctostaphylos bakeri) and narrow-leaved bird's beak (Cordylanthus tenuis ssp. capillaris) are state-listed as Rare, and both are Category 2 candidates for federal listing; meaning that the U.S. Fish and Wildlife Service has information suggesting that listing is possibly appropriate, but more information on biological vulnerability and threats is needed before a decision to list can be made.

Baker's Manzanita Taxonomy and Biology

The Harrison Grade Reserve is centered within a large, nearly contiguous population of Baker's manzanita (Figures 3 and 4). Baker's manzanita is known only from 9 populations in Sonoma County. Seven of those populations occur within approximately two miles of the Reserve (Figure 6). The population occurring in the Reserve is the second largest known according to California Natural Diversity Data Base records. During the survey for this report it was estimated that there are approximately 600 to 1,200 individuals of Baker's manzanita, however, CNDDDB data give an estimated range of 1,001 to 10,000 individuals based on field surveys by other individuals.

FIGURE 6
Distribution of Baker's Manzanita Populations



Baker's manzanita is sometimes considered a subspecies of Stanford's manzanita, Arctostaphylos stanfordiana ssp. bakeri, (Munz and Keck 1968, p. 421) and is occasionally referred to as a subspecies in other publications (Kruckeberg 1984). Other names and combinations have also been applied to Baker's manzanita (see Appendix I). The main differentiating characteristics are Baker's manzanita has a basal burl, larger flowers, longer and denser hairs along with short glandular ones on darker branchlets, while Stanford's manzanita lacks a basal burl, has smaller flowers and lacks glandular hairs (see Appendix I, also see Munz and Keck 1968).

The formation of a basal burl by Baker's manzanita suggests that it is likely to be a post-fire stump sprouter (Parker 1987). A specific ecological study to develop management guidelines for this species is necessary prior to establishing a prescribed burn plan. Management goals for this species should include protection of the population and habitat. These management goals can be met, in part, through:

- * Physical protection from disturbance with additional fencing.
- * Developing a prescribed burn schedule
- * Fulfilling Reserve management goals

Sonoma Narrow-Leaved Bird's Beak Taxonomy and Biology

The Sonoma narrow-leaved bird's beak (Cordylanthus tenuis ssp. capillaris) is known only from two populations in Sonoma County, the larger one occurring on the Reserve. The population in the Reserve had more than 5,000 individuals based on field surveys in 1987 (CNDDDB). This species is called Cordylanthus pallescens in Munz and Keck (1968), which is apparently an illegitimate name (see Appendix I). This species is characterized by a lack of hairs on the stems and leaves, and having a 3-parted bract at the base of the flower (Appendix I).

The Sonoma narrow-leaved bird's beak is a hemiparasite and has its roots joined by haustoria to the roots of trees, shrubs or perennial grasses and herbs while it is a seedling. The densest population on the Reserve is in an opening between the Sargent cypress forest and serpentine chaparral (Figure 5). All individuals on the Reserve either are in the human-caused opening or along the road-cut bordering Harrison Grade Road. The occurrence of this plant only in openings receiving full sunlight suggest that some form of disturbance such as controlled burning or artificial clearing is necessary to maintain high population levels. Additional research may be necessary to determine whether this species is limited only by the amount of light or if, in addition, there is a specific host plant that has other habitat requirements.

Management goals for the Sonoma narrow-leaved bird's beak should include protection of the population and its habitat. These goals can be met in part through:

- * Physical protection by additional fencing.
- * Fulfilling the Reserve management goals.

RESERVE MANAGEMENT GOALS

The following list includes individual management goals:

- * Removal of all litter and refuse
- * Develop a new parking area
- * Enhance the existing trail system
- * Avoid use of pesticides and fertilizers
- * Assess and eliminate external impacts from adjacent property both private and county development
- * Non-native plant invasion and removal
- * Protection from trespass and dumping

Removal of Refuse

All refuse including bottles, cans, furniture, appliances and cut wood should be removed from the Reserve. The refuse is concentrated on the east border of the Reserve along Harrison Grade Road. After removal of all existing refuse, an annual

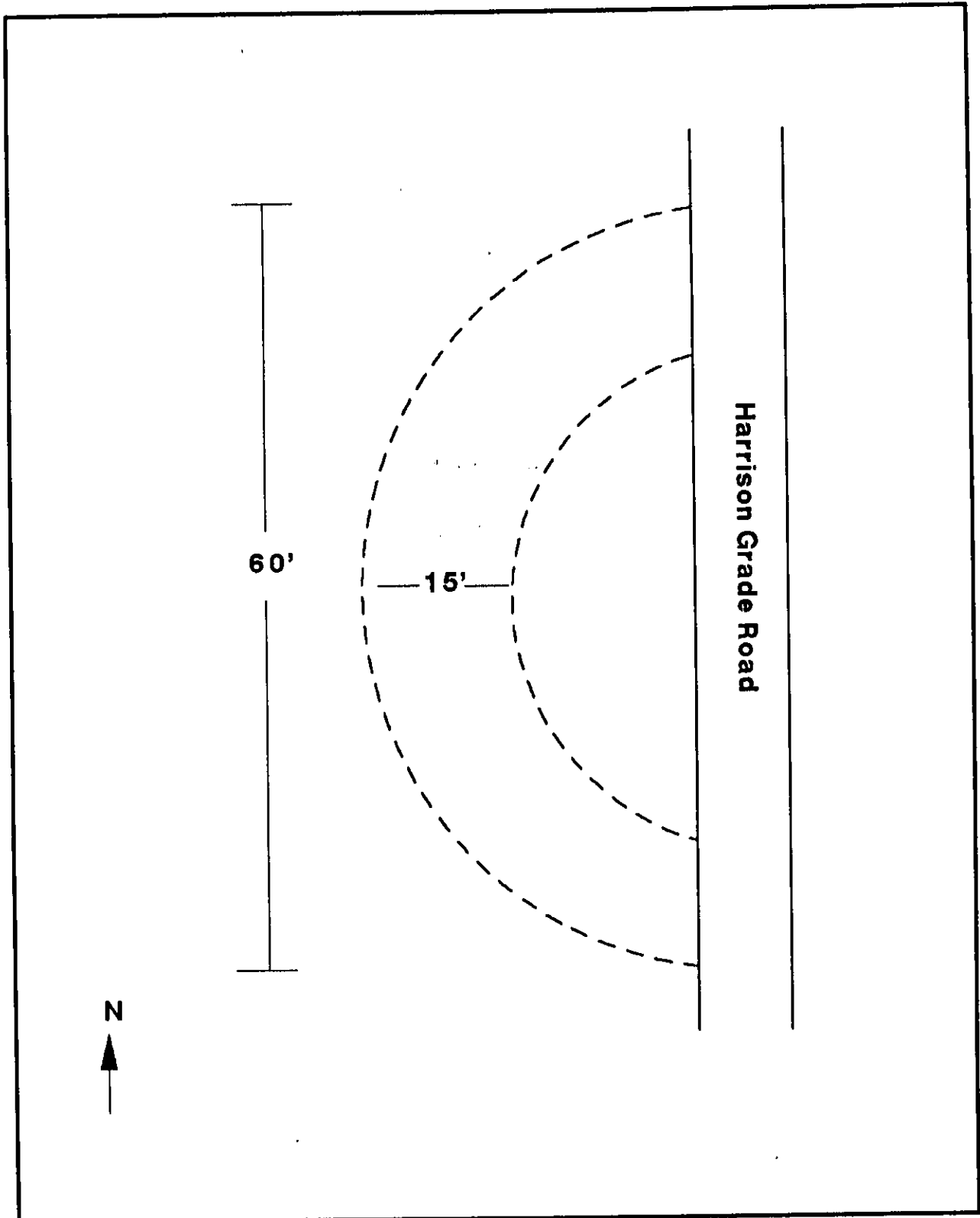
check for dumping and littering should occur. Justification for removing refuse includes visitor safety, reducing the fire hazard, allowing natural revegetation in disturbed dump sites and increasing aesthetic values. Prevention of future dumping of large objects, such as furniture, can be achieved by placing additional fencing along the Harrison Grade Road border of the Reserve. Responsibility for refuse removal lies with the regional office of the Department of Fish and Game.

Parking Area

A new drive-through parking area should be developed along Harrison Grade Road (Figure 3). The new parking area would be situated between the Sargent cypress woodland and Harrison Grade Road. The parking should be a semi-circle having a diameter between entrance and exit of approximately 60 feet, and lane width of 15 to 18 feet (Figure 7). This size parking area would allow 5 to 6 compact vehicles lengthwise with the opportunity for double parking allowing 8 to 10 vehicles. This space would allow for 3 to 4 half ton pickup trucks.

During development of the parking area, a botanist should be present to flag any rare plants in order to avoid impacts. Development of the parking area may require trimming or removal of one or two Baker's manzanita shrubs. Removal of any plants should be done only after they have been identified for removal

FIGURE 7
Proposed Parking Area Design



by a botanist designated by the Endangered Plant Project. Drainage pipes will need to be placed in the gutter between the Reserve and Harrison Grade Road at the points of exit and entry to the parking area.

Justification for the new parking area includes: safer vehicle access and exit from the Reserve and Harrison Grade Road; current parking area is on a large population of the state-listed Sonoma narrow-leaved bird's beak and new parking area does not contain that rare plant. The current trail system begins in the vicinity of the proposed new parking area, thus, creating easy access to the Reserve by visitors. Development and maintenance of the parking area will be the responsibility of the regional office of the Department of Fish and Game.

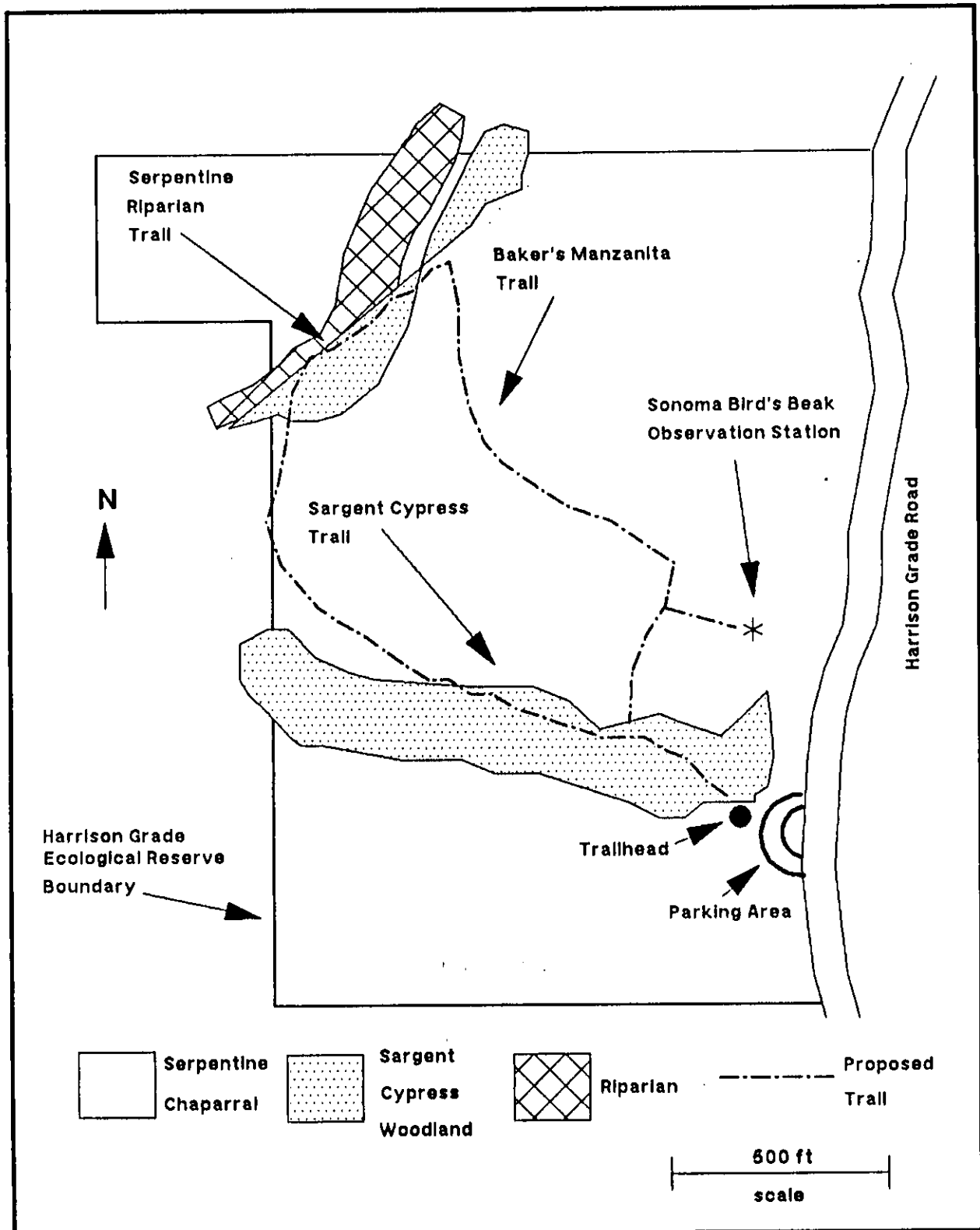
Trail System

An unmarked and partially revegetated trail system exists that allows access to the eastern half of the Reserve. Marking and clearing existing trails overgrown by shrubs would allow easier access by visitors. The trail system should be extended to allow access to new areas. Expansion of the trail system would require some trimming of shrubs. A botanist should be present to flag rare species so they are not disturbed. Trail development will not require any disturbance to the two state-listed rare plant species. Free-standing trail markers should identify direction

of the trail and significant local features such as plant community and dominant plant species. The trail system could be subdivided and named according to the type of vegetation such as the "Baker's Manzanita Trail", "Sargent Cypress Trail" and "Serpentine Riparian Trail". A loop-type trail system should be developed that would begin and end at the parking area. A rough proposal for a trail system is diagramed in Figure 8.

Specific trail design should avoid placing paths through rare plant populations, down steep, rocky and erosion prone slopes, and immediately next to shrubs of poison oak. Maintenance of the trails will include removal of overgrowth and annual trail inspection for erosion in spring. Should erosion be excessive, such as loss of surface soil greater than 3 inches or exposure of perennial plant roots, damaged trails should be closed. Closure of erosion damaged trails should remain until repairs are made. Long-term trail planning and maintenance should include use of alternate trails and permanent closure and natural revegetation of damaged trails. Closure of trails should also occur if damage to rare plant species has occurred. Except for erosion control, disturbance of the soil along the trail should be avoided to prevent damage to plant roots and reduce the opportunity of weeds to establish in the disturbed soil.

FIGURE 8
Proposal for Trail System Design



Justification for expansion of the trail system is that it would allow easier access to the Reserve by DFG personnel. In addition, it would allow visitors to view the three plant communities, two rare plant species and many serpentine soil endemic plants found in the Reserve. Development and maintenance of the trail system is the responsibility of the regional office of the Department of Fish and Game.

Use of Pesticides and Fertilizers

Pesticides and fertilizers should be avoided. The justification is to prevent impacts to native vegetation, especially the rare plant species. Further, pesticides could negatively impact pollinating insects of the rare plant species. Due to the nutrient poor conditions of the serpentine soil, addition of fertilizer would increase nutrient levels that would allow increased invasion by non-native weeds. Invasive weeds could potentially outcompete native species including rare plants. In addition, pesticide and fertilizer laden runoff could enter the seasonal wetland in the riparian zone, resulting in adverse impacts to water quality and stream biota.

External Impacts

An evaluation of land uses by neighboring properties should be made to determine if current and anticipated future uses are consistent with management goals of the Reserve and if they pose potential negative impacts. Possible negative impacts include; dumping of refuse which could "spill" over into the preserve, uncontrolled and unplanned fire, use of pesticides and fertilizers within the Reserve drainage system and development that would increase soil erosion and siltation in the riparian zone. The regional office of the Department of Fish and Game should contact neighboring land owners and discuss current and potential future land uses. Protection from some external impacts, such as dumping of refuse, can be controlled by additional cyclone fencing around the perimeter of the Reserve.

Since much of the vegetation in the Reserve and surrounding area is chaparral, fire is a potential impact. Fire could be caused naturally by lightning strike, or by nearby rubbish burning or trespassers. A prescribed burning plan should consider the effects to rare plants, non-chaparral communities and areas outside the Reserve. Coordination with local California Department of Forestry should be made on plans for prescribed burning. Ultimately the best protection would be acquisition of neighboring properties so that the entire watershed is included within the Reserve.

Non-native Plants

The 11 non-native plant species currently found in the Reserve occur in low numbers and are found primarily in human-caused disturbed areas. Introduction of non-native plants should not occur. Revegetation should be allowed to occur naturally so as not to disturb the soil that would possibly allow additional invasion from non-native plant species. No active removal of non-natives is currently necessary. Natural revegetation will likely occur in the disturbed sites and ultimately reduce the populations of non-native plant species.

Protection

The main sources of potential impacts to the site that are of immediate concern are from dumping of refuse and trespass of motor vehicles (ORV). Some cyclone fencing and gates have been installed by the regional staff of DFG along the Reserve perimeter with Harrison Grade Road. Cyclone fencing should be contiguous along that perimeter to prevent access from the road. The additional fencing and gates should be planned in conjunction with the development of the new parking area.

The above seven management goals represent both immediate and long term planning needs. Table 2 outlines a management schedule on six of those goals.

TABLE 2
Management Schedule

<u>Goal</u>	<u>Need</u>	<u>Maintenance Period</u>
Refuse Removal	immediate	annual
Parking Area	immediate	biannual
Trail Development	next 3 years	annual
Rare Plant Management	next 2 years	
Assess External Impacts	immediate	
Protection (fencing) ¹	immediate	

¹extend fencing along Harrison Grade Road

REFERENCES CITED

- Alexander, E.B., W.E. Wildman, and W.C. Lynn. 1985. Ultramafic (Serpentinitic) Mineralogy Class. In Mineral Classification of Soils. Soil Science Society of America and American Society of Agronomy, Madison. Special Publ. no. 16.
- Bailey, E.H. and D.R. Harden. 1975. Mineral resources, San Francisco Bay Region, California. U.S. Geological Survey. Miscellaneous Investigations Series 12 pp. and map.
- Brooks, R.R. 1987. Serpentine and its Vegetation. Dioscorides Press, Portland. 454 pp.
- Holland, R.F. 1986. Preliminary descriptions of the terrestrial natural communities of California. Unpubl. report of the Nongame-Heritage Program, California Dept. Fish and Game.
- Kruckeberg, A.R. 1984. California serpentines: Flora, vegetation, geology, soils and management problems. University of California Press, Berkeley; 180 pp.
- McCarten, N.F. 1986. Serpentines of the San Francisco Bay Region: Vegetation, floristics, distribution, and soils. Report to the California Endangered Plant Project. 60 pp.

Munz, P.A. and Keck, D.D. 1968. A California Flora with Supplement. University of California Press, Berkeley. 1681 pp.

Oakeshott, G.B. 1978. California's Changing Landscape. McGraw-Hill Book Co., New York. 379 pp.

Parker, V.T. 1987. Can native flora survive prescribed burns? Fremontia 3 - 10.

Soil Survey of Sonoma County. 1972. U.S. Dept. of Agriculture.