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File Code: 4060-3 Date: SEP 28 1995
Route To:

Subject: Establishment of Hale Ridge Research Natural Area

To: Regional Forester, R5

I have reviewed the enclosed Establishment Record and I concur with the establishment of the Hale Ridge Research Natural Area on the Mendocino National Forest. The land allocation and NEPA decision for this Research Natural Area were included in the Record of Decision for the Mendocino National Forest Land and Resource Management Plan.

It is my pleasure to support this establishment of a new RNA.

for JAMES C. SPACE
Station Director

Enclosures

cc: (without enclosures)
David Diaz, R5 RNA Coordinator, TM
Connie Millar, PSW RNA Coordinator
C.Phillips, RNA Ecologist

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FS-6200-28b (12/93)

SIGNATURE PAGE

for

RESEARCH NATURAL AREA ESTABLISHMENT RECORD

HALE RIDGE RESEARCH NATURAL AREA

MENDOCINO NATIONAL FOREST

LAKE COUNTY, CALIFORNIA

The undersigned certify that all applicable land management planning and environmental analysis requirements have been met and that boundaries are clearly identified in accordance with FSM 4063.21, Mapping and Recordation, and FSM 4063.41 5.e(3) in arriving at this recommendation.

Prepared by Cath Phillips for Date July 3, 1995
David R. Johnson, Biologist,
Pacific Southwest Research Station

Recommended by _____ Date 7/14/95
Blaine Baker, District Ranger,
Upper Lake Ranger District

Recommended by _____ Date 7/25/95
Daniel K. Chisholm, Forest Supervisor,
Mendocino National Forest

Concurrence of _____ Date 9/29/95
James C. Space, Station Director
Pacific Southwest Forest and Range Experiment Station

Established by James A. Lawrence Date 10/12/95
for G. Lynn Sprague, Regional Forester
Pacific Southwest Region

RECORD OF DECISION

FINAL ENVIRONMENTAL IMPACT STATEMENT
LAND AND RESOURCE MANAGEMENT PLAN

MENDOCINO NATIONAL FOREST
USDA-FOREST SERVICE

Colusa, Glenn, Lake, Mendocino, Tehama, and Trinity Counties, California

This document presents the decision regarding the selection of a Land and Resource Management Plan for the National Forest land within the Mendocino National Forest. It summarizes the reasons for choosing the Preferred (PRF) Alternative as the basis for the Forest Plan which will be followed for the next 10 to 15 years. Estimates of the long-term environmental and economic consequences contained in the Final Environmental Impact Statement were considered in this decision.

compared to 12,300 AUMs in the 1989 base year and approximately 6,000 AUMs during the current grazing season. The success of permittee livestock management, improvements, and application of grazing systems in meeting utilization standards and desired conditions will determine actual annual grazing outputs for each permit.

Timber:The Plan provides that 61,000 acres of suitable forest land is available for scheduled timber harvest. The maximum average annual allowable sale quantity (ASQ) in the Plan is 12.2 MMBF. The average annual harvest over the past decade has been steadily declining from 84 MMBF in the early 1980's to 2 MMBF in 1994.

The ASQ results from a combination of even-aged and uneven-aged silvicultural systems consistent with multiple use objectives and desired conditions of the Forest. The Plan includes 580 acres annually of reforestation, and 2,000 acres annually of timber stand improvement including precommercial thinning, release and weeding.

Selection of site-specific silvicultural prescriptions at the project level will be based on analysis of current conditions, requirements and regulations, and desired future conditions.

Green tree retention (GTR) will be the primary method of regeneration harvest used under the Plan. Utilizing the GTR regeneration method, both large and small trees are retained on a site to provide for dispersal of numerous organisms, future snags and coarse woody debris, and vertical and genetic diversity.

Recreation:With planned rehabilitation of existing facilities and construction of new facilities, developed recreation opportunities will be adequate to meet projected demand over the next 5 decades. Recreation use is estimated to increase by 32 percent from current levels in the next decade. Needed rehabilitation of existing facilities will be accomplished during the first decade, and new sites will be constructed to meet projected demand within available funding levels.

The Plan permits Off Highway Vehicle (OHV) use on designated roads and trails only. OHV trails will increase by 55% by the end of the fifth decade. Foot and horse trails will increase by 37% by the end of the fifth decade, and new trail construction will not occur in designated wilderness areas.

Soils:Maintenance of long-term soil productivity is given a high priority in the Plan. Minimizing reduction in long-term productivity from erosion, nutrient loss, displacement, and compaction are emphasized. Provisions are made for rehabilitation and improvement measures where needed.

Research Natural Areas:In addition to the Frenzel Creek Research Natural Area (RNA) previously established, this Plan allocates 3,211 acres of National Forest lands in four areas to the RNA management prescription, Rx 11. The three areas formally established as RNAs by this Record of Decision are Doll Basin, Hale Ridge, and Devil's Basin. Wilder Ridge will be formally established at a later date.

Wild and Scenic Rivers:A total of 221 streams, nearly 900 miles, were considered for eligibility to the National Wild and Scenic Rivers system. This Plan recommends Congressional designation of 40.3 miles of three rivers and streams to the National Wild and Scenic River System. The rivers include the Middle Fork of the Eel River within the Yolla Bolly-Middle Eel Wilderness,

No decisions on site specific projects are made in this document, although a number of projects are identified. Those projects identified in various parts of the Plan or final EIS are only included in order to clarify discussions, illustrate a point, or to show that Forest Plan goals and objectives can be achieved.

Final decisions on site-specific projects will be made during Forest Plan implementation after appropriate analysis and documentation meeting NEPA requirements.

VI. *SIGNATURE AND DATE.*

James A. Lawrence
G. LYNN SPRAGUE
for Regional Forester

7-7-95
Date

TITLE PAGE

Establishment Record for Hale Ridge Research Natural Area within Mendocino National Forest, Lake County, California.

A. INTRODUCTION

The Hale Ridge Research Natural Area (HRRNA) was selected to represent Knobcone Pine Forest[1] for the North Coast Ranges physiographic province. The HRRNA encompasses 975 acres (395 ha) on the Upper Lake Ranger District of the Mendocino National Forest. The area was nominated for Research Natural Area (RNA) status by the Forest Supervisor (1984), and an ecological survey was completed in 1987 (Keeler-Wolf 1987). The area was recommended for establishment by the Region 5 PSW Research Natural Area Committee in 1987. Unless otherwise noted, information contained in this establishment record was taken from, "An Ecological Survey of the Proposed Hale Ridge Research Natural Area, Mendocino National Forest, Lake County, California" (Keeler-Wolf 1987).

In addition to the knobcone pine element, a number of plant species and transitional cover types typical of the knobcone woodland in the North Coast Ranges are present within this RNA. Across the northern slopes of the RNA, knobcone pine is transitional with mixed conifer forest, dominated by Douglas-fir (Pseudotsuga menziesii), and on the more southerly aspects a gradation from mixed stands of chaparral to dense stands of chamise (Adenostoma fasiculatum) is found. Of special interest is a relatively high number of species indicative of serpentine soils (Kruckeberg 1984) however, serpentine soils do not occur within the RNA. No federally or state listed plant species are known to occur within the HRRNA.

All of the lands within the HRRNA are under the jurisdiction of the Mendocino National Forest.

1) Land Management Planning
The establishment of Hale Ridge RNA is recommended and evaluated in the Mendocino National Forest Land and Resources Management Plan (LRMP) and the Final Environmental Impact Statement and Appendices for the LRMP (U.S.D.A. Forest Service 1995a-c). The land allocation for the Hale Ridge RNA was decided by the signing of the Record of Decision (ROD) for the LRMP by the Regional Forester (1995). The establishment of the RNA will be completed by the signing of this Establishment Record with concurrence of the Station Director. The HRRNA is part of Management Area #5 allocated to Management Prescription #11 which emphasizes the preservation of natural conditions and the protection of features for which the RNA was established (Appendix C).

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1 Vegetation types follow Holland (1986). Tree names are in accordance with Little (1979), and all other plant names follow Munz (1968).

B. OBJECTIVES

Objectives for establishment of the HRRNA are to preserve a representative example of Knobcone Pine Forest and associated communities within the North Coast Ranges physiographic province. Establishment of the HRRNA will preserve genetic diversity and serve as a baseline area for the measurement of long-term ecological change. The RNA will also function as a control area for comparing results from manipulative research, and monitor the effects of resource management techniques and practices. The HRRNA will serve as a reference area for the study of succession in a plant community where fire plays a crucial role, and provide on site educational opportunity for the study of a plant community whose ecology is poorly understood.

C. JUSTIFICATION FOR ESTABLISHMENT

Establishment of the HRRNA meets the need within the Regional RNA program for representation of the knobcone pine target element in the North Coast Ranges physiographic province. In addition to the knobcone pine element, the HRRNA also contains an interesting transitional forest with affinities to both the Mixed Conifer type (SAF 243) and the Pacific Douglas-fir type (SAF 229). The area within the proposed RNA has been identified by the Mendocino National Forest as part of a Late Successional Reserve (RC313) and is considered critical habitat for the northern spotted owl (Strix occidentalis caurina[2]), a species that is Federally listed as threatened. The other vegetation within the HRRNA is chaparral, ranging from mixed chaparral stands to dense stands of chamise. An unusual floristic feature of the HRRNA is the relative abundance of species listed by Kruckeberg (1984) as serpentine indicators, but which do not occur on serpentine within the unit.

The vegetation types associated with the knobcone pine forest at the HRRNA are typical for the North Coast Ranges; successional relationships, soil-moisture relationships and fire history have likely been similar to those for community associates found in the lower mountains of the Inner Coast Ranges. These elements combine to make the HRRNA a good study site to better understand the ecological requirements and interrelationships between knobcone pine and its associates in this part of California.

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2 Name in accordance with Hoffmann (1955).

D. PRINCIPAL DISTINGUISHING FEATURES

The HRRNA is characterized by the presence of knobcone pine with transitions to mixed conifer forest, dominated by Douglas-fir, to the north and relatively diverse mixed chaparral, with transition to chamise chaparral, on the drier south-facing slopes. The entire RNA is also within a late successional reserve (RC313) to provide and protect habitat for northern spotted owl and other late

successional forest dependent species. Graywacke sandstone and shales of the Franciscan Assemblage form the underlying geologic foundation of the HRRNA, with soils consisting of: 1) Sanhedrin-Kekawaka-Speaker complex underlying the densest knobcone stands and Douglas-fir dominated forest to the north, 2) Maymen-Etsel-Speaker association underlying the chaparral on the southerly slopes, and 3) Speaker-Maymen-Marpa association underlying some knobcone and small amounts of Douglas-fir and canyon live oak (Quercus chrysolepsis). Most of the knobcone stands are 30-60 years old and are a result of extensive fires in the area, typical for this vegetation type and crucial for its regeneration.

An interesting floristic feature is the presence of serpentine indicator species occurring within the RNA where no serpentine soils occur. Arctostaphylos stanfordiana, A. glandulosa, Castilleja foliolosa, Chaenactis glabriuscula, Eriophyllum lanatum, Galium ambiguum, Phacelia imbricata, and knobcone pine are species commonly associated with serpentine. Leather oak (Quercus durata) and possibly Cordylanthus tenuis ssp. brunneus also occur within the RNA and are considered as highly restricted serpentine endemics (Kruckeberg 1984). The relatively poor soil developed on Franciscan graywacke and shale is the likely explanation for the occurrence of these species on Hale Ridge.

E. LOCATION

1) The HRRNA is located on the Upper Lake Ranger District of the Mendocino National Forest. No other lands are involved.

2) The approximate center of the unit is at 39°16'45" North latitude, and 122°48'0" West longitude.

3) The boundary for the HRRNA is outlined in Map 2, the Legal Boundary Description is as follows:

   An area within the Mendocino National Forest, Lake County, California, comprising portions of sections 30, 31, and 32, T17N, R8W; section 36, T17N, R9W; and sections 5 and 6, T16N, R8W, M.D.M. The boundary is more particularly described as follows:

   Beginning at the corner of sections 25, 30, 31, and 36, T17N, R8W and R9W, M.D.M., said corner monumented with a USFS monument per Book 54 of Records of Survey at Pages 33-38, Lake County Records;

   Thence northerly coincident with the westerly line of said section 30 to Salt Creek;

   Thence southeasterly and easterly up Salt Creek through said section 30 to the junction with an unnamed creek adjacent to the protracted section line of aforesaid sections 30 and 31;

Thence southeasterly and easterly up said unnamed creek through aforesaid sections 31 and 32 to a point in said creek which bears North 45° West, a distance of approximately 550 feet from the high point on a knoll on Hale Ridge within the NE1/4SE1/4 of said section 32, said knoll is designated "A" on the referenced map.

Thence South 45° East, a distance of approximately 550 feet to said point "A"; with a geographic position of 39°16'48-1/2"North, 122°46'43-1/2"West;

Thence South, a distance of approximately 450 feet to a point in a major draw within the NE1/4SE1/4 of said section 32, said point designated "B" on the reference map with a geographic position of 39°16'45"North, 122°46'43-1/2"West;

Thence southwesterly down said draw through said section 32 to the junction with an unnamed creek within the SW1/4SE1/4 of said section 32;

Thence southwesterly down said creek through aforesaid sections 32 and 5 to the junction with Rice Fork;

Thence westerly and northwesterly down said Rice Fork through aforesaid sections 5,6, 31, and 36 to the junction with a major draw within the SE1/4NE1/4 of said section 36, said junction designated "C" on the referenced map with a geographic position of 39°17'03-1/2"North, 122°48'56"West;

Thence northeasterly up said draw to a point on the top of Hale Ridge within the NW1/4NW1/4 of said section 31, said point designated "D" on the referenced map with a geographic position of 39°17'13"North, 122°48'36"West;

Thence northwesterly descending along the crest of Hale Ridge through said section 31 to a point on said ridge within the NW1/4NW1/4 of said section 31, said point designated "E" on the referenced map with a geographic position of 39°17'19-1/2"North, 122°48'45West;

Thence North 45° West to the westerly line of said section 31;

Thence northerly coincident with the westerly line on said section 31 to the point of beginning.

4) The HRRNA includes 975 acres (395 ha) of the inner Coast Ranges of central Lake County.

5) Elevations range from 2400 feet (732 m) along Salt Creek on the northwestern boundary, to 3600 feet (1097 m) on the eastern-most boundary of the area.

6) The HRRNA is accessible from the Upper Lake Ranger Station, taking between 1 and 1.5 hours to reach the western edge of the unit (about 30 miles (48 km) (Map 1). Upper Lake can be reached from U.S. highway 101 from the north via state highway 20 at Calpella, or from the south via Hopland and state highways 175 and 29. Upper lake is approximately 20 road miles (32.2 km) southeast of Capella and 29 road miles (46.7 km) northwest of Hopland.

To reach the HRRNA drive north and west from the Upper Lake Ranger Station on Elk Mountain Road (the M1) approximately 12 miles (19.3 km) to the intersection with Bear Creek Road (the M10). Follow Bear Creek Road east and south for approximately 6 miles (9.7 km) to the junction of Forest Road (FR) 17N16. Follow FR 17N16 south and east to FR 17N04, approximately 2.5 miles (4.0 km). Turn right (west) on FR 17N04 and proceed approximately 2.5 miles to the northwest boundary of the RNA, approximately 0.2 mile (0.8 km) south of where FR 17N04 crosses the Rice Fork of the Eel River. FR 17N04 parallels the western boundary of the area for about one mile along the Rice Fork. The best access route from this road is where the tractor trail (8W21) steeply ascends the southwest slope of Hale Ridge in the SW 1/4 of Section 31. At this point the Rice Fork can be forded easily and the tractor trail may be followed on foot up slope from the creek into the interior of the RNA. Other points along the road are too thickly vegetated with chaparral and knobcone pine to afford easy penetration into the area. The tractor trail was most recently brushed out at least 10 years ago and is presently overgrown in some areas. However , it remains the most strategic way to traverse the site from west to east (see location map). After a steep uphill climb for about 0.75 mile (1.2 km) the level ridgetop is reached. Once atop Hale Ridge the trail continues east to the eastern boundary and ascends the western flanks of Goat Mountain until it joins FR 24N02. Access from the east via FR 24N02 is slightly more difficult because of a 1/2 mile (0.8 km) walk down the overgrown tractor trail before the upper edge of the study area is reached. FR 24N02 connects with FR 17N04 via FR 18N01. About 45 minutes is necessary to drive from one end of the tractor trail around to the other.

The eastern access point can also be reached from Willows, requiring about 3 hours drive time. A light duty 4-wheel drive vehicle is recommended for both routes.

F. AREA BY COVER TYPE (Map 3)

SAF (Eyre 1980) TYPE	CODE	ACRES	HECTARES
Knobcone Pine	248	380	154
Sierra Nevada Mixed Conifer	243	320	129
Unclassified		275	111
TOTALS		975	394
KUCHLER (1966) TYPE			
Mixed Conifer Forest	5	320	129
Chaparral	29	165	67
Unclassified		490	198
TOTALS		975	394
HOLLAND (1986) TYPE			
Knobcone Pine Forest	83210	380	154
Sierra Nevada Mixed Conifer	84230	320	129
Mixed Chaparral	37110	113	46
Chamise Chaparral	37200	52	21
Unclassified		110	45
TOTALS		975	395

G. PHYSICAL AND CLIMATIC CONDITIONS

The HRRNA occupies an entire watershed bound on much of the southwestern and all of the southern boundary by the Rice Fork of the Eel River, and by a fork of Salt Creek on the north and northeast. Hale Ridge is the prominent topographic feature of the RNA, descending from the northwest slopes of Goat Mountain in a westerly direction. The ridge is steepest on the north side, although the southern Rice Fork Canyon is deeper. The summit of Hale Ridge is relatively flat, running for about 1.5 miles (2.4 km). To the east, the ridge summit loses definition as it ascends Goat Mountain, while to the west the plateau of the ridge steeply descends to the confluence of the Rice Fork and Salt Creek. All slope aspects are represented within the HRRNA - with southerly and southwesterly slopes dominating, followed by northerly and northeasterly slopes. Eastern aspects are uncommon and western aspects occur only on the westernmost tip of the ridge.

No weather stations are located within the HRRNA. The nearest station that has recorded rainfall in the past (incomplete data 1986-1989) is located 10 miles (16 km) SSW of the area in Upper Lake, elevation 1343 ft (409 m). Average annual precipitation is 41.5 inches (1054 mm) at Upper Lake. Estimates for the HRRNA range between 45 inches (1143 mm) at the low elevations to 55 inches (1397 mm) at the higher reaches (Kahrl 1979). Rainfall is strongly seasonal

with roughly 75% falling between November and April. Snowfall is a minor form of precipitation, even at the highest elevations, with only a few winter snows lasting on the ground more than a few days.

Temperature in the area can be characterized as typical for this part of the North Coast Ranges with July highs reaching 102-106°F (40-41°C) on the average, and the winter lows ranging in the mid 20's°F (about -4°C).

Table 1: Monthly and annual normals of precipitation 1961-1985 for Upper Lake Ranger District (Owenby, J.R. and D.S. Edzell, 1992).

Month	Ppt (inches)	Ppt (mm)
Jan	8.54	215
Feb	6.58	167
Mar	6.26	159
Apr	2.94	75
May	0.81	21
Jun	0.21	5
Jul	0.05	0.1
Aug	0.24	6
Sep	0.65	17
Oct	2.46	62
Nov	6.82	173
Dec	7.30	185
Ann	42.86	1088

H. VALUES

1) Flora

The flora of the HRRNA includes at least 104 species of vascular plants (Appendix A), identified by Keeler-Wolf (1987) during the ecological survey. The vegetation can be divided into three main communities: knobcone pine woodland, mixed conifer forest, and chaparral (Map 3). The knobcone pine woodland, while considered as a single community, can be broken down into three phases. The mixed conifer forest is transitional, varying between north and south-facing slopes, but in all cases is dominated by Douglas-fir. The chaparral is somewhat complex and can be broken into three major communities.

Following is a brief description of the major plant associations in the RNA. All scientific names are in accordance with Munz (1968) and code numbers following association names are Holland type numbers. The analysis of vegetation is based on ten 100 m^2 sample plots established in the knobcone woodland, six 100 m^2 plots established in the mixed conifer forest, and on observation of the chaparral (Keeler-Wolf 1987).

Knobcone Pine Forest (83210): Pinus attenuata stands cover roughly 40% of the HRRNA, and all of the stands appear to be the result of extensive fire which burned much of Hale Ridge about 1932. The densest stands of knobcone are on mesic sites on the western end of Hale Ridge (northwest-to-northeast aspect). They have a sparse understory of shrubs and virtually no herbaceous cover. Hoary manzanita (Arctostaphylos canescens) and shrubby interior live oak (Quercus wislizenii) are the only species commonly associated with this dense phase. On the most mesic sites, occasional small trees of canyon live oak occur. The presence of canyon live oak suggests potential for this site to be colonized by mixed conifer forest; numerous Douglas-fir seedlings growing in the tractor trail within this phase also provide evidence of successional direction. Stem density is high, running between 25-35 living stems per 100 m^2.

The second phase of knobcone (the most widespread phase at Hale Ridge) occurs on west-northwest to southwest-facing slopes. It is characterized by moderate knobcone stem density (modal density about 16 stems per 100 m^2). Understories in this phase are dominated by eastwood manzanita (Arctostaphylos glandulosa) (6-8 ft (2 m) tall) and interior live oak (to 15 ft (4.5 m) tall). Ceanothus lemmonii and chamise also occur at low densities. Successional status of this phase is variable depending on soil depth. With a fire frequency greater than 1 per 100 years, it would be unlikely that the mixed conifer forest could effectively colonize this phase, although deeper soil sites with occasional canyon live oak suggest the potential.

The third phase of knobcone woodland is characterized by a relatively open canopy overlying a moderately dense cover of shrubs; stem densities of 10 and 13 per 100 m^2 were found on the two plots representing this phase. Because of the more open canopy and predominantly southern exposure, chamise and Pickeringia montana have a higher importance in this phase than in the other two, and interior live oak is reduced in representation. The successional status of this phase is unlikely to change dramatically, even in the absence of fire. The dry exposure and shallow rocky-soil are probably inadequate to support anything but knobcone woodland and chaparral. Prolonged fire-free periods would be detrimental to knobcone and short-lived chaparral genera (e.g. chamise, Pickeringia, Ceanothus), eventually reducing the floral composition to longer-lived chaparral species (manzanita sp., interior live oak, leather oak).

The highest density of herbaceous species (in association with knobcone) was found on a site which was once phase 3 knobcone forest; the site was prescribe-burned in February 1983 and wildfire reached the area in 1988 (see Values - 7 Fire History). Species include: Hypericum concinnum, Gilia capitata, Lotus humistratus, Clarkia rhomboidea, Cirsium vulgare, Wyethia angustifolia, and Mentzelia dispersa.

Sierra Nevada mixed conifer forest (84230): The most important species throughout this community, at Hale Ridge, are Douglas-fir and canyon live oak; this forest occupies the northward-facing slopes on Hale Ridge. At its best development it is an open forest with large canopy trees overlying a discontinuous understory of canyon live oak and madrone (Arbutus menziesii). The shrub and herb layers are relatively poorly represented, and none are important in either cover or density. Unlike the knobcone and chaparral associations at Hale Ridge, fire has not destroyed the canopy in parts of this forest for over 200 years. Although many of the larger trees in this association are fire scarred, indicating repeated exposure to fire, the relatively steep slopes and open understory have prevented these fires from crowning. In addition to Douglas-fir and canyon live oak, sugar pine (Pinus lambertiana) is a significant regeneration component; these three species comprise the most important juvenile elements in this forest.

Northern Mixed Chaparral (37110): This is the most extensive and variable of the three forms of chaparral at Hale Ridge, occupying westerly to southeasterly-facing slopes, with the best developed stands occurring near the eastern boundary of the RNA. It can be characterized as having relatively high species diversity and longevity, and is relatively mesophilic compared to chamise chaparral. It varies in density (from 60-100% cover), and in height (from 5-15 ft (1.5-4.5 m)). Principal woody constituents are: Arctostaphylos glandulosa, A. canescens, A. stanfordiana, chamise, Ceanothus cuneatus, Pickeringia montana, Quercus wislizenii var. frutescens, Lonicera interrupta, Cercocarpus betuloides, and Garrya fremontii. Herbaceous cover, while relatively rare, includes: Pallaea mucronata, Castilleja foliolosa, Cryptantha torreyana, Solidago californica, Phacelea imbricata, Cuscuta sp., and Clarkia rhomboidea.

Chamise chaparral (37200): This is the most xerophilic of the three types of chaparral identified at Hale Ridge, typically occurring on the driest south-facing slopes, on the shallowest and rockiest soils. Species diversity is low with chamise often composing 65-100% of the woody cover. This is also the shortest of the three chaparral types, with an average shrub height of 3.5 ft (1 m). Herb cover is rare except in controlled burn areas or areas where shrubs are senescent. Chamise chaparral is adapted to burning about once every 20 years (Vogl et al. 1976), or becomes senescent at 50 years (Hanes 1977).

Successional chaparral (not mapped): The successional chaparral, as identified by Keeler-Wolf (1987), is successional from mechanical disturbance, resulting from the clearing of the tractor trail up the ridge. This association is about 10-15 years old, with a relatively low shrub diversity compared to well-developed mixed chaparral. The shrub component is dominated by Ceanothus sp. (C. integerrimus, C. cuneatus, C. lemmonii) but also includes other species such as Pickeringia montana and chamise. Height of this chaparral form frequently reaches 15-20 ft (4.5-6 m), and successional trends are variable depending on location. The mesic ridge top portion is being invaded by young Douglas-fir and occasional young knobcone

pine, while southwest facing slopes appear to remain dominated by shrubs (Pickeringia, Ceanothus cuneatus and chamise). The presence of a relatively high density and diversity of low sub-shrubs, herbs, and grasses is also characteristic of this form of chaparral. This is in response to the relative openness of the vegetation, exposed mineral soil, and a lack of phytochemical buildup found in chamise chaparral (Hanes 1977). Some of the characteristic species include: Hypericum concinnum, Bromus tectorum, Chrysothamnus nauseosus, Cryptantha torreyana, and Agoseris heterophylla.

2) Fauna

No wildlife surveys have been conducted within the HRRNA. However the mixed conifer forest has been identified as part of the critical habitat and dispersal habitat of the Federally-listed threatened northern spotted owl (territory #60, 20, Gard 1984). The RNA is also identified in the Mendocino National Forest LRMP as being dispersal habitat for goshawk, a Forest Service sensitive species, and key winter range for black-tailed deer. Gard (1984) suggests that species and habitat usage should be typical of that found in mixed conifer stands and chaparral. A partial list of vertebrate species is compiled in Appendix B.

3) Geology

The underlying rocks of the HRRNA are all graywacke sandstones and shales of the Franciscan Assemblage (Bailey et al. 1964, Blake and Jones 1981). Maps in Blake and Jones (1981) indicate Hale Ridge within the easternmost portion of the central belt of the Franciscan formation. Graywacke is the most extensive rock type in the RNA. It has a muddy, brownish-gray sandstone appearance, ranging from rather soft and crumbly in weathered outcrops to solid rocks and boulders in the stream bed of the Rice Fork.

Shale is not as extensive as the graywacke, occurring typically as thin partings less than 5 ft (1.5 m) thick. Minor silicification occurs within joint surfaces on knobs within the western portion of the parcel. There was no evidence of additional mineralization or alteration in the vicinity of the silicified areas or elsewhere in the parcel. No areas of special geological interest are identified within the RNA (See Mineral Potential Report in Appendix D).

4) Soils

Three soil series in four Mapping Units (Smith and Broderson 1989) are found within the HRRNA (Map 4 and Appendix E). On the northerly slopes, underlying the densest knobcone stands (Soil Conservation Service (SCS) Mapping Unit Symbol 201; 15% to 30% slope) and the mixed conifer forest (SCS Mapping Unit Symbol 202; 30% to 50% slope), the soil is classified in the Sanhedrin-Kekawaka-Speaker (S-K-S) complex. This soil is typified as being moderately deep to very deep and well drained, with an effective rooting depth of 20 inches to 60+ inches (508 mm to 1524+ mm). Permeability is moderately slow; water holding capacity ranges from 2 inches to 10 inches (51 mm to 254 mm). Surface runoff is rapid; erosion hazard is moderate to severe. Soil acidity is moderate in the upper soil profile and stronger in the subsoil.

Underlying the chaparral, on southerly slopes, is the Maymen-Etsel-Speaker association (SCS Mapping Unit Symbol 170; 30% to 50% slope). This soil type is shallow to moderately deep and well drained to excessively drained, with an effective rooting depth of 6 inches to 40 inches (152 mm to 1016 mm). Permeability is moderately slow to moderate; water holding capacity ranges from 0.5 inches to 6 inches (13 mm to 152 mm). Surface runoff is rapid; erosion hazard is moderate to severe. This series is slightly more acidic then the Sanhedrin-Kekawaka-Speaker complex.

The Speaker-Maymen-Marpa association (SCS Mapping Unit Symbol 225; 30% to 50% slope) underlies the west-central portion of the HRRNA and supports some knobcone and small areas of Douglas-fir and canyon live oak dominated forest. It is considered to be intermediate in depth, water holding capacity and acidity relative to the other two series. Effective rooting depth ranges between 12 inches to 40 inches (305 mm to 1016 mm).

5) Lands
All lands within the HRRNA are under the jurisdiction of the Mendocino National Forest. No lands have been acquired, and there are no outstanding rights.

6) Heritage
The RNA has not been surveyed for archaeological or historic sites. However, it is probable that historic properties exist within the area due to the distribution of historic sites in similar natural and cultural environments.

7) Fire History
Fire swept over much of Hale Ridge around 1932 and all of the knobcone pine stands are probably a result of this fire. In February of 1983 and 1984, a total of about 80 acres (32 ha) of chamise and mixed chaparral was prescribe-burned; the purpose was to break up the continuity of fuels in the area and reduce fuels loading. The fires were permitted to burn into the knobcone. However, fuel conditions were not hot enough to benefit knobcone seed release, and only a few trees were scorched and/or killed along the interface.

Approximately 50 percent of the RNA was burned in the Letts fire in December of 1988. Because of the late season, the intensity of the fire varied greatly. Some areas did not burn, much of the area was lightly burned, and a few areas had intense ground fire with a few patches of crowning. Fire control methods included a short tractor trail in the southeast portion of the RNA (see fire map Appendix F).

I. IMPACTS AND POTENTIAL CONFLICTS

1) Mineral Resources
There are no outstanding applications or leases for any type of mineral resources. The area will be recommended for withdrawal from mineral entry with the Record of Decision on the Mendocino's Land and Resource Management Plan. Until the Bureau of Land Management determines the area's mineral entry status, no applications will be approved. Conclusions of the Mineral Potential Report (USDA Forest Service, 1992, Appendix D) state that the lands within the proposed Hale Ridge RNA have a low to moderate potential for hosting a valuable deposit for geothermal resources, and a low potential for the occurrence of any other locatable, leasable, or salable mineral resources. Based on the low to moderate mineral potential, the lack of mining related activity, and a field exam of the lands, it does not appear that the RNA designation would present any adverse impacts on the mineral resources.

2) Grazing
The HRRNA is not included within a grazing allotment.

3) Timber
Gard (1984) identifies 225 acres (91 ha) of the mixed conifer stands on the north slope of the HRRNA as capable of producing timber. Gard also estimates 182 acres (74 ha) of knobcone (phase I) as potentially suitable timber land, plus an additional unspecified acreage currently supporting knobcone that could possibly be converted to productive commercial timber. However, the entire area has been removed from the suitable timber land base because of its designation as a Late Successional Reserve. RNA designation will not conflict with Forest timber resources.

4) Watershed Values
The Hale Ridge Research Natural Area occupies portions of several sub-watersheds, flanked by Salt Creek on the north and the Rice Fork of the Eel River on the west and south; both flow perennially. Slopes are steep (60%+ on some side drainages), and numerous small ridges and drainages divide the area. Since erosion hazard is high, maintenance of vegetative cover will benefit watershed values by preventing excessive sedimentation of the streams. Burning may be prescribed to maintain the vegetation type for which the HRRNA was recommended. Proper planning of prescription burn programs should not have a long term impact on water quality.

5) Recreation Values
Some recreationists use Crabtree Hot Springs which is adjacent to the northwestern boundary of the RNA. The Rice Fork is also lightly used for recreation, but entry into the RNA is minimal. There is an unknown increase in risk of wildfire due to the human use at the hot springs.

Recreational use of the area is by unauthorized motorcyclist use of the trail providing through access from Upper Lake to Stonyford or by unauthorized 4x4 use of the upper part of the trail within the knobcone stand. In either case, due to the density of the knobcone stand along the trail, OHV use is restricted to the trail by people "just passing through." This trail is proposed for obliteration in FY 1995 and 1996. The Management Prescription for RNAs prohibits recreational uses that would contribute to modification of the area and states that construction of new roads will not occur within the RNA and access on any existing roads into the area will be limited. The HRRNA is sparsely used by hunters.

6) Wildlife and Plant Values
With a management program that may include prescribed-burning, establishment of the HRRNA will maintain wildlife and plant habitat values typical of the ecosystem represented, and afford the opportunity to obtain a great deal of knowledge on the ecology of a widespread, but little understood vegetation type. If the area is entirely protected from fire of any kind, including prescribed-burns, habitat diversity may deteriorate in time.

The mixed conifer forest, on the north slope of Hale Ridge, is designated critical habitat for northern spotted owl, and the entire RNA is within a late successional reserve. The RNA also provides dispersal habitat for northern goshawk and is part of the Hale Ridge key winter range for deer. Establishment of the HRRNA would support protection of this timber stand and habitat for these wildlife species.

7) Special Management Areas
The Hale Ridge Research Natural Area does not fall within any congressionally designated wilderness area. The entire Hale Ridge RNA is within a late successional reserve (RC313).

8) Transportation Plans
Current access into the HRRNA is adequate for RNA objectives. The trail (8W27) which traverses the RNA is scheduled for obliteration in FY 1995 and 1996. Erosion along this trail will be repaired at this time.

9) Visual Quality
The adopted Visual Quality Objective (VQP) for HRRNA is retention. Establishment of the HRRNA, through its maintenance of natural conditions and processes, will meet this objective.

J. MANAGEMENT PRESCRIPTION

Appendix C contains management direction for the HRRNA as stated in the Mendocino National Forest Land and Resource Management Plan. Management emphasis calls for preservation of representative examples of specific botanic, aquatic, and geologic features, primarily for scientific and educational purposes. Other uses are secondary to this purpose.

Once the HRRNA is established, the Mendocino National Forest will prepare a Management Strategy for the HRRNA in consultation with the Pacific Southwest Research Station. The plan will specify management practices, project prescriptions, uses, and monitoring conducive to the objectives for establishment of the HRRNA.

1) Vegetation Management - Exposure to fire is an important requirement for regeneration of many of the plant species within this vegetation association, thus fire needs to play a role in the management of the HRRNA. Prolonged fire-free periods would be detrimental to knobcone pine and short lived chaparral species; without fire, habitat diversity will deteriorate. While it is well known that fire is crucial for survival of this plant community, exposure requirements are not well understood, creating an excellent opportunity for research.

K. ADMINISTRATIVE RECORDS AND PROTECTION

Official responsibility for administration and protection of the Hale Ridge Research Natural Area is with the District Ranger, Upper Lake Ranger District, 10025 Middle Creek Road, Upper Lake, California 95485. (707) 275-2361.

L. ARCHIVING

The research coordinator is the Director, Pacific Southwest Research Station, P.O. Box 245, Berkeley, California 94701. The Director is responsible for coordinating research in the area and for archiving research data and reports from the HRRNA in a manner conducive to facilitate the exchange and transfer of information among Stations, Forests, scientists, and land managers.

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HALE RIDGE RNA ESTABLISHMENT RECORD
APPENDICES

APPENDIX A
Vascular Plant List for Hale Ridge RNA

APPENDIX B
Partial list of vertebrate species for Hale Ridge RNA

APPENDIX C
The following pages pertinent to the Hale Ridge RNA, are taken from the Mendocino National Forest Land and Resource Management Plan, the Final Environmental Impact Statement and Appendices

APPENDIX D
Mineral Potential Report for the proposed Hale Ridge RNA

APPENDIX E
Soil descriptions from USDA Soil Conservation Service, Soil Survey of Lake County, California, 1989

APPENDIX F
Fire Map for Letts Fire

APPENDIX A

Vascular Plant List for Hale Ridge RNA

This list includes species identified for the HRRNA to date. Nomenclature follows Munz (1970). The following legend describes the vegetation type symbols which accompany each taxon in the list.

p.....Douglas-fir dominated forest

k.....knobcone pine woodland

cc.....chamise chaparral

mc.....mixed chaparral

d.....successional (disturbed) chaparral (not mapped)

Achillea millefolium; p

Adenostoma fasciculatum; cc, mc, k

Agoseris heterophylla; p, k

Arctostaphylos canescens; k, mc, p

Arctostaphylos glandulosa; k, mc

Arctostaphylos manzanita; k, mc

Arctostaphylos stanfordiana; k, mc

Arnica discoidea; p, k

Arbutus menziesii; p

Avena barbata; mc, d

Bromus tectorum; mc, d

Bromus mollis; d, cc

Bromus rubens; d, cc

Brodiaea elegans; mc

Chaenactis glabriuscula; d

Chlorogalum pomeridianum; mc, d

Cirsium sp. (native); p

Cirsium vulgare; d

Ceanothus integerrimus; d, p

Ceanothus cuneatus; mc, d

Ceanothus lemmonii; d, k, mc

Centaurea solstitialis; d

Chrysothamnus nauseosus; d

Clarkia amoena subsp. huntiana; d, cc

Clarkia rhomboidea; cc, d

Cynoglossum grande; mc, p

Cuscuta sp.; d, cc, mc

Castilleja foliolosa; mc, cc

Cordylanthus tenuis subsp. brunneus?; d

Calocedrus decurrens; p

Chimaphila menziesii; p

Collomia heterophylla; p

Campanula prenanthoides; p

Cryptantha torreyana; d, cc

Eschscholzia californica; d

Elymus glaucus; p

Eriophyllum lanatum subsp.; d

Erodium cicutarium; d

Eriogonum nudum; d, mc

Epilobium minutum; d

Eriodictyon californicum; d, mc, cc

Festuca idahoensis; p

Festuca myuros; d

Festuca reflexa; cc, d, mc

Festuca californica; p

Galium ambiguum; p

Galium parisiense; d

Galium nuttallii; mc, cc

Gilia capitata; k, d

Garrya fremontii; mc

Haplopappus linearifolius; d, k, mc

Hypericum concinnum; d

Hieracium albiflorum; p

Iris sp.; p

Keckiella lemmonii; mc, d

Lonicera interrupta; mc

Lomatium utriculatum; d

Lotus humistratus; d, k, mc

Monardella villosa; mc, d

Madia gracilis; d

Malacothrix floccifera; d

Melica harfordii; p

Mentzelia dispersa; d, k

Navarretia bakeri; d

Navarretia squarrosa; d

Nemacladus capillaris; d

Orobanche fasciculata; d

Pinus attenuata; k, p, mc, cc, d

Pinus ponderosa; p

Pinus sabiniana; mc

Pinus lambertiana; p

Pedicularis densiflora; p

Penstemon azureus; d, mc

Phacelia imbricata; cc, d

Pickeringia montana; d, mc, cc, k

Pellaea mucronata; mc, cc

Pseudotsuga menziesii; p, d

Quercus dumosa; mc

Quercus durata; mc, k

Quercus kelloggii; p

Quercus chrysolepis; p, k, mc

Quercus wislizenii var. frutescens; k, mc, cc

Rhamnus californica; mc, k

Ribes roezlii var. cruentum; p

Rhus trilobata; mc, k

Solidago californica; d, mc

Symphoricarpos mollis; p

Stellaria nitens; d

Toxicodendron diversilobum; k

Wyethia angustifolia; d, k

Zigadenus micranthus; d

APPENDIX B

Partial list of vertebrate species for Hale Ridge RNA

Vertebrate species were not documented in the Ecological Survey for Hale Ridge, and in discussion with the Mendocino National Forest no faunal surveys have been conducted on the RNA. This partial list of species was composed following review of species range maps. Authorities for species are Stebbins (1966) for reptiles and amphibians; Robbins (1983) and Hoffmann (1955) for birds; and Ingles (1965) for mammals.

FISH

The absence of perennial streams or standing bodies of water within the RNA eliminates the opportunity for the establishment of a fish population.

AMPHIBIANS

Western toad (Bufo boreas)

Pacific tree frog (Hyla regilla)

REPTILES

Western fence lizard (Sceloporus occidentalis)

Western skink (Eumeces skiltonianus)

Western yellow-bellied racer (Coluber constrictor)

Pacific gopher snake (Pituophis melanoleucus)

California kingsnake (Lampropeltis getulus)

REPTILES (continued)

Common garter snake (Thamnophis sirtalis)

Western rattlesnake (Crotalus viridis)

BIRDS

Turkey vulture (Cathartes aura)

Cooper's hawk (Accipiter cooperii)

Sharp-shinned hawk (Accipiter striatus)

Red-tailed hawk (Buteo jamaicensis)

American kestrel (Falco sparverius)

Band-tailed pigeon (Columba fasciata)

Mourning dove (Zenaida macroura)

Great horned owl (Bubo virginianus)

Barn owl (Tyto alba)

Northern spotted owl (Strix occidentalis caurina)

Anna's hummingbird (Calypte anna)

Black-chinned hummingbird (Archilochus alexandri)

Common flicker (Colaptes auratus)

Acorn woodpecker (Melanerpes formicivorus)

Hairy woodpecker (Picoides villosus)

Downy woodpecker (Picoides pubescens)

Western kingbird (Tyrannus verticalis)

Olive-sided flycatcher (Contopus borealis)

Scrub jay (Aphelocoma coerulescens)

American crow (Corvus brachyrhynchos)

Plain titmouse (Parus inornatus)

Bushtit (Psaltriparus minimus)

BIRDS (continued)

White-breasted nuthatch (Sitta carolinensis)

Red-breasted nuthatch (Sitta canadensis)

Brown creeper (Certhia americana)

House wren (Troglodytes aedon)

American robin (Turdus migratorius)

Hermit thrush (Catharus guttatus)

Pine siskin (Carduelis pinus)

Rufous-sided towhee (Pipilo erythrophthalmus)

Brown towhee (Pipilo fuscus)

Dark-eyed junco (Junco hyemalis)

White-crowned sparrow (Zonotrichia leucophrys)

Golden-crowned sparrow (Zonotrichia atricapilla)

Fox sparrow (Passerella iliaca)

MAMMALS

Common opossum (Didelphis marsupialis)

Ornate shrew (Sorex ornatus)

Broad-handed mole (Scapanus latimanus)

Fringed myotis (Myotis thysanodes)

Little brown myotis (Myotis lucifugus)

California myotis (Myotis californicus)

Yuma myotis (Myotis yumanensis)

Long-eared myotis (Myotis evotis)

Red bat (Lasiurus borealis)

Hoary bat (Lasiurus cinereus)

Big brown bat (Eptesicus fuscus)

MAMMALS (continued)

Lump-nosed bat (Plecotus townsendii)

Pallid bat (Antrozous pallidus)

Black-tailed hare (Lepus californicus)

Brush rabbit (Sylvilagus bachmani)

Beechey ground squirrel (Otospermophilus beecheyi)

Sonoma chipmunk (Eutamias sonomae)

Botta pocket gopher (Thomomys bottae)

Western harvest mouse (Reithrodontomys megalotis)

Brush mouse (Peromyscus boylii)

Deer mouse (Peromyscus maniculatus)

Dusky-footed wood rat (Neotoma fuscipes)

California meadow mouse (Microtus californicus)

Porcupine (Erethizon dorsatum)

Gray fox (Urocyon cinereoargenteus)

Coyote (Canis latrans)

Racoon (Procyon lotor)

Mink (Mustela vison)

Long-tailed weasel (Mustela frenata)

Spotted skunk (Spilogale putorius)

Striped skunk (Mephitis mephitis)

Badger (Taxidea taxus)

Bobcat (Lynx rufus)

Black-tailed deer (Odocoileus hemionus columbianus)

APPENDIX C

The following pages. pertinent to the Hale Ridge RNA, are taken from the Mendocino National Forest Land and Resource Management Plan, the Final Environmental Impact Statement and Appendices.

United States
Department of
Agriculture

Forest Service

Pacific
Southwest
Region

February 1995

Land and Resource Management Plan

Mendocino National Forest

38. The need to identify typical examples of important botanical, aquatic, and geological types and protect them through establishment of Research Natural Areas, Special Interest Areas, or National Conservation Areas.

The Plan establishes four additional Research Natural Areas to preserve representative examples of specific botanical ecosystems and specifies the goals for their management. Forest standards and guidelines provide direction for the completion of a Forest-wide inventory to identify representations of the remaining biological component, as well as for the aquatic and geologic elements of the Research Natural Area system. The proposed Plan also provides for the evaluation of four candidate Special Interest Areas for designation.

MANAGEMENT DIRECTION-Forest Goals IV - 3

RESEARCH NATURAL AREAS

Manage existing and recommended Research Natural Areas to preserve the specific botanical elements represented. Complete establishment reports for areas recommended for designation.

MANAGEMENT DIRECTION-Future Condition IV - 7

RESEARCH NATURAL AREAS

Four additional Research Natural Areas, representing the knobcone pine, chamise chaparral, black oak, and mixed conifer ecosystems, will be established and managed for non-manipulative research, observation, and study.

downhill skiing; however, snowmobiling and cross-country skiing are reasonably possible in the Mendocino Pass-Anthony Peak-Plaskett Lakes, Hull Mountain, and Alder Springs areas.

As early as the 1960's, interest was expressed in, and studies begun on, development of the Anthony Peak area for downhill and Nordic skiing. Although there is still substantial interest from both Glenn and Mendocino counties, the potential is limited by the problem of access, which would require major reconstruction and paving of Forest Highway 7. Beyond that; any development must contend with the vagaries of the weather and spotty snowpack.

RESEARCH NATURAL AREAS

Research Natural Areas (RNAs) are areas set aside to preserve representative examples of specific botanic, aquatic, and geologic features, primarily for scientific and educational purposes.

The Mendocino National Forest has five designated RNAs. These areas on the Forest are:

1. Frenzel Creek (Sargent cypress, MacNabe cypress, and serpentine chaparral) - This 935 acre area is located approximately six miles south of Stonyford in the Frenzel Creek drainage, a small tributary to Little Stony Creek. The area also has several plant species listed Regionally as sensitive.

2. Hale Ridge (knobcone pine) - This 975 acre area includes dense stands of knobcone pine with several transitional zones to chamise chaparral, mixed hardwoods and chaparral, and mixed conifer types. The area occupies the entire watershed bounded by the Rice Fork of the Eel River and a fork of Salt Creek. It is dissected into numerous small fingers and subwatersheds, and all possible aspects are represented. Elevation ranges from 2,400 feet to 3,600 feet. Slopes range from 5% on the main ridgetops, to over 60% in some of the side drainages.

3. Wilder Ridge (chamise/chaparral) - Located on the eastern edge of the Forest, this 570 acre area has a prevailing easterly aspect which is moderately steep with slopes of 30% to 50%, and incised by several steep draws and intermittent stream courses, which result in very broken topography. Dense stands of chamise occur on approximately 340 acres.

4. Devils Basin (black oak) - Devils Basin is on the north slope of Log Springs Ridge along Thomes Creek. The heart of the basin is a large flat on the toe of an old land failure and is surrounded on three sides by moderately steep slopes. Elevations range from 1,500 feet to 3,850 feet. The area contains a large stand of black oak (420 acres) with adjacent stands of oak-savannah, mixed hardwood, conifer-hardwood, and mixed shrub types for a total of 671 acres.

5. Doll Basin (mixed conifer) - The area lies between Doll Ridge and Summit Ridge and contains five distinct drainages totaling approximately 995 acres. Vegetation ranges from Douglas-fir Ponderosa pine at the lower elevations to white fir Douglas-fir at the higher elevations. Sugar pine, incense cedar, and black oak are secondary species found through much of the area.

Additional inventories will be conducted to determine if there are opportunities for representation of additional targeted botanical, geological, and aquatic elements for the physiographic province.

RIPARIAN AREAS

Riparian areas include lands adjacent to perennial and intermittent streams and other bodies of water, wetlands, and floodplains. These areas support a variety of plant communities and habitat for many aquatic and terrestrial animals. The riparian areas serve to help protect water quality and fish habitat, by filtering run-off, maintaining channel stability, and providing shade to maintain water temperatures. These areas also contribute to the visual variety of the landscape and biodiversity of the Forest; they

Rx 11 - RESEARCH NATURAL AREA

Description: Protect and manage recommended and established Research Natural Areas as components of the Research Natural Area system, preserving the natural integrity of the area for non-manipulative scientific and educational purposes. These areas contribute to the preservation of examples of significant natural ecosystems, provide genetic diversity (gene pools), and protect, where appropriate, habitats of threatened and endangered, or sensitive plant and animal species.

Application: This prescription applies to all RNAs. These areas and the ecologic components represented by each are listed below:

Frenzel Creek	Serpentine Chaparral, Macnab and Sargent Cypress
Hale Ridge	Knobcone Pine
Devils Basin	Black Oak
Doll Basin	Mixed Conifer
Wilder Ridge	Chamise Chaparral

Management Direction and Associated Standards and Guidelines:

1. Use special use permits or cooperative agreements to coordinate planned research activities. These will be executed between the research proponent and the Pacific Southwest Station Director, with review and approval of the Forest Supervisor and District Ranger.

2. Request withdrawal from mineral entry for recommended RNAs.

3. Prohibit recreational uses that would contribute to modification of the area.

4. Permit grazing within established range allotments as long as that use preserves and does not detract from the values for which the RNA was established.

5. Prohibit timber harvesting unless necessary to meet RNA objectives.

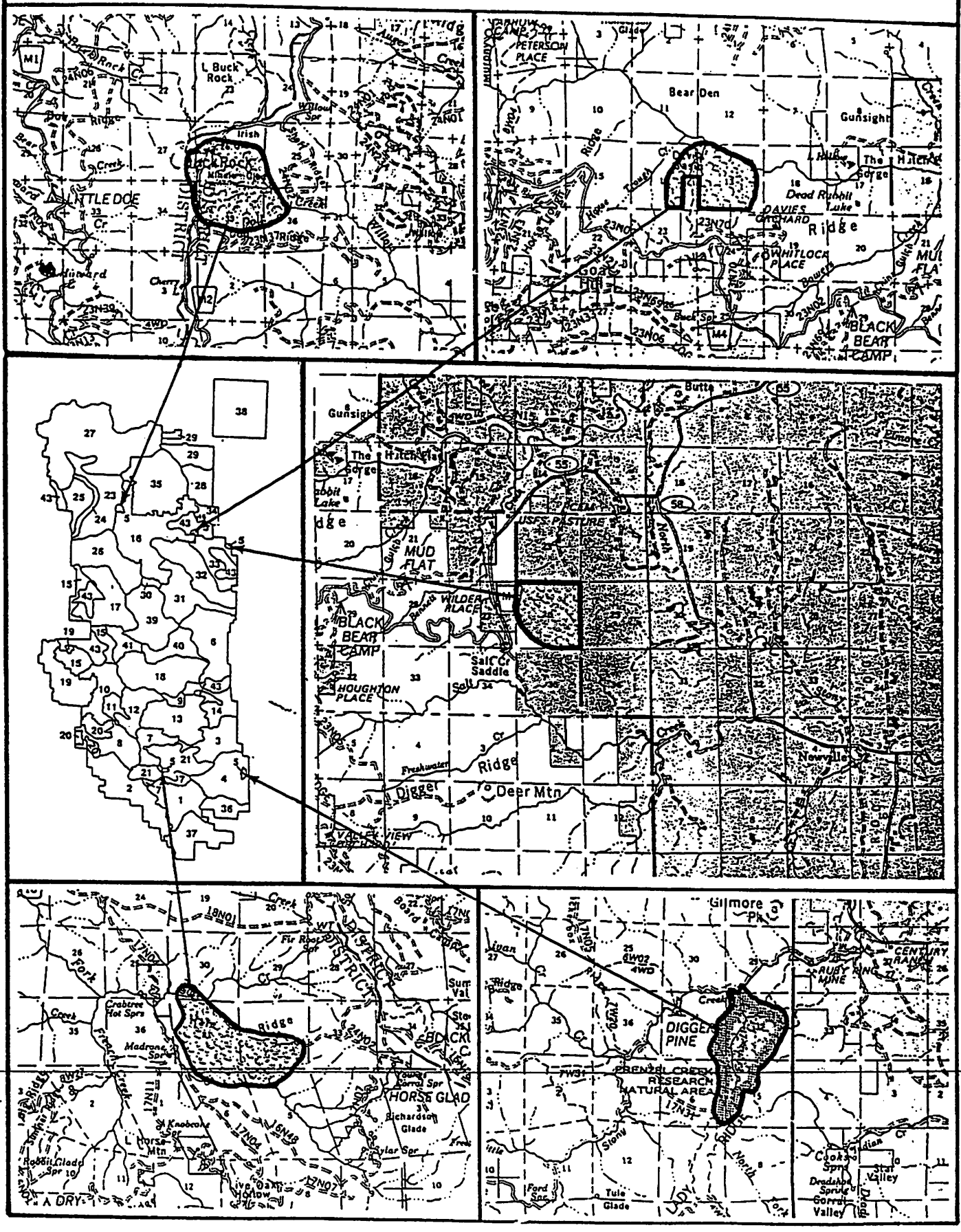
6. Construct no new roads, and limit access on any existing roads into the areas. Existing trails may be retained or expanded if needed to provide access for research personnel or educational groups.

7. Normally meet a visual quality objective of retention within RNAs. Consider exceptions on a case-by-case basis where consistent with RNA management objectives.

8. Protect habitat for all species of wildlife, fish and plants present in their natural condition.

MANAGEMENT AREA #5

Research Natural Area



MANAGEMENT AREA #5

RESEARCH NATURAL AREAS

Total Acres	4,146
NF Acres	4,146

Research Natural Areas (RNAs) are areas managed to preserve representative examples of specific botanic, aquatic, and geological features, primarily for scientific and educational purposes. No roads are located within the RNAs. The Pacific Southwest Region has identified ecosystems within each physiographic province which are needed to complete a botanical target system of RNAs. The Mendocino National Forest is located in the North Coast Range physiographic province which has 13 botanical elements targeted. The Six Rivers National Forest is also located within this province.

Frenzel Creek RNA is the only established RNA on the Mendocino National Forest. It is located approximately six miles south of Stonyford in the Frenzel Creek drainage. It consists of approximately 935 acres and contains three botanical elements; Sargent cypress, MacNab cypress, and serpentine chaparral. This area also has good potential as a serpentine geologic type.

No federally listed threatened or endangered or Forest Service sensitive wildlife species occur in the Frenzel Creek area. The riparian vegetation along Frenzel Creek provides cover and forage for a variety of small mammals, reptiles, deer, and songbirds.

Frenzel Creek RNA contains several sensitive plant species, as well as several species of special interest. The listed species are: Astragalus clevelandii, Hesperolinon drymarioides, and Eriogonum nervulosum. Special interest species include: Asclepias solanoana, Mimulus brachiatus, Mimulus glaucescens, Nemacladus montanus, Senecio clevelandii, a subspecies of Streptanthus morrisonii, an apparently undescribed species of Allium, and an undescribed subspecies of the Castilleja miniata complex.

Four additional Research Natural Areas are recommended for establishment on the Mendocino National Forest. Their descriptions are as follows:

a. Hale Ridge (knobcone pine) - consists of 960 acres including dense stands of knobcone pine as well as several transitional zones to chamise chaparral, mixed hardwoods and chaparral, and mixed conifer types. The area occupies an entire watershed bounded by the Rice Fork of the Eel River and a fork of Salt Creek. It is dissected into numerous small fingers and subwatersheds, with all aspects represented. A portion of this area is within Late Successional Reserve and is also critical habitat for the northern spotted owl. A portion of this area was burned by wildfire in December, 1988. Because of the late season, the intensity of the fire varied greatly. Some areas did not burn, much of the area was lightly burned, and a few areas had intense ground fire with a few patches of crowning. No new tractor lines were constructed during firefighting operations within the area. However, an old tractor line in the western portion of the area is severely eroded and in need of treatment. Elevation ranges from 2,400 feet to 3,600 feet. This area contains no known sensitive plants.

b. Wilder Ridge (chamise chaparral) - includes 570 acres on the Eastern edge of the Forest. The prevailing eastern aspect is moderately steep with slopes of 30% to 50%, and is incised by several steep draws and intermittent streamcourses which result in very broken topography. Dense stands of chamise occur on approximately 340 acres. Elevations range from about 1,000 feet to just over 1,800 feet. The Wilder Ridge management area provides habitat for chaparral adapted species such as the California thrasher, but does not contain habitat for any federally listed threatened or endangered or Forest Service sensitive wildlife species. Eriastrum brandegeae, a sensitive plant, grows on this site. This site also contains suitable habitat for Antirrhinum subcordatum.

c. Devils Basin (black oak) - lies on the north slope of Log Springs Ridge above Thomes Creek. The heart of the basin is a large flat on the toe of an old land failure and is surrounded on three sides by moderately steep slopes. The area contains a large stand of black oak (420 acres) with adjacent stands of oak-savannah, mixed hardwood, conifer-hardwood, and mixed shrub types for a total of 671 acres. The Devils Basin area contains habitat for bear, deer and turkey. It is located within a Late Successional Reserve, and also provides critical habitat for the northern spotted owl. Elevations range from about 1,500 feet to 3,500 feet. This area contains no known sensitive plants.

d. Doll Basin (mixed conifer) - Vegetation ranges from Douglas-fir/ponderosa pine at the lower elevations to white fir/Douglas-fir at the higher elevations. Sugar pine, incense cedar, and black oak are secondary species found through much of the area. This extremely rugged area, totaling about 995 acres, lies between Doll Ridge and Short Ridge below Forest Service road 24N02. Five distinct, steep-walled drainages dissect the terrain. The Doll Basin area is located within a Late Successional Reserve, and it contains critical habitat for the northern spotted owl. The elevation range is 4,200-6,700 feet. This area contains no known sensitive plants.

MANAGEMENT PRESCRIPTION ALLOCATION

Management Prescription	Acres
Research Natural Areas	4,146

Management Direction

Management Direction for this management area is set forth in the Research Natural Area Management Prescription, described earlier in this chapter. This management area corresponds exactly to the area where that prescription applies. Further direction applicable to this management area can be found in the Forest-wide Standards and Guidelines.

Control erosion and restore soil stability along the old tractor line at the western edge of the proposed Hale Ridge RNA.

MANAGEMENT AREA #5

Key Wildlife Habitat

	Species	Description
Hale Ridge	Northern Spotted Owl	Entirely within LSR RC313 Dispersal habitat Critical habitat
	Goshawk	Dispersal habitat
	Deer	Hale Ridge key winter range (entire area)
Devil's Basin	Northern Spotted Owl	Portion of LSR RC309 Dispersal habitat Critical habitat
	Goshawk	Dispersal habitat
	Marten/Fisher	Dispersal habitat
	Deer	Portion of Thomes Creek key winter range
Doll Basin	Northern Spotted Owl	Late Successional Reserve Critical habitat
	Goshawk	Nesting habitat
	Marten/Fisher	Denning habitat
	Deer	Portion of Wells Cabin/Plaskett key summer range
Frenzel Creek	None	
Wilder Ridge	None	

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Research Natural Areas

1. Include specific recommendations for fire suppression in the management plan for each of the Research Natural Areas.

Research Natural Area Prescription

This prescription provides for the protection and management of Research Natural Areas, preserving the natural integrity of the area for non-manipulative scientific and educational purposes. These areas contribute to the preservation of examples of significant natural ecosystems, provide genetic diversity (gene pools), and protect, where appropriate, habitats of threatened and endangered, or sensitive plant and animal species.

RESEARCH NATURAL AREAS

Each of the alternatives call for the continued management of the Frenzel Creek Research Natural Area for its scientific and educational values. In addition, the Preferred, Current, RPA, and Amenity Emphasis alternatives, as well as the Citizens Forest Plan, establish four additional RNAs totaling approximately 3,200 acres.

- Research Natural Areas/Special Interest Areas

Four additional Research Natural Areas would be established under this alternative. The RNAs and ecosystems represented are:

Area Name	Ecosystem
Hale Ridge	Knobcone Pine
Wilder Ridge	Chamise Chaparral
Devils Basin	Black Oak
Doll Basin	Mixed Conifer

A Forest-wide inventory to identify suitable representations of the remaining botanical component, as well as for the aquatic and geologic elements of the Research Natural Area System would be completed prior to scheduled Plan revision. Areas found suitable would be designated during a Forest Plan ammendment or during the scheduled Plan revision.

Four additional candidate Special Interest Areas would be evaluated as to their suitability for designation as Special Interest Areas. These areas are: Twin Rocks, Keller Lake, Blue Banks, and Anthony Peak. These areas would be protected from activities that could detract from their special characteristics until suitability evaluations have been completed. In addition, a Forest-wide inventory of potentially suitable Special Interest Areas would be completed prior to scheduled Plan revision and on a project-by-project basis during implementation of the Plan. All areas found suitable, either through the four specific suitability studies, or through the Forest-wide inventory, would be recommended for designation and protected pending final classification decisions.

- Riparian Areas

Under this alternative, additional protection, maintenance, and restoration would be provided for riparian areas, riparian ecosystems, and stream channels by establishing 100 to 300 foot riparian reserves (RRs) along each side of all perennial, intermittent, and some ephemeral streams, lakes, ponds, reservoirs, and wetlands (See Chapter IV of the LRMP for a detailed description of riparian reserve widths). These zones are designed to restore and maintain the ecological health of watersheds and aquatic ecosystems contained within them (FSEIS ROD, B-9). Timber harvest would be precluded from RRs, and they would be removed from the suitable timber landbase. All activities within the RRs would be designed to attain, or to not retard or prevent attainment of Aquatic Conservation Strategy objectives (FSEIS ROD, B-10).

- Roadless and Undeveloped Areas

Approximately 51,500 acres within seven inventoried (RARE II) roadless areas would be managed under the Backcountry Management Prescription, and an additional 671 acres would be managed as a Research Natural Area. Management under these prescriptions would maintain the diversity of plant and animal life, provide opportunities for the enjoyment of primitive and/or semi-primitive recreational activities, and preserve future management options by maintaining the undeveloped character of the area. In addition, road construction would be prohibited in 21,880 acres of inventoried roadless area within key watersheds. Road construction would also be prohibited within the entire Elk Creek roadless area, which includes 5,381 acres not managed under the Backcountry Management Prescription. Of the remaining 62,518 acres within inventoried roadless areas, approximately 34,697 acres would be within riparian reserves. The balance, 27,821 acres, would be managed for a full range of uses including the development of road and trail access, sustained timber yields, forest health, and improvement of wildlife and livestock forage and facilities.

TABLE 2-11
ACREAGE ALLOCATION BY MANAGEMENT PRESCRIPTION AND ALTERNATIVE

MANAGEMENT PRESCRIPTION	PRF	CUR	RPA	MKT	AMN	LBU	CFP
Wildlife Emphasis	59,690	102,536	102,536	103,608	115,626	102,536	26,396
Range Emphasis	0	15,131	15,131	14,053	4,035	11,823	0
Chaparral Management	106,991	110,485	110,336	98,691	36,048	110,485	40,000
Minimal Management	258,170	169,915	182,196	198,860	107,620	213,241	83,987
Recreation Area	1,863	1,763	1,863	1,763	1,863	1,763	1,788
Habitat Conservation Area	208,670*	196,740	196,740	196,740	196,740	196,740	26,607**
Timber Modified	61,000	58,615	86,263	29,510	149,140	79,902	19,533
Timber Intensive	0	92,614	52,734	107,785	0	79,902	0
Wilderness	137,787	137,787	137,787	137,787	137,787	137,787	137,787
Wild & Scenic River	4,667	4,667	4,667	4,667	4,667	4,667	4,667
Research Natural Area	4,146	4,146	4,146	935	4,146	935	4,146
Backcountry	51,415	0	0	0	136,718	0	141,950
Wilderness Recovery	0	0	0	0	0	0	407,448
Total Acres	894,399	894,399	894,399	894,399	894,399	894,399	894,399

* For the Preferred alternative, the acreage shown are Late Successional Reserve acreage.
** 170,133 acres included in the Wilderness Recovery prescription since it is the more restrictive prescription.

RANGE

Transitory rangelands are managed at a low level of intensity under all alternatives. The Market Emphasis alternative provides for the most intensive management within annual and perennial grasslands, of any of the alternatives considered. The Preferred, Current, and RPA alternatives call for somewhat less intensive management of these areas, whereas the Amenity Emphasis and Low Budget alternatives only provide for a low level of management on all rangelands. The Citizens Forest Plan phases out livestock grazing after the first decade.

The Current, RPA, Low Budget, and Market Emphasis alternatives meet or exceed the 1990 RPA Program target for all decades. The Preferred alternative is below the targeted outputs in all decades by 4,300 AUMs. The Amenity Emphasis alternative falls short of the year 2000 target by about 6,600 AUMs, and it falls short

Mendocino counties, the potential is limited by the problem of access, which would require major reconstruction and paving of Forest Highway 7. Beyond that, any development must contend with the vagaries of the weather and spotty snowpack.

RESEARCH NATURAL AREAS

Research Natural Areas (RNAs) are areas set aside to preserve representative examples of specific botanic, aquatic, and geologic features, primarily for scientific and educational purposes.

The Mendocino National Forest presently has one designated RNA, Frenzel Creek. It is located approximately six miles south of Stonyford in the Frenzel Creek drainage, a small tributary to Little Stony Creek and is approximately 935 acres. The targeted ecosystems represented are Sargent cypress, MacNab cypress, and serpentine chaparral. It also has several plant species listed Regionally as sensitive.

The Pacific Southwest Region has identified specific targeted elements within each physiographic province which are needed to complete the botanical component of the RNA system. The Mendocino, Six Rivers, and Trinity National Forests are located in the North Coast Ranges physiographic province. To date five areas on the Mendocino National Forest have been given consideration for inclusion in the RNA system.

These areas on the Forest are:

1. Hale Ridge (knobcone pine) - This 975 acre area includes dense stands of knobcone pine with several transitional zones to chamise chaparral, mixed hardwoods and chaparral, and mixed conifer types. The area occupies the entire watershed bounded by the Rice Fork of the Eel River and a fork of Salt Creek. It is dissected into numerous small fingers and subwatersheds, and all possible aspects are represented. Elevation ranges from 2,400 feet to 3,600 feet. Slopes range from 5% on the main ridgetops, to over 60% in some of the side drainages. An ecological survey of the area completed in 1987, concluded this area is a viable candidate for inclusion in the RNA system.

2. Wilder Ridge (chamise chaparral) - Located on the eastern edge of the Forest, this 570 acre area has a prevailing easterly aspect which is moderately steep with slopes of 30% to 50%, and incised by several steep draws and intermittent stream courses, which result in very broken topography. Dense stands of chamise occur on approximately 340 acres. An ecological survey of this area was completed in 1991.

3. Twin Rocks (foothill woodland) - This area lies on the south side of Twin Rocks Ridge and includes 393 acres, of which 290 acres are typed as mixed hardwood. The area includes several species of deciduous and evergreen oaks and other species associated with this type. Elevation ranges from 1,700 feet to 3,400 feet and slope ranges from 10% to 60%. The Black Butte River borders the south/southwest side. Based on the ecological survey completed in 1987, it has been determined that this area does not adequately represent the blue oak/gray pine foothill woodland community of the North Coast Range physiographic province, and has been dropped from further consideration as a Research Natural Area. No other satisfactory representatives of this community have been found on the Forest.

4. Devils Basin (black oak) - Devils Basin is on the north slope of Log Springs Ridge along Thomes Creek. The heart of the basin is a large flat on the toe of an old land failure and is surrounded on three sides by moderately steep slopes. Elevations range from 1,500 feet to 3,850 feet. The area contains a large stand of black oak (420 acres) with adjacent stands of oak-savannah, mixed hardwood, conifer-hardwood, and mixed shrub types for a total of 671 acres. An ecological survey completed in 1987 concluded this area is a viable RNA representing the black oak vegetative community.

5. Doll Basin (mixed conifer) - The area lies between Doll Ridge and Summit Ridge and contains five distinct drainages totaling approximately 995 acres. Vegetation ranges from Douglas-fir Ponderosa pine at the lower elevations to white fir Douglas-fir at the higher elevations. Sugar pine, incense cedar, and

black oak are secondary species found through much of the area. An ecological survey completed in 1986 concluded this area is a very good representation of the North Coast Range mixed conifer type.

Additional inventories will be necessary to determine if there are opportunities for representation of additional targeted botanical elements for the physiographic province. Development of the aquatic and geologic elements of the Research Natural Area System has been deferred under the Regional Guide for the Pacific Southwest Region. No inventory for candidate aquatic or geologic elements of the RNA system have been conducted for the Mendocino National Forest.

RIPARIAN AREAS

Riparian areas include lands adjacent to perennial and intermittent streams and other bodies of water, wetlands, and floodplains. These areas support a variety of plant communities and habitat for many aquatic and terrestrial animals. The riparian areas serve to help protect water quality by filtering run-off, maintaining channel stability, and providing shade to maintain water temperatures. These areas also contribute to the visual variety of the landscape and biodiversity of the forest; they provide water oriented recreational opportunities and forage, cover, and dispersal habitat for both wildlife and livestock; and they contain valuable timber resources.

Typical riparian vegetation normally associated with these moist sites is often lacking along the major stream courses such as the Middle Fork of the Eel River. This condition is due, at least in part, to the scouring effect of high peak flows during periods of flooding such as those which occurred during 1964 and during the high flows of the early 1970's. Where the typical riparian vegetation does occur, it is most often found in narrow bands or patches along stream courses, with alder and maple being the major species.

Wetlands include swamps, marshes, bogs, wet meadows, and natural ponds. There are some larger wet meadows like Kingsley Glade, bogs like Lower Letts Valley, and ponds like Alder Creek Pond and numerous landslide slump ponds that meet the wetland definition.

While most of the true floodplains are outside the Forest boundary, there are minor amounts within the Forest. Flooding occurs along steep narrow mountain canyons of the Middle Fork of the Eel River, Black Butte River, Grindstone Creek, and Thomes Creek. The Middle Creek Campground, Bear Creek Campground, and Road 20N01 across Gravelly Valley are all built on floodplains. Although the flood of 1964 approached these facilities, they remained above the high water mark.

Protection and management of riparian areas on the Forest is a significant public and resource management issue. The major areas of conflict in management of these areas has focused on timber harvest, road construction, livestock grazing, and, to a lesser extent, certain forms of recreation, primarily OHV use.

Current management within riparian areas emphasizes the prevention and improvement of increases in water temperature, sedimentation, or channel blockages and protection of the plants and animals dependent on these areas. This is accomplished through the implementation of improvement projects, approved Best Management Practices, and on-site examination of conditions within proposed project areas to identify appropriate mitigation measures. These areas receive further protection through Streamside Management Zones, Riparian Reserves, Riparian Management Zones, Minimum Management Requirements, and/or Forest-wide standards and guides.

RESEARCH NATURAL AREAS

The following discussion focuses on those major ecosystems needed to complete the Mendocino National Forest portion of the botanical element of the Research Natural Area network for the North Coast Range physiographic province.

Inventories to identify potential RNAs for the aquatic and geologic elements of the Research Natural Area network will be completed during implementation of the Forest Plan.

Assumptions Important to this Discussion Are:

- The existing Frenzel Creek RNA will continue to be managed as a RNA under all alternatives.

Activities Having a Major Effect on Research Natural Area Objectives Are:

- **Designation or Non-Designation**

  An objective of the RNA System is to include in the RNA System suitable representation of each of the targeted elements for each physiographic province. Each of the areas considered here have been selected from a number of potential areas as being the best representative of the particular element. Thus, designation or non-designation becomes the most significant action in accomplishment of the RNA System objectives.

- **Wildfire**

  Although wildfire may be considered a natural part of the ecology of certain vegetative communities, uncontrolled fire also has the potential to consume the values which led to an area being reserved through RNA classification. The potential risk of loss of RNA values is considered to be proportional to the total acreage lost to wildfire within the Forest.

PREFERRED, CURRENT, RPA, AND AMENITY EMPHASIS ALTERNATIVES

These alternatives designate four RNAs which include representation of the knobcone pine, chamise chaparral, black oak, and mixed conifer ecosystems. Additional inventories to identify representatives of the remaining botanical elements, as well as representation of the aquatic and geologic elements of the Research Natural Area System, are provided for under each of these alternatives.

Forest-wide losses from wildfire are expected to average about 2,027 acres per year under these alternatives.

No additional RNAs are designated under this alternative. As these areas are managed for other purposes, their value for scientific study, education, and research will be reduced or lost. No additional inventories to identify potential areas would be undertaken under either of these alternatives.

CITIZENS FOREST PLAN

This alternative designates four RNAs which include representation of the knobcone pine, chamise chaparral, black oak, and mixed conifer ecosystems. Additional inventories to identify representatives of the remaining botanical elements, as well as representation of the aquatic and geologic elements of the Research Natural Area System, are provided for under this alternative. With the exception of potential loss from wildfire, the risk of disturbance resulting from management activity or other uses would be less than under the other alternatives.

Forest-wide, wildfire is expected to burn an average of about 2,814 acres per year.

RIPARIAN AREAS

This assessment of the environmental consequences is based on the extent and intensity of management activities occurring within riparian areas, as defined below, under each alternative.

Assumptions Important to this Discussion Are:

- Riparian areas are defined as geographically delineated areas, with distinctive resource values and characteristics. They are comprised of the aquatic and riparian ecosystems, floodplains, and wetlands. The protection buffer widths and activities permitted or restricted within the buffers vary by alternative.
- All Management Indicator Species (MIS) may depend upon riparian areas.
- Riparian areas provide habitat elements such as snags, downed logs, hardwood tree species, herbaceous forage, and vegetative diversity important to numerous wildlife and fish species.
- Riparian areas provide important travel corridors for many vertebrate species.
- The diverse vegetation and large down logs often found within riparian areas provide important sources of cover and food, and they moderate high summer water temperatures for resident fish.
- Riparian vegetation acts as a buffer limiting sediment inflow to streams.
- Timber management activities within riparian zones generally reduce the overall quality of riparian habitat for wildlife.

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The most direct influence on the area has been the construction of Road 24N02 on the western boundary of the area. Increased runoff in the stream channels has increased down-cutting somewhat and may have accelerated some slides along the streambanks. The overall direct impact is slight, but is definitely greater than natural conditions.

All but 24 acres within the area have tentatively been classified as suitable for timber management. However, helicopter or long-span skyline systems will be required to harvest a large portion of the area due to the rugged topography and the geologically sensitive nature of the area.

Prehistoric archaeological sites are recorded at both Irish and Minnie Glades. Both sites are considered significant and potentially eligible to the National Register of Historic Places. The significance of the sites is enhanced by recent pollen-correlation studies which, in conjunction with archaeological research, associate human activity at the sites directly to changes in the paleoenvironment over the last 8,700 years.

The lower portions of the area are included in a portion of a Spotted Owl Management Area (SOMA). The nest area is just downstream from the easternmost portion of the area. This SOMA is not a part of the minimum spotted owl network for the Forest, but is included in the network for the proposed Plan.

Soils within the area are classified as sheetiron gravelly loam, with an average depth of 16 to 36 inches to a highly fractured bedrock material of metasediments (predominantly mica schist). The erosion hazard is moderate to high (on the steeper slopes), and the highly fractured nature of the parent material has given rise to the numerous drainages and unstable streambanks.

This area is a very good RNA area representing the mixed conifer type. The area is large enough to remain essentially unmodified even with the limited grazing within the area. There are broad range of elevational and aspect types and hence, vegetative types. Accessibility to the area is very good, but is limited by winter road conditions. There are no existing physical improvements and no past human disturbance.

HALE RIDGE RNA

This Research Natural Area consists of approximately 975 acres within T.17 N., R.8 W., Sections 30, 31, and 32, T.17 N, R.9 W., Section 36, and T.16 N., R.8 W., Sections 5 and 6. The area is proposed to represent the knobcone pine cover type (SAF Type 248), within the North Coast Region physiographic province. An ecological survey was completed in 1987.

This area was found to be excellent in terms of meeting the qualitative description given for knobcone pine (SAF type 248). In addition to a dense stand of 52 year old knobcone, the area also allows for observation of transitional zones between knobcone and brush, and knobcone and commercial conifers on three different soil types. The area also allows for studies of knobcone on all aspects and ability to isolate small stands to study subwatersheds, effects of prescribed fire and different knobcone stocking densities and ages.

The size and geography of the area was also found to be very favorable as numerous sub watersheds can be isolated for study and comparison.

The area contains dense stands of knobcone pine typical of the target element (SAF Type 248), but also includes a number of the transitional types associated with the knobcone type. A transitional zone between knobcone and chamise chaparral, grading from pure knobcone through mixtures with chamise, manzanita, mixed hardwoods, and ceanothus spp. to pure chaparral occurs on the west and south slopes, representing both elevational and aspect transitions. On the north slopes another transitional zone between pure knobcone and mixed conifer, predominately Douglas-fir, occurs.

The acreage by major vegetation type within the area is as follows:

Knobcone	365 Ac
Mixed Conifer	324 Ac
Conifer Hardwood	28 Ac
Hardwood	33 Ac
Mixed Brush	225 Ac
	975 Ac

The stand of pure, dense knobcone is located primarily on a northwest facing ridgetop, providing north, west, and south exposures. This area last burned as part of a fire in 1932, resulting in the dominance of this dense, even-aged stand approximately 52 years old. The knobcone of poorer stocking with chamise understory in some areas represents older remnants that were not burned in the 1932 fire. No other wildfires are known to have occurred within the area since 1911.

The area occupies an entire watershed bounded on one side by the Rice Fork of the Eel River and a fork of Salt Creek on the other. The area is dissected into numerous small finger ridges and sub watersheds with all aspects represented. Elevation ranges from 2,400 feet to 3,600 feet. Slopes range from 5-10% on top of the gentle ridgetop to more than 60% in some of the side drainages.

Soil series represented within the area include the Boomer-Hoda-Speaker, which includes the dense conifer and knobcone stands. Other soils include the Maymen-Etsel-Speaker association (476) and Speaker-Maymen-Marpa association (429). Maymen and Etsel soils are very shallow and have low waterholding capacity, supporting stands of chamise and mixed brush. The Speaker and Marpa soils are deeper and have adequate waterholding capacity to support some timber, knobcone, or hardwoods.

The mixed conifer stand on the northern aspect provides foraging habitat for spotted owl and is within a Spotted Owl Management Area. Although no wildlife surveys have been conducted in the area, use is believed typical of that associated with the mixed conifer and chaparral types. Little wildlife use, except wood rats, is likely within the dense stands of knobcone.

A tract of private property lies adjacent to the northwestern boundary of the area. The exact boundaries of this property is uncertain due to the lack of monumented corners from which to run an accurate survey. The property is held in undivided shares by a large number of owners and its use and existence is noteworthy only because of the presence of Crabtree Hot Springs, which is frequented, particularly in the summer, by hot springs bathing enthusiasts. This use constitutes a small but unknown risk of a man-caused fire which under the proper conditions might cross the Rice Fork and affect this area. Use of the Rice Fork by other recreationists also poses the same risk.

Prescribed burning has taken place within and adjacent to the area, and across the Rice Fork. Spring burning in adjacent areas could continue for fuel reduction and wildlife enhancement, with no effect upon this area.

Due to the existence of Crabtree Hot Springs, potential exists for geothermal resources and interest in exploration both within the proposed RNA and in adjacent areas has been expressed. Currently a lease application for geothermal exploration has been made for T.17 N., R.8 W., Sections 31 and 32. Such exploration, if undertaken poses little threat to the area as drilling pads could be located on adjacent lands and with directional drilling, site occupancy would not be required.

The area can be reached from Willows via Forest roads in approximately three hours, requiring a light duty 4x4 for the last three to four miles. From Upper Lake it requires about 1 1/4 hours to reach the lower part of the area at the Rice Fork Crossing. This crossing is difficult during periods of heavy winter or spring rains. Approximately 1/2 to 1 hour of hiking from the bottom of the creek up a steep tractor trail would provide access to the heavy knobcone stand on top of the ridge. Alternatively, from Upper Lake,

one could drive around to the top in 2 1/2 to 3 hours, with the same access as from Willows, again requiring a 4x4 for the last three to four miles.

Thus the area provides a good blend of remoteness and accessibility. Most people coming out to the area are headed for the Rice Fork or Crabtree Hot Springs. The only recreational use of the area is by motorcyclists using the tractor trail providing through access from Upper Lake to Stonyford or by 4x4 use of the upper part of the tractor trail within the knobcone stand. In either case, due to the density of the knobcone stand along the trail, OHV use is restricted to the trail by people "just passing through", with little effect upon the area adjacent to the trail.

The tractor trail, mentioned above, is the only physical improvement within the area. The trail will continue to be used as a through route by motorcycles unless specific actions are undertaken to curtail use. The trail is a potential candidate for Green Sticker funds to locate an OHV route from Davis Flat to Upper Lake.

Inclusion of this area, in the Research Natural Area System, would result in the loss of timber management opportunities on approximately 274 acres of otherwise suitable timberlands and the opportunity to consider this area for the sale of knobcone or biomass production. Also, if prescribed burning is not part of the management plan, a small amount of chaparral and wildlife habitat improvements would be lost.

WILDER RIDGE RNA

The Wilder Ridge Research Natural Area contains approximately 570 acres and is located in Section 26, T.23 N., R.7 W. The prevailing easterly aspect is moderately steep with slopes ranging from 30% to 50%. The area is incised by several steep draws and intermittent streamcourses which result in very a broken relief. Elevations range from 1,854 feet at the top of Wilder Ridge to 1,000 feet at the eastern edge of the section. There are several knobs in the interior of the area which range from 1,200 feet to just over 1,500 feet. An ecological survey was completed in 1991.

This area was originally considered as a representative for two vegetation types, chamise and foothill woodland; the area encompasses almost a full section with the western end in pure chamise (400 acres) and the eastern edge (approximately 85 acres) with scattered Blue Oak (*Quercus douglasii*). However, upon evaluation this area did not meet the foothill woodland type as well as another candidate area.

The area contains pure chamise on the upper third of the slope and on all but the northern aspects of draws. These "cooler" aspects contain a mixed brush type, i.e., manzanita, toyon, bay, scrub oak, and some live oak. The middle third of the area is predominantly chamise with small groups of young gray pine and some old growth gray pine jutting through the brush. There are some small openings of annual grass occurring in this zone with several varieties of small herbaceous and woody plants on the northerly aspects. The eastern edge of the area is more of a grass or savannah type. Ground cover is predominantly annual grasses with a sparse Blue oak overstory (just under 20% crown closure).

The soils in this area are shallow to very shallow and are classified as Lithosols. This class is typically found in the foothills of western Tehama County. The soil series is Millsholm rocky-sandy loam on the ridge top to a Millsholm clay loam in the middle third of the section with the eastern portion falling into a Lodo-Maymen Shaly-loam.

Wildlife use of the area is believed to be typical of that found throughout the foothill chaparral types.

The area is easily reached via the Round Valley road that leads to within a 15 minute walk of the southwest corner. This is an all weather county road which provides access to the south half of the Corning District.

APPENDIX D

Mineral Potential Report for the proposed Hale Ridge RNA.

United States Department of Agriculture | Forest Service | Mendocino National Forest | 420 E. Laurel Street Willows, CA 95988 916 934-3316

Reply To: 4060 Research Natural Areas Date: November 2, 1992

Subject: Mineral Potential of the Proposed Hale Ridge RNA

To: Pacific Southwest Forest and Range Experiement Station
Attn: Ann Dennis

Enclosed is a copy of the Mineral Potential Report for lands proposed for mineral withdrawal in the Hale Ridge candidate Research Natural Area, Mendocino National Forest. This copy is being sent at the request of Rich Teixeira, Geologist on the North Zone Minerals Management Team.

Dick English

JAMES R. ENGLISH
Land Management Planning Staff

Enclosure

UNITED STATES
DEPARTMENT OF AGRICULTURE
FOREST SERVICE

MINERAL POTENTIAL REPORT FOR LANDS PROPOSED FOR MINERAL WITHDRAWAL IN THE HALE RIDGE RESEARCH NATURAL AREA, MENDOCINO NATIONAL FOREST LAKE COUNTY, CALIFORNIA

LANDS INVOLVED

T. 16 N., R. 8 W., MDM,
Sections 5 & 6 - portions;

T. 17 N., R. 8 W., MDM,
Sections 30 - 32 - portions;

T. 17 N., R. 9 W., MDM,
Section 36 - portion;

containing approximately 1000 acres.

Prepared By:

Richard W. Teixeira

Richard W. Teixeira
Geologist
North Zone Minerals Management
September 15, 1992

RICHARD WAYNE TEIXEIRA No. 013 USDA FOREST SERVICE CERTIFIED MINERAL EXAMINER

Technical Review:

North Zone Minerals

10/13/92
Date

Management Review:

Forest Supervisor

10/29/92
Date

Bureau of Land Management

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INTRODUCTION

This report presents the results of an investigation to determine the potential for the occurrence and development of mineral resources within the lands proposed for inclusion in the Hale Ridge Research Natural Area (RNA) and to identify any minerals-related issues which may be a factor in deciding whether to designate the area as an RNA. The Land and Resource Management Plan (LRMP) for the Mendocino National Forest proposes to withdraw the subject lands from location and mineral entry under the General Mining Laws in support of the lands being proposed as a Research Natural Area. In addition, potential surface disturbing activities associated with leasable or salable minerals would not be allowed in a designated RNA.

Opinions and conclusions in this report are based upon a field exam of the subject lands and a review of available literature. I conducted a field exam of the subject land on September 9, 1992 and was not accompanied by anyone. This report should not be used for purposes other than that for which it was prepared.

CONCLUSIONS

The lands within the proposed Hale Ridge RNA have a low to moderate potential for hosting a valuable deposit for geothermal resources, and a low potential for the occurrence of any other locatable, leasable or salable mineral resources. There are no mining claims or mineral leases or lease applications within the RNA. Based on the low to moderate mineral potential, the lack of mining related activity, and a field exam of the lands, it does not appear that the proposed RNA designation would present any adverse impacts on the mineral resource.

LANDS INVOLVED

The land proposed for inclusion within the Hale Ridge RNA consist of:

Lake County, California,

T. 16 N., R. 8 W., MDM,
Sections 5 & 6 - portions;

T. 17 N., R. 8 W., MDM,
Sections 30 - 32 - portions;

T. 17 N., R. 9 W., MDM,
Section 36 - portion,

containing approximately 1000 acres.

The subject lands are located in the Coast Range mountains in Lake County, approximately 10 air miles northeast of the community of Upper Lake (MAP 1). The lands lie immediately east of Forest Route 17N04. The proposed RNA is a portion

of Hale Ridge bounded on the north by Salt Creek and an unnamed ephemeral stream and is bounded on the south by Rice Fork. Forest Route 17N04, a 2WD unsurfaced road provides access to the southwest edge of the parcel. A fireline can be utilized as a foot trail to provide foot access to the interior of the parcel. The south slope and most of the north slope of Hale Ridge was burned by fires in 1987 and is covered by shrubs and dead trees. The unburned portion of the north slope is covered by a pine and oak woodland.

STATUS RECORD DATA

The lands within the proposed RNA are reserved public domain which were withdrawn for inclusion in the Mendocino National Forest by Presidential Proclamation on February 6, 1907, with the exception of Section 36. The lands within Section 36 were clearlisted by the State of California on February 28, 1917 under authority of the State Clearlist Act of March 3, 1853.

Public Law 167 determinations were completed on June 5, 1964 and serialized as S-064221. All surface management is by the U.S. Forest Service.

Mining Claims: The most recent Bureau of Land Management mining claim records dated May 8, 1992 show no mining claims within or adjacent to the proposed RNA.

Mineral Leases: There are no mineral leases or lease applications on or adjacent to the proposed RNA.

Prospectively Valuable Classification: The proposed RNA has been classified by the Bureau of Land Management as being "prospectively valuable" for geothermal resources (U.S. Bureau of Land Management, 1985). The subject lands lie within an area which has been classified by the California Division of Mines and Geology as favorable for the discovery at shallow depth of thermal water of sufficient temperature for direct heat applications (Majmundar, 1984). It should be noted that this is a provincial classification and does not consider site specific characteristics such as local bedrock geology and structure or distance to potential markets.

GEOLOGY

The subject land lies in the central portion of the Franciscan Assemblage of the Coast Range Geologic Province. The Franciscan assemblage is generally composed of graywacke and metagraywacke units separated by zones of melange. The Franciscan assemblage has been divided into three subparallel belts or terranes separated by eastward dipping thrust faults. The parcel lies in the Central Terrane composed of a series of melanges containing subterrane size blocks of metagraywacke. Other rock types within the blocks include metachert, greenstone and serpentinite. Isolated blocks of blueschist and eclogite occur in a matrix of sheared and quartz veined mudstone and sandstone (Diggles and others, 1990).

Bedrock underlying the portion of Hale Ridge within the proposed RNA consists of interbedded metagraywacke, sandstone and shale of the Franciscan

Assemblage. Minor silicification occurs within joint surfaces on knobs within the western portion of the parcel. There was no evidence of additional mineralization or alteration in the vicinity of the silicified areas or elsewhere in the parcel.

MINERALIZATION

Historically, the most important mineral commodities in the Coast Ranges have been mercury, manganese and geothermal resources with lessor chromite, copper, silver and gold (Diggles and others, 1990). Currently gold and geothermal resources are the only significant commodities. Manganese occurs primarily in chert in the Central terrane. Chromite has come entirely from ultramafic rocks and was only produced during the two World Wars and the Korean War with government subsidies. Copper, gold and silver occur in massive sulfide deposits in metavolcanic rocks, in base metal-rich quartz veins in various rock types and as disseminations and quartz veins in serpentine and Tertiary volcanic rocks. Mercury occurs in silica-carbonate rocks, an alteration product of serpentine which probably represent the tops of ancient hot springs. The McLaughlin gold mine was originally a mercury mine.

Plate 1 of Diggles and others (1990) identifies the subject lands as lying within terranes permissive for the occurrence of massive sulfide deposits, low sulfide gold-quartz deposits and Franciscan-type manganese-chert deposits. They did not identify any known occurrences or deposits of any mineral commodities in or within 5 miles of the subject lands (Plates 7, 10 and 11 of Diggles and others). The northwest trending linear ultramafic unit immediately west of the subject lands was identified as having moderate potential for chromite based on geologically favorable rocks, although there are few known deposits (Plate 12 of Diggles and others). The subject lands were not identified as having any potential for hosting gold or copper deposits (Plates 13 & 14 of Diggles and others).

The metagraywacke, sandstone and shale underlying the proposed RNA is not a typical host rock for massive sulfide deposits nor is there any evidence of massive sulfide mineralization. There are no significant quartz veins visible on the parcel which would host precious or base metals. Chert, a possible host for manganese, does not crop out in the RNA.

Geothermal resources in the Coast Range province are associated with Quaternary volcanism or thermal springs. Although there are no Quaternary volcanics in the vicinity of the subject lands, Crabtree Hot Springs is approximately 1/4 mile west of the lands in Rice Fork. Crabtree Hot Springs is a thermal spring with a surface temperature of 41°C and a flow of 76 liters per minute although the springs were dry at the time of the field exam. Sodium bicarbonate is the primary chemical constituent (Majmundar, 1984). The spring occurs along a northwest striking, southwest dipping fault, which extends generally from Lake Pillsbury in the north to Pine Mountain in the south, west of the proposed RNA (McNitt, 1968). Another unnamed thermal spring approximately five miles south of the parcel occurs along the same fault trend. There are no surface indications of a geothermal resource in the proposed RNA.

MINING HISTORY

No areas of past mineral exploration or production in or adjacent to the subject lands were identified in the U.S. Bureau of Mines MILS data (U.S. Bureau of Mines, 1979) or in the U.S. Geological Survey MRDS data base (Diggles and others, 1990). I observed no evidence of past prospecting, exploration or mining related activity on the parcel during the field exam.

There is one unnamed mineral location for mercury in section 25 about one mile to the northwest (Jenkins, 1939). The location represents one or more mining claims for quicksilver with no record of production.

The most recent Bureau of Land Management mining claim records dated May 8, 1992 show no mining claims in or within five miles of the subject lands.

There are no geothermal leases or lease applications and there has been no known exploration for geothermal resources in the proposed RNA.

MINERAL POTENTIAL

Locatable Minerals: The subject land is not known to contain locatable minerals of more than nominal value. The potential for their occurrence is low, based on the geologic setting, lack of historic mining in the area, and lack of current mining related activities in the area.

Leasable Minerals: The subject lands have been classified as being "prospectively valuable" for geothermal resources. There are no leases or lease applications on or adjacent to the subject lands. Crabtree Hot Springs lies approximately 1/4 mile to the west although there does not appear to be any structural features connecting the hot spring with the subject lands. Distance to markets and access would limit development opportunities. It is my opinion that the subject land has a low to moderate potential for hosting geothermal resources and a low potential for hosting any other energy or nonenergy leasable mineral deposit.

Salable Minerals: The subject land is not known to host salable mineral deposits of more that nominal value. There is no known past or present production from the subject lands. It is my opinion that the subject land has a low potential for the occurrence of economic deposits of salable mineral commodities.

Critical and Strategic Minerals: The subject land is not known to contain any critical or strategic minerals, and the potential for their occurrence is low.

REFERENCES

Diggles, M.F., Silberman, M.L., Kilburn, J.E., Ashley, R.P., Bagby, W.C., Berquist, J.R., Cox, D.P., Evarts, R.C., Hassemer, J.R., Huber, D.F., Sudington, S., Mangan, D.L., Peterson, J.A., Plouff, D., Rinehart, C.D., Singer, D.A., and Smith, J.G., 1990, Terranes Permissive for Undiscovered

Mineral Resources within the Range of the Northern Spotted Owl, Northwestern California, Western Oregon, and Western Washington: U.S. Geological Survey Administrative Report, 41 pp., 22 pl.

Jenkins, Olaf P., 1939, Quicksilver Properties: California Division of Mines and Geology Economic Mineral Map of California No. 1-Quicksilver, scale 1:1,000,000.

Majmundar, Hasmukhrai H., 1984, Technical Map of the Geothermal Resources of California: California Division of Mines and Geology Geologic Data Map No. 5, scale 1:750,000.

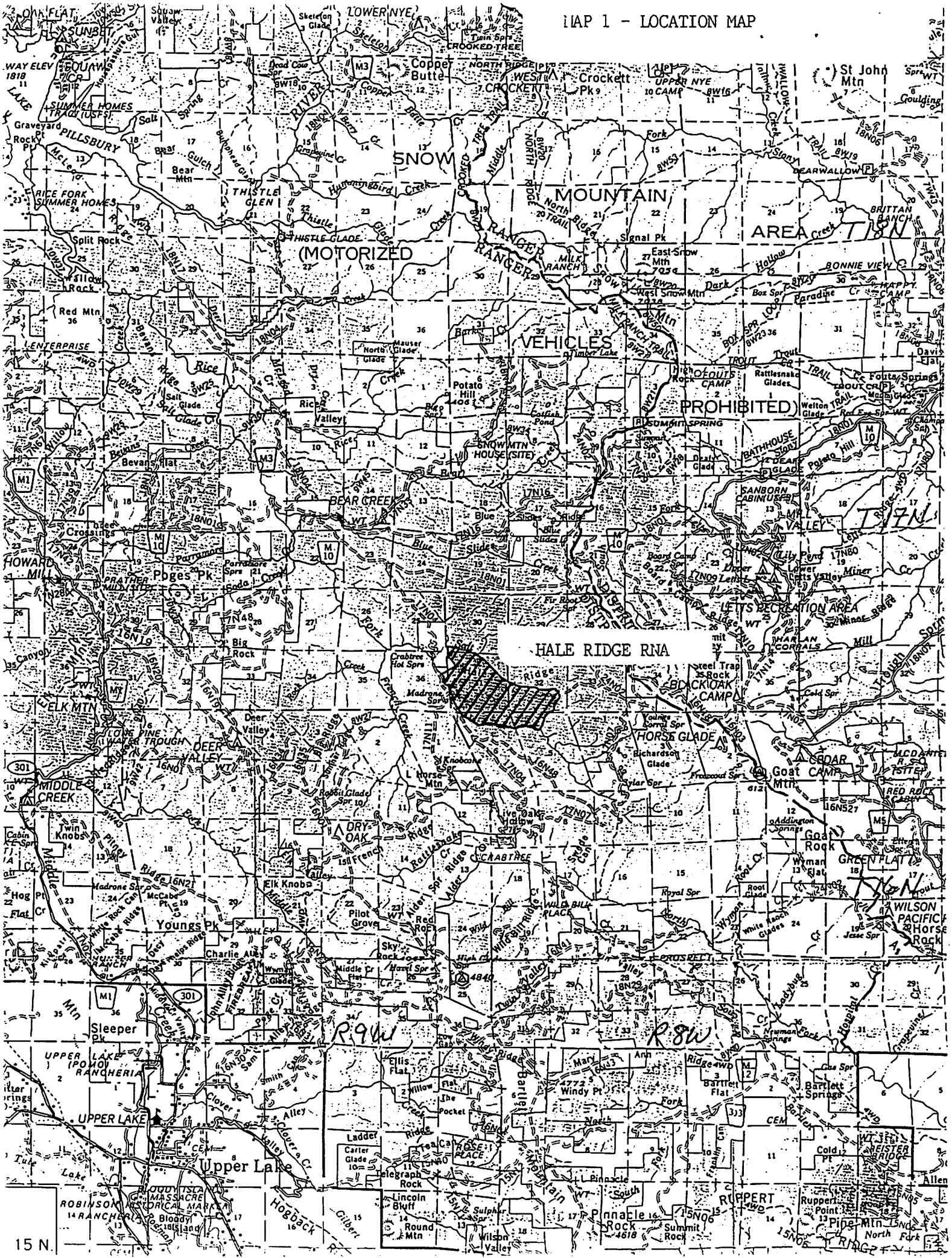
McNitt, James R., Geology of the Lakeport Quadrangle, Lake County, California: California Division of Mines and Geology Map Sheet 10, scale 1:62,500.

U.S. Bureau of Land Management, 1985, Prospectively Valuable Maps, scale 1:500,000.

U.S. Bureau of Land Management, 1992, Geographic Index of Mining Claim Locations, California.

U.S. Bureau of Mines, 1979, Mineral Industry Location System (MILS), Ukiah Sheet, scale 1:250,000.

MAP 1 - LOCATION MAP



LEGEND

KJf - Jurassic-Cretaceous Franciscan formation

ub - Mesozoic ultramafic rocks

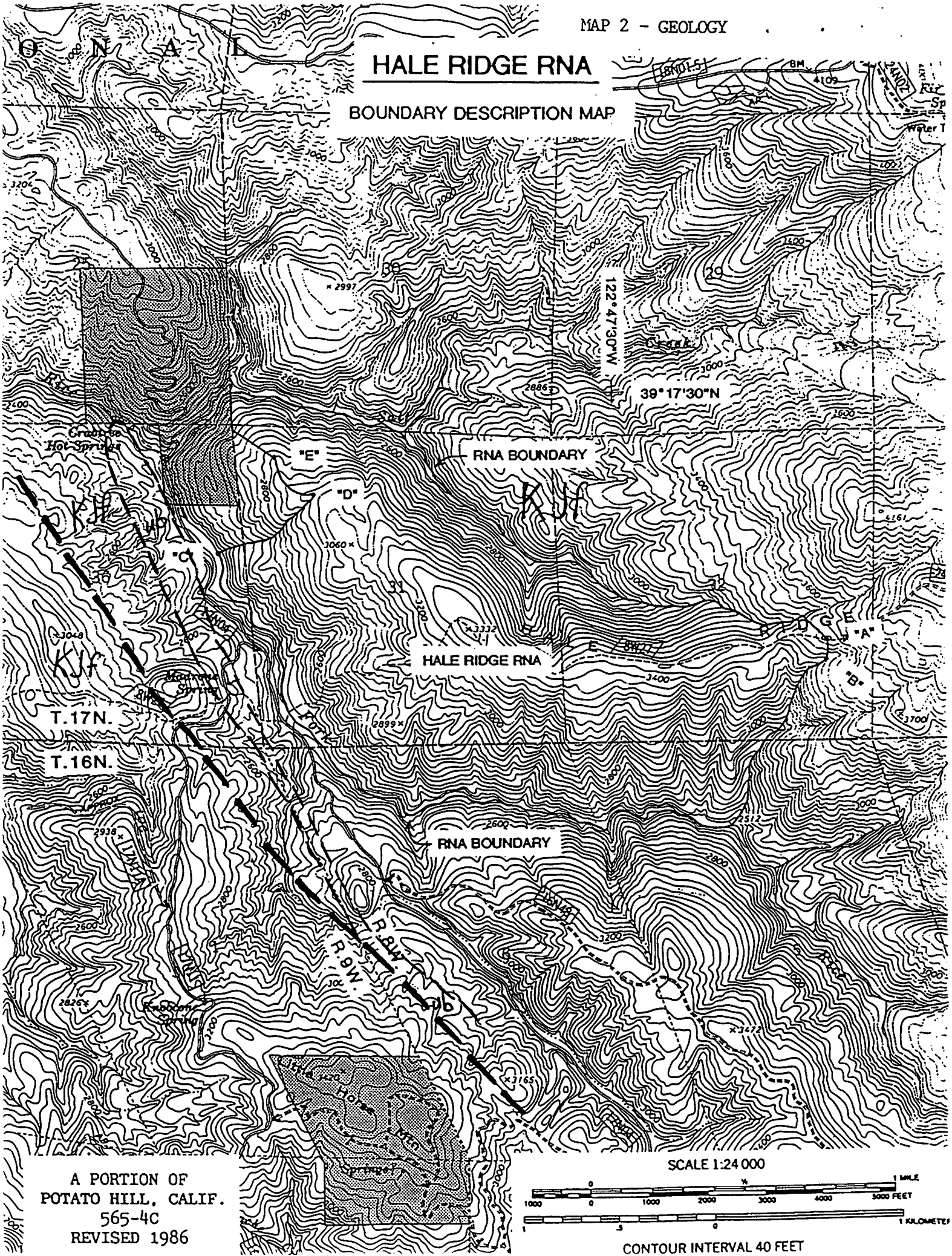
Fault

Geology from Jennings and Strand, 1960

MAP 2 - GEOLOGY

HALE RIDGE RNA

BOUNDARY DESCRIPTION MAP



A PORTION OF
POTATO HILL, CALIF.
565-4C
REVISED 1986

SCALE 1:24 000

1 MILE
5000 FEET
1 KILOMETER

CONTOUR INTERVAL 40 FEET

APPENDIX E

Soil descriptions from USDA Soil Conservation Service, Soil Survey of Lake County, California, 1989.

increase access, and reduce the risk of fire. Constructing firebreaks or ridgetops helps to prevent wildfire, which results in erosion. Where the Maymen soil is cleared for firebreaks, seeding grass reduces erosion. The Etsel soil will not support good stands of grass.

This map unit is in capability subclass VIIs (15), nonirrigated.

170—Maymen-Etsel-Speaker association, 30 to 50 percent slopes. This map unit is on mountains. The vegetation is mainly brush on the Maymen and Etsel soils and mixed conifers and hardwoods on the Speaker soil. Elevation is 2,000 to 4,000 feet. The average annual precipitation is 35 to 50 inches, the average annual air temperature is 52 to 56 degrees F, and the average frost-free period is 130 to 180 days.

This unit is about 35 percent Maymen gravelly loam, 30 percent Etsel very gravelly loam, and 20 percent Speaker gravelly loam. The Speaker soil is on north- and east-facing slopes, and the Maymen and Etsel soils are on ridgetops and on south- and west-facing slopes.

Included in this unit are small areas of Marpa, Neuns, and Sanhedrin soils and Rock outcrop. Rock outcrop is on ridgetops and in steep drainageways. Also included are small areas of soils that are at an elevation of more than 4,000 feet and soils that have slopes of 15 to 30 percent. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

The Maymen soil is shallow and somewhat excessively drained. It formed in material weathered from sandstone. Typically, the surface layer is light yellowish brown gravelly loam 4 inches thick. The subsoil is light yellowish brown gravelly loam 8 inches thick. Hard, fractured sandstone is at a depth of 12 inches.

Permeability of the Maymen soil is moderate. Available water capacity is 1 inch to 3 inches. Effective rooting depth is 12 to 20 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Etsel soil is shallow and somewhat excessively drained. It formed in material weathered from sandstone. Typically, the soil is very pale brown gravelly loam 3 inches thick over very pale brown gravelly loam 7 inches thick. Fractured sandstone is at a depth of 10 inches.

Permeability of the Etsel soil is moderate. Available water capacity is 0.5 inch to 1.5 inches. Effective rooting depth is 6 to 12 inches. Surface runoff is rapid, and the hazard of erosion is moderate.

The Speaker soil is moderately deep and well drained. It formed in material weathered from sandstone. Typically, the surface is covered with a mat of partially decomposed needles, leaves, and twigs 1 inch thick. The surface layer is brown gravelly loam 2 inches thick. The upper 6 inches of the subsoil is reddish yellow gravelly loam, and the lower 19 inches is reddish yellow clay loam. Soft sandstone is at a depth of 27 inches.

Permeability of the Speaker soil is moderately slow. Available water capacity is 2 to 6 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used mainly as wildlife habitat and watershed. It is also used for timber production.

The natural vegetation on the Maymen and Etsel soils is mainly brush. The species in most areas are mainly chamise, manzanita, and buckbrush. Properly planned and applied prescribed burning or chemical or mechanical treatment can be used in small areas to improve habitat for wildlife, increase access, and reduce the risk of fire.

Douglas-fir, ponderosa pine, and California black oak are the main tree species on the Speaker soil. Among the trees of limited extent are Pacific madrone and knobcone pine. Some areas are dominated by knobcone pine because of past fires. On the basis of a 100-year site curve, the mean site index is 107 for Douglas-fir and 106 for ponderosa pine. The potential annual production of ponderosa pine on the Speaker soil is 425 board feet per acre from a fully stocked stand of trees. Conifer stands commonly are small and widely scattered, making them generally noncommercial.

Some concerns for the harvesting of timber are steepness of slope and seasonal wetness. Use of wheeled and tracked equipment when the soil is moist produces ruts, compacts the soil, and can damage the roots of trees. Unless adequate plant cover or water bars are provided, steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying. Disturbance of the protective layer of duff can be reduced by careful use of either wheeled and tracked equipment or cable harvesting systems. Unsurfaced roads and skid trails are slippery when wet. They may be impassable during rainy periods. Rock for construction of roads generally is available on this unit. Establishing plant cover on steep cut and fill slopes reduces erosion.

Seedling survival is a concern in the production of timber. Reforestation can be accomplished by planting Douglas-fir and ponderosa pine seedlings on the Speaker soil. If seed trees are present, natural reforestation of cutover areas by Douglas-fir and ponderosa pine occurs periodically. The high soil temperature and low content of soil moisture during the growing season result in a high mortality rate for Douglas-fir, especially on the south- and southwest-facing slopes. Because of the high risk of fire on the surrounding brush-covered soils, firebreaks are needed to protect plantations on this unit.

Among the common forest understory plants on the Speaker soil are poison-oak, perennial fescue, and bedstraw.

The Maymen soil is in capability subclass VIIe (15), nonirrigated; the Etsel soil is in capability subclass VIIs (15), nonirrigated; and the Speaker soil is in capability subclass VIe (5), nonirrigated.

Riverwash is used mainly as wildlife habitat and as a source of sand and gravel. Because it is nearly devoid of vegetation, it is not used for agriculture.

The removal of aggregates can lower the level of the streambeds and widen stream channels. This can undermine structures, lower the water table adjacent to the stream channel, and erode streambanks, thereby increasing sedimentation downstream. Streambanks can be protected against water erosion by use of a suitable structure, riprap, or vegetation. Check dams or buried sills can be used to control the lowering of streambeds. Shallow recharge ponds can be located in areas of adjacent soils to minimize the effects of a lowering ground water table.

This map unit is in capability class VIII (14), nonirrigated.

200—Rock outcrop-Etsel-Snook complex, 50 to 80 percent slopes. This map unit is on hills and mountains. The vegetation is mainly brush and sparse annual grasses. Elevation is 1,400 to 4,000 feet. The average annual precipitation is 30 to 50 inches, the average annual air temperature is 56 to 57 degrees F, and the average frost-free period is 135 to 190 days.

This unit is about 60 percent Rock outcrop, 15 percent Etsel gravelly loam, and 15 percent Snook loam. Areas of the Snook soil at elevations of more than 3,500 feet are on south-facing slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Mayacama, Maymen, and Neuns soils. Also included are small areas of Etsel soils that have slopes of less than 50 percent or are neutral in reaction and small areas of soils that are at an elevation of more than 4,000 feet. Included areas make up about 10 percent of the total acreage. The percentage varies from one area to another.

Rock outcrop consists of exposed areas of hard, unweathered sandstone. It occurs on ridgetops and side slopes as intruding bedrock or as detached masses of rock. Outcroppings are 100 feet in diameter to 5 acres in diameter.

The Etsel soil is shallow and somewhat excessively drained. It formed in material weathered from sandstone. Typically, the soil is light yellowish brown gravelly loam 3 inches thick over light yellowish brown very gravelly loam 5 inches thick. Sandstone is at a depth of 8 inches.

Permeability of the Etsel soil is moderate. Available water capacity is 0.5 inch to 1.5 inches. Effective rooting depth is 6 to 12 inches. Surface runoff is very rapid, and the hazard of erosion is severe.

The Snook soil is shallow and somewhat excessively drained. It formed in material weathered from sandstone or shale. Typically, the soil is light yellowish brown loam 5 inches thick. Fractured sandstone is at a depth of 5 inches.

Permeability of the Snook soil is moderate. Available water capacity is 0.5 to 1.0 inch. Effective rooting depth is 4 to 10 inches. Surface runoff is very rapid, and the hazard of erosion is severe.

This unit is used mainly as wildlife habitat and watershed.

The natural vegetation on this unit is mainly brush. Because of the instability of the Etsel soil, vegetation should be retained for erosion control and to provide wildlife habitat.

This map unit is in capability subclass VIIs (15), nonirrigated.

201—Sanhedrin-Kekawaka-Speaker complex, 15 to 30 percent slopes. This map unit is on mountains. The vegetation is mainly mixed conifers and hardwoods. Elevation is 2,200 to 4,800 feet. The average annual precipitation is 40 to 60 inches, the average annual air temperature is 49 to 55 degrees F, and the average frost-free period is 120 to 180 days.

This unit is about 35 percent Sanhedrin gravelly loam, 30 percent Kekawaka loam, and 15 percent Speaker gravelly loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Bamtush and Marpa soils and small areas of Kekawaka, Sanhedrin, and Speaker soils that have slopes of more than 30 percent. Also included, on Long Ridge in the Mendocino National Forest, are areas of Sanhedrin and Kekawaka soils that are severely eroded; small areas of soils that are similar to the Sanhedrin soil but are more than 60 inches deep; and small areas of soils that are similar to the Speaker soil but have a clay subsoil. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

The Sanhedrin soil is deep and well drained. It formed in material weathered from sandstone. Typically, the surface is covered with a mat of partially decomposed needles, leaves, twigs, and bark 2 inches thick. The upper part of the surface layer is brown gravelly loam 4 inches thick, and the lower part is pale brown gravelly loam 4 inches thick. The upper 33 inches of the subsoil is light yellowish brown and reddish yellow gravelly loam, and the lower 16 inches is reddish yellow gravelly clay loam. Sandstone is at a depth of 57 inches.

Permeability of the Sanhedrin soil is moderately slow. Available water capacity is 4 to 8 inches. Effective rooting depth is 40 to 60 inches. Surface runoff is rapid, and the hazard of erosion is moderate.

The Kekawaka soil is very deep and well drained. It formed in material weathered from sandstone and shale. Typically, the surface is covered with a mat of partially decomposed needles, leaves, bark, and twigs 3 inches thick. The surface layer is yellowish brown loam 2 inches thick over light yellowish brown loam 7 inches thick. The upper 19 inches of the subsoil is strong brown and

reddish yellow clay loam, the next 14 inches is reddish yellow and strong brown clay, and the lower 26 inches is reddish yellow gravelly clay.

Permeability of the Kekawaka soil is moderately slow. Available water capacity is 8 to 10 inches. Effective rooting depth is 60 inches or more. Surface runoff is rapid, and the hazard of erosion is severe.

The Speaker soil is moderately deep and well drained. It formed in material weathered from sandstone. Typically, the surface is covered with a mat of partially decomposed needles, leaves, and twigs 1 inch thick. The surface layer is brown gravelly loam 2 inches thick. The upper 6 inches of the subsoil is reddish yellow gravelly loam, and the lower 19 inches is reddish yellow clay loam. Soft sandstone is at a depth of 27 inches.

Permeability of the Speaker soil is moderately slow. Available water capacity is 2 to 6 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used mainly for timber production, wildlife habitat, and watershed.

Douglas-fir, sugar pine, ponderosa pine, California black oak, and Pacific madrone are the main tree species on this unit. On the basis of a 100-year site curve, the mean site index for Douglas-fir is 121 on the Sanhedrin soil, 154 on the Kekawaka soil, and 107 on the Speaker soil. On the basis of a 100-year site curve, the mean site index for ponderosa pine is 116 on the Sanhedrin soil, 147 on the Kekawaka soil, and 106 on the Speaker soil. The potential annual production of ponderosa pine on the Sanhedrin soil is 530 board feet per acre from a fully stocked stand of trees. The potential annual production of ponderosa pine on the Kekawaka soil is 945 board feet per acre from a fully stocked stand of trees. The potential annual production of ponderosa pine on the Speaker soil is 425 board feet per acre from a fully stocked stand of trees. In many areas, the Kekawaka soil has a rather abrupt boundary between the surface layer and the clay subsoil. In those areas, productivity is much lower; the average site index is 106 for Douglas-fir and 113 for ponderosa pine.

A concern for the harvesting of timber is seasonal wetness. Use of wheeled and tracked equipment when the soil is moist produces ruts, compacts the soil, and can damage the roots of trees. Disturbance of the protective layer of duff can be reduced by the careful use of wheeled and tracked equipment. Unsurfaced roads and skid trails are slippery when wet. They may be impassable during rainy periods. Roads are dusty when dry. If the road is to be used heavily, the surface should be treated. Rock for construction of roads is not readily available on this unit. Establishing plant cover on steep cut and fill slopes reduces erosion on this unit.

Plant competition is a concern in the reforestation and production of timber. When openings are made in the canopy, invading brushy plants that are not controlled can prevent the establishment of seedlings. Reforestation can be accomplished by planting Douglas-fir, ponderosa pine, and sugar pine seedlings. If seed trees are present, natural reforestation of cutover areas by conifers frequently occurs.

Among the common forest understory plants are bedstraw, rose, manzanita, and annual forbs.

This map unit is in capability unit IVe-1 (5), nonirrigated.

202—Sanhedrin-Kekawaka-Speaker complex, 30 to 50 percent slopes. This map unit is on mountains. The vegetation is mainly mixed conifers and hardwoods. Elevation is 2,200 to 4,800 feet. The average annual precipitation is 40 to 60 inches, the average annual air temperature is 49 to 55 degrees F, and the average frost-free period is 120 to 180 days.

This unit is about 35 percent Sanhedrin gravelly loam, 30 percent Kekawaka loam, and 15 percent Speaker gravelly loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Bamtush, Marpa, and Maymen soils. The Maymen soil is on some south-facing, brush-covered slopes. Also included are small areas of Kekawaka, Sanhedrin, and Speaker soils that have slopes of less than 30 percent; soils that are similar to the Speaker soil but have a clay subsoil; soils that are similar to the Sanhedrin soil but are 60 to 80 inches deep; and on Long Ridge in the Mendocino National Forest, Sanhedrin and Kekawaka soils that are severely eroded. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

The Sanhedrin soil is deep and well drained. It formed in material weathered from sandstone or shale. Typically, the surface is covered with a mat of partially decomposed needles, leaves, twigs, and bark 2 inches thick. The upper part of the surface layer is brown gravelly loam 4 inches thick, and the lower part is pale brown gravelly loam 4 inches thick. The upper 33 inches of the subsoil is light yellowish brown and reddish yellow gravelly loam, and the lower 16 inches is reddish yellow gravelly clay loam. Sandstone is at a depth of 57 inches.

Permeability of the Sanhedrin soil is moderately slow. Available water capacity is 4 to 8 inches. Effective rooting depth is 40 to 60 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Kekawaka soil is very deep and well drained. It formed in material weathered from sandstone or shale. Typically, the surface is covered with a mat of partially decomposed needles, leaves, twigs, and bark 2 inches thick. The surface layer is yellowish brown loam 2 inches thick over light yellowish brown loam 7 inches thick. The upper 19 inches of the subsoil is strong brown and reddish yellow clay loam, the next 14 inches is reddish yellow and strong brown clay, and the lower 26 inches is reddish yellow gravelly clay.

Permeability of the Kekawaka soil is moderately slow. Available water capacity is 8 to 10 inches. Effective rooting depth is 60 inches or more. Surface runoff is rapid, and the hazard of erosion is severe.

The Speaker soil is moderately deep and well drained. It formed in material weathered from sandstone. Typically, the surface is covered with a mat of partially decomposed conifer needles, leaves, twigs, and bark 1 inch thick. The surface layer is brown gravelly loam about 2 inches thick. The upper 6 inches of the subsoil is reddish yellow gravelly loam, and the lower 19 inches is reddish yellow clay loam. Soft sandstone is at a depth of 27 inches.

Permeability of the Speaker soil is moderately slow. Available water capacity is 2 to 6 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used mainly for timber production, wildlife habitat, and watershed.

Douglas-fir, ponderosa pine, sugar pine, California black oak, and Pacific madrone are the main tree species on this unit. On the basis of a 100-year site curve, the mean site index for Douglas-fir is 121 on the Sanhedrin soil, 154 on the Kekawaka soil, and 107 on the Speaker soil. On the basis of a 100-year site curve, the mean site index for ponderosa pine is 116 on the Sanhedrin soil, 147 on the Kekawaka soil, and 106 on the Speaker soil. The potential annual production of ponderosa pine on the Sanhedrin soil is 530 board feet per acre from a fully stocked stand of trees. The potential annual production of ponderosa pine on the Kekawaka soil is 945 board feet per acre from a fully stocked stand of trees. The potential annual production of ponderosa pine on the Speaker soil is 425 board feet per acre from a fully stocked stand of trees. In some areas, the Kekawaka soil has a rather abrupt boundary between the surface layer and the clay subsoil. In those areas, productivity is much lower; the average site index is 106 for Douglas-fir and 113 for ponderosa pine. Among the trees of limited extent are canyon live oak, Oregon white oak, and white fir.

Some concerns for the harvesting of timber are steepness of slope, the hazard of erosion, and seasonal wetness. The Kekawaka soil has a tendency to slump in some areas; however, this is not a consistent trait. It happens more frequently where there is an abrupt boundary between the surface layer and the clay subsoil. Use of wheeled and tracked equipment when the soil is moist produces ruts, compacts the soil, and can damage the tree roots. Unless adequate plant cover or water bars are provided, steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying. Disturbance of the protective layer of duff can be reduced by the careful use of either wheeled and tracked equipment or cable harvesting systems. Unsurfaced roads and skid trails are slippery when wet. They may be impassable during rainy periods. Roads on this unit are dusty when dry. If the road is to be used heavily, its surface should be treated. Rock for construction of roads is not readily available on this unit. Establishing plant cover on steep cut and fill slopes reduces erosion on this unit.

Plant competition is a concern in the reforestation and production of timber on this unit. When openings are made in the canopy, invading brushy plants that are not controlled can prevent the establishment of conifer seedlings. Reforestation can be accomplished by planting Douglas-fir, ponderosa pine, and sugar pine seedlings. If seed trees are present, natural reforestation of cutover areas by conifers frequently occurs.

Among the common forest understory plants are bedstraw, wild rose, manzanita, and annual forbs.

This map unit is in capability subclass VIe (5), nonirrigated.

203—San Joaquin Variant fine sandy loam, 0 to 5 percent slopes. This moderately deep, well drained soil is on alluvial plains and stream terraces. It formed in alluvium derived dominantly from volcanic rock. The vegetation in areas not cultivated is mainly annual grasses and forbs. Elevation is 1,300 to 1,500 feet. The average annual precipitation is 25 to 35 inches, the average annual air temperature is 55 to 59 degrees F, and the average frost-free period is 155 to 205 days.

Typically, the surface layer is light gray fine sandy loam 21 inches thick. The subsoil is light brownish gray clay loam 4 inches thick. The next layer is a silica-cemented hardpan 5 inches thick. The upper 21 inches of the substratum is pale brown sandy loam, and the lower part to a depth of 65 inches is pale brown fine sandy loam. In some areas the surface layer is loam or silty clay loam. Depth to the hardpan is 20 to 40 inches. The hardpan commonly is 3 to 8 inches thick.

Included in this unit are small areas of Wolfcreek soils. Also included are small areas of a yellower soil with hard, brittle calcium carbonate concretions that is saturated with water for long periods of time and small areas of soils that are similar to this San Joaquin Variant soil but are calcareous throughout. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Permeability of the San Joaquin Variant soil is very slow. Available water capacity is 2.5 to 4.5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is very slow, and the hazard of erosion is slight.

This unit is used mainly for hay and pasture and homesite development.

If this unit is used for hay and pasture, the main limitations are the hardpan, which restricts rooting depth, and restricted available water capacity. Ripping and shattering the hardpan increases the effective rooting depth. Frequent applications of irrigation water are needed because of the restricted available water capacity.

board feet per acre from a fully stocked stand of trees. The potential annual production of ponderosa pine on the Sanhedrin soil is 530 board feet per acre from a fully stocked stand of trees.

Some concerns for the harvesting of timber are steepness of slope, seasonal soil wetness, and the hazard of erosion. Use of wheeled and tracked equipment when the soil is moist produces ruts, compacts the soil, and can damage the roots of trees. Unless adequate plant cover or water bars are provided, steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying. Disturbance of the protective layer of duff can be reduced by the careful use of either wheeled and tracked equipment or cable harvesting systems. Unsurfaced roads and skid trails on the Speaker and Sanhedrin soils are slippery when wet. They may be impassable during rainy periods. Rock for construction of roads is not readily available on this unit. Establishing plant cover on steep cut and fill slopes reduces erosion on the Speaker and Sanhedrin soils. Revegetation of cut and fill slopes is difficult on the Marpa soil because of the high content of rock fragments and restricted available water capacity.

Seedling establishment is a concern in the production of timber. Reforestation can be accomplished by planting ponderosa pine seedlings on the Marpa soil and on south-facing aspects. Douglas-fir can be planted on the cooler, north-facing aspects and in most areas of the Sanhedrin soil. If seed trees are present, natural reforestation of cutover areas by ponderosa pine and Douglas-fir occurs periodically. When openings are made in the canopy, invading brushy plants that are not controlled can delay the establishment of seedlings.

Among the common forest understory plants are manzanita, snowberry, rose, and perennial grasses.

This map unit is in capability subclass VIe (5), nonirrigated.

225—Speaker-Maymen-Marpa association, 30 to 50 percent slopes. This map unit is on mountains. The vegetation is mainly conifers and hardwoods on the Speaker and Marpa soils and brush and hardwoods on the Maymen soil. Elevation is 1,500 to 4,000 feet. The average annual precipitation is about 35 to 50 inches, the average annual air temperature is 52 to 56 degrees F, and the average frost-free period is 130 to 180 days.

This unit is about 30 percent Speaker gravelly loam, 25 percent Maymen gravelly loam, and 25 percent Marpa gravelly loam. The Speaker and Marpa soils are on north- and east-facing slopes, and the Maymen soil is on south- and west-facing slopes and on ridges.

Included in this unit are small areas of Bamtush, Etsel, Mayacama, Neuns, and Sanhedrin soils and Rock outcrop. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

The Speaker soil is moderately deep and well drained. It formed in material weathered from sandstone or shale. Typically, the surface is covered with a mat of partially decomposed needles, leaves, and twigs 1 inch thick. The surface layer is brown gravelly loam 2 inches thick. The upper 6 inches of the subsoil is reddish yellow gravelly loam, and the lower 19 inches is reddish yellow clay loam. Soft sandstone is at a depth of 27 inches.

Permeability of the Speaker soil is moderately slow. Available water capacity is 2 to 6 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Maymen soil is shallow and somewhat excessively drained. It formed in material weathered from sandstone or shale. Typically, the surface layer is light yellowish brown gravelly loam about 4 inches thick. The subsoil is light yellowish brown gravelly loam about 8 inches thick. Hard, fractured sandstone is at a depth of 12 inches.

Permeability of the Maymen soil is moderate. Available water capacity is 1 inch to 3 inches. Effective rooting depth is 12 to 20 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Marpa soil is moderately deep and well drained. It formed in material weathered from sandstone. Typically, the surface is covered with a mat of partially decomposed needles, leaves, and twigs 1 inch thick. The surface layer is light brown gravelly loam 10 inches thick. The upper 5 inches of the subsoil is brown gravelly loam, and the lower 10 inches is strong brown very gravelly clay loam. Hard, fractured sandstone is at a depth of 25 inches.

Permeability of the Marpa soil is moderate. Available water capacity is 1.5 to 4.0 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used mainly as wildlife habitat and watershed. It is also used for production of timber and firewood.

Douglas-fir, ponderosa pine, and California black oak are the main tree species on the Speaker and Marpa soils. On the basis of a 100-year site curve, the mean site index for Douglas-fir is 107 on the Speaker soil and 103 on the Marpa soil. On the basis of a 100-year site curve, the mean site index for ponderosa pine is 106 on the Speaker soil and 105 on the Marpa soil. The potential annual production of ponderosa pine on the Speaker soil is 425 board feet per acre from a fully stocked stand of trees. The potential annual production of ponderosa pine on the Marpa soil is 415 board feet per acre from a fully stocked stand of trees. Among the trees of limited extent are Pacific madrone, sugar pine, and interior live oak. Conifer stands commonly are small and widely scattered, making them generally noncommercial.

Some concerns for the harvesting of timber are the hazard of erosion, seasonal wetness, and steepness of

slope. Use of wheeled and tracked equipment when the soil is moist produces ruts, compacts the soil, and can damage the roots of trees. Unless adequate plant cover or water bars are provided, steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying. Disturbance of the protective layer of duff can be reduced by the careful use of wheeled and tracked equipment or cable yarding systems. Rock for construction of roads generally is available on this unit. Establishing plant cover on steep cut and fill slopes reduces erosion. Revegetation of cut and fill slopes is difficult on the Maymen and Marpa soils because of the restricted available water capacity and high content of rock fragments.

Seedling survival is a concern in the production of timber on this unit. The high soil temperature and low content of soil moisture during the growing season cause mortality of seedlings, especially in areas of the Marpa soil on south- and southwest-facing slopes. Reforestation of the Speaker and Marpa soils can be accomplished by planting ponderosa pine seedlings. Survival of Douglas-fir seedlings is higher if they are planted on north-facing slopes. If seed trees are present, natural reforestation of cutover areas by conifers occasionally occurs. Because of the high risk of fire on the surrounding brush-covered soils, firebreaks are needed to protect plantations.

Among the common forest understory plants are mountain brome, California fescue, wild pea, and hoary manzanita.

The natural vegetation on the Maymen soil is mainly brush. This soil is used mainly as watershed, wildlife habitat, and recreation areas. Properly planned and applied prescribed burning or chemical or mechanical treatment can be used in small areas to improve habitat for wildlife, increase access, and reduce the risk of fire.

The Speaker and Marpa soils are in capability subclass VIe (5), nonirrigated. The Maymen soil is in capability subclass VIIe (15), nonirrigated.

226—Speaker-Maymen-Marpa association, 50 to 75 percent slopes. This map unit is on mountains. The vegetation is mainly conifers and hardwoods on the Speaker and Marpa soils and brush and hardwoods on the Maymen soil. Elevation is 1,500 to 4,000 feet. The average annual precipitation is 35 to 50 inches, the average annual air temperature is 52 to 56 degrees F, and the average frost-free period is 130 to 180 days.

This unit is about 30 percent Speaker gravelly loam, 25 percent Maymen gravelly loam, and 20 percent Marpa gravelly loam. The Speaker and Marpa soils are on north- and east-facing slopes, and the Maymen soil is on south- and west-facing slopes and on ridges.

Included in this unit are small areas of Bamtush, Etsel, Mayacama, Neuns, and Sanhedrin soils and Rock outcrop. The areas of Rock outcrop are on ridges or side slopes. Included areas make up about 25 percent of the unit. The percentage varies from one areas to another.

The Speaker soil is moderately deep and well drained. It formed in material weathered from sandstone or shale. Typically, the surface is covered with a mat of partially decomposed needles, leaves, and twigs 1 inch thick. The surface layer is brown gravelly loam 2 inches thick. The upper 6 inches of the subsoil is reddish yellow gravelly loam, and the lower 19 inches is reddish yellow clay loam. Soft sandstone is at a depth of 27 inches.

Permeability of the Speaker soil is moderately slow. Available water capacity is 2 to 6 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is very rapid, and the hazard of erosion is severe.

The Maymen soil is shallow and somewhat excessively drained. It formed in material weathered from sandstone or shale. Typically, the surface layer is light yellowish brown gravelly loam 4 inches thick. The subsoil is light yellowish brown gravelly loam 8 inches thick. Hard, fractured sandstone is at a depth of 12 inches.

Permeability of the Maymen soil is moderate. Available water capacity is 1 inch to 3 inches. Effective rooting depth is 12 to 20 inches. Surface runoff is very rapid, and the hazard of erosion is severe.

The Marpa soil is moderately deep and well drained. It formed in material weathered from sandstone. Typically, the surface layer is covered with a mat of partially decomposed needles, leaves, and twigs 1 inch thick. The surface layer is light brown gravelly loam 10 inches thick. The upper 5 inches of the subsoil is brown gravelly loam, and the lower 10 inches is strong brown very gravelly clay loam. Hard, fractured sandstone is at a depth of 25 inches.

Permeability of the Marpa soil is moderate. Available water capacity is 1.5 to 4.0 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is very rapid, and the hazard of erosion is severe.

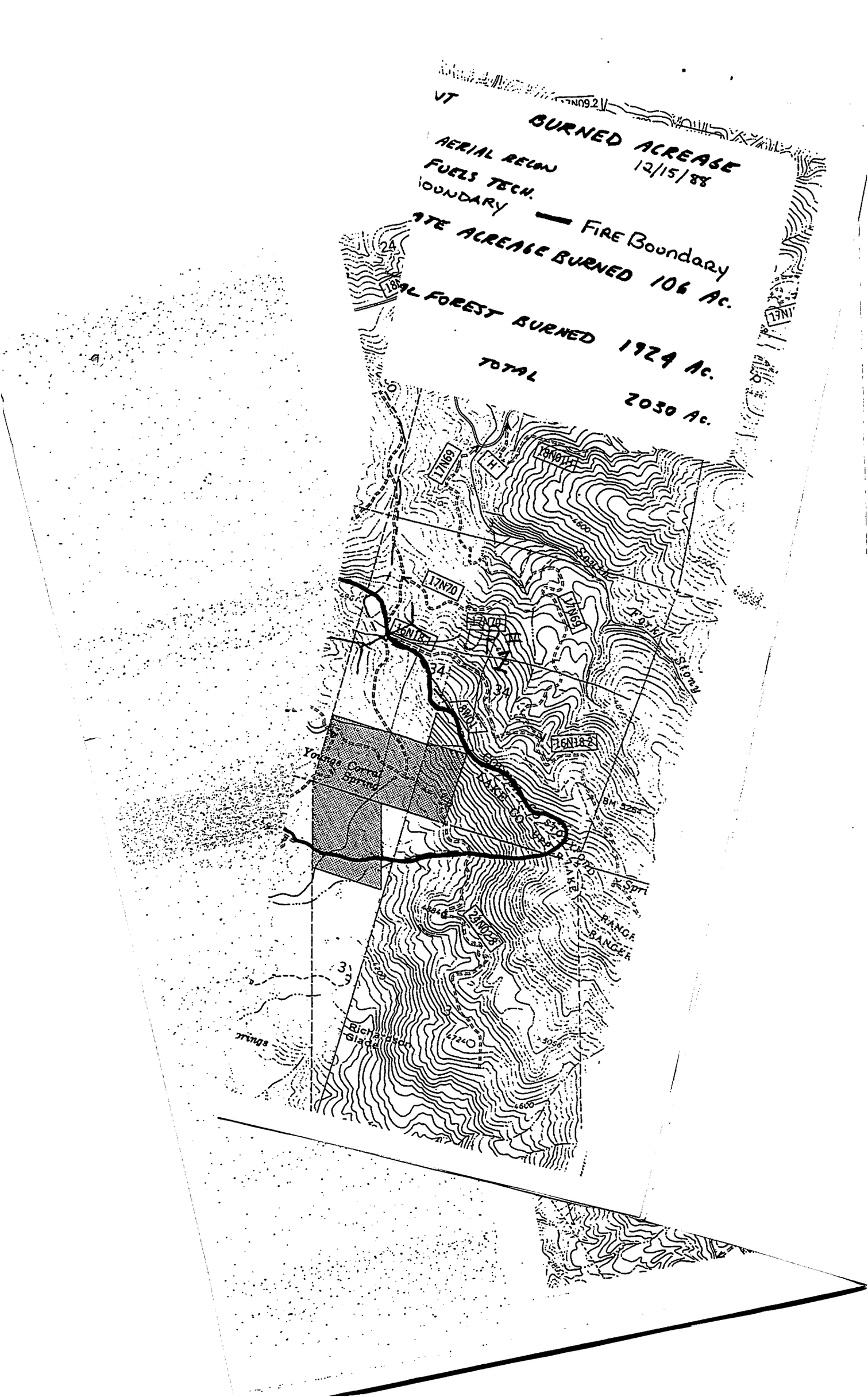
This unit is used mainly as wildlife habitat and watershed. It is also used for production of timber and firewood.

Ponderosa pine, Douglas-fir, California black oak, and interior live oak are the main tree species on the Speaker and Marpa soils. On the basis of a 100-year site curve, the mean site index for ponderosa pine is 106 on the Speaker soil and 105 on the Marpa soil. On the basis of a 100-year site curve, the mean site index for Douglas-fir is 107 on the Speaker soil and 103 on the Marpa soil. The potential annual production of ponderosa pine on the Speaker soil is 425 board feet per acre from a fully stocked stand of trees. The potential annual production of ponderosa pine on the Marpa soil is 415 board feet per acre from a fully stocked stand of trees. Estimates of the site index and yield for California black oak and interior live oak have not been made.

The main limitations for the harvesting of timber are steepness of slope and the hazard of erosion. Cable

APPENDIX F

Fire Map for Letts Fire, December 1988.


VT
BURNED ACREAGE
12/15/88
AERIAL RECON
FUELS TECH.
BOUNDARY — FIRE Boundary
ATE ACREAGE BURNED 106 Ac.
AL FOREST BURNED 1924 Ac.
TOTAL 2030 Ac.
17N69
16N01
17N70
16N18
Young's Corral Burned
Stony
BM 5264
RANGE
RANGER
Bicha
Glade
Trings


LETTS INCIDE
APPED DURING
MOODY,