SIGNATURE PAGE

for

RESEARCH NATURAL AREA ESTABLISHMENT RECORD

WILDER RIDGE RESEARCH NATURAL AREA

MENDOCINO NATIONAL FOREST

TEHAMA 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 _____ Date 4/5/96
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TITLE PAGE

Establishment Record
for
Wilder Ridge Research Natural Area
within
Mendocino National Forest
Tehama County, California

A. Introduction

Research Natural Areas (RNA) comprise a network of Forest Service and other public lands permanently allocated for the purposes of maintaining biological diversity, conducting non-manipulative research and monitoring, and fostering education. RNAs include a representative array of widespread ecosystem types as well as unique ecosystems. There are more than 300 RNAs already established in the nation.

In California the primary selection of RNAs on Forest Service land is based on the identification of "target elements" which are representative plant communities described in various ecological studies (Kuchler 1966, Eyre 1980, Holland 1986). Additional RNAs may be chosen to represent an unusual ecosystem such as an aquatic and geologically unique area. The intention is to accurately reflect the broad diversity of ecosystems on Forest Service lands in California. Although chosen by "target element" or unique ecosystem, most RNAs contain several vegetation types which interact with the "target element." All vegetation types and their interactions are important to the integrity and value of an RNA.

Wilder Ridge Research Natural Area (WRRNA) is located on the eastern slope of northern Coast Ranges in Tehama County. It was first nominated by the Mendocino National Forest in 1984 for its representative pure chamise (Adenostoma fasciculatum[1]) chaparral and blue oak (Quercus douglasii) woodland types. After field reconnaissance and further evaluation, the blue oak woodland in the RNA was determined to be a poor representative of the foothill woodland target element. However, the RNA was not dropped from consideration because the area offers a combination of chamise and blue oak not found in other areas. The nomination was approved by Region 5/PSW RNA Committee in 1984. In 1992 Rundel and Shultz completed an Ecological Survey of the RNA.

This area serves as a wintering ground for black-tailed deer and at one time was a major winter camp for the Nomlaki Tribe. Since the late 1800's and early 1900's grazing became the major land use activity in the general area. Currently, the WRRNA is within the Wilder grazing allotment, which has a stocking level of 50 head of cattle for the season between September 15 and March 15. It is a term permit with on-off provisions. A few cattle are let into the RNA for a total of 24 Animal Unit Months (AUMs) (Fuller 1995).

Located on the Corning District of Mendocino National Forest, WRRNA encompasses most of section 26, T23N, R7W (Mount Diablo Baseline and Meridian, USGS Newville quad). It is on the eastern edge of the Forest (Appendix A1), and abuts private land on its north and east sides. The private land, Murphy Ranch, is owned by Marjorie Murphy, who is also the grazing permittee. The boundary between WRRNA and Murphy Ranch is approximately 2 miles (3.2 km) and is well marked. The road into Murphy Ranch provides easy access to the northeastern corner of the RNA. Forest Service land to the south and west of

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[1]Nomenclature for plants follows Munz (1968), except tree species which follow Little (1979).

WRRNA is in Management Area #33 (Valley View Management Area).

1) Land Management Planning

The establishment of Wilder Ridge RNA is recommended and evaluated in the Mendocino National Forest Land and Resource 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 Wilder 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 the Establishment Record by the Regional Forester with the concurrence of the Station Director. WRRNA is in Management Area #5, Research Natural Area (Appendix A1). Management directions follow the Forest Goals (Appendix A2), Forest-Wide Standards and Guidelines (Appendix A3) and Management Prescription #11 (Appendix A4).

B. Objectives

The objective of establishing WRRNA is to add a representative of the chamise chaparral vegetation type in the inner ridges of the Coast Range to the Region 5 and National RNA system. The WRRNA will provide research and education opportunities on plant communities of chamise chaparral, foothill pine[2]-oak woodland and non-native grasslands and on the interactions among these communities.

Establishment of the WRRNA will also serve the objective of the RNA system to preserve biological diversity. There are 95 documented plant species within the RNA including 2 listed as sensitive (List 1B) by the California Native Plant Society (Skinner and Pavlik 1994).

C. Justification

Vegetation composition at Wilder Ridge RNA is typical of inner Coast Range in areas north of the Carquinez Strait. Relatively little of the landscape type represented at Wilder Ridge RNA is in public ownership or other reserve status, therefore, establishment of WRRNA will make a unique and important contribution as a research facility.

The topography of WRRNA provides unusually good opportunities for research. The slopes of Wilder Ridge contain several small drainages with relatively uniform slope, aspect and vegetation. This provides researchers with excellent opportunities for replicated plots and observations. In addition, the pattern of contrasting substrates and aspects presented by the uptilted strata and dissected topography in eastern half of the WRRNA provides an excellent opportunity to study soil-vegetation relationships. The lower drainages offer an opportunity to study ephemeral creek systems, and vegetation and hydrologic relationships.

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[2]Formerly called digger pine (Pinus sabiniana).

The WRRNA also provides an unusually good opportunity for studying fire ecology and for reinstating a pre-European fire regime in a fire climax vegetation type (Dennis and Isle 1992). The RNA has natural firebreaks along the western and eastern boundaries and there are no roads or habitation for many miles to the south of WRRNA. The logical lines for controlling fires within the RNA correspond with the RNA boundaries. WRRNA is also well-protected from casual visitors so the risk of non-prescribed human caused ignitions is low. The sheer face of Wilder Ridge on the west provides a natural barrier to the RNA and the private land to the north and east reduces public access. This also provides some measure of protection for monitoring plots and scientific equipment.

Two annual herbaceous plant species occurring in the RNA, Eriastrum brandegeae and Antirrhinum subcordatum, are listed by the California Native Plant Society (CNPS) as rare, threatened, or endangered in California and elsewhere (List 1B) (Skinner and Pavlik 1994). Both occur in the chamise chaparral.

D. Principal distinguishing features

Wilder Ridge on the western border of WRRNA is the dominant feature. It runs north-south and the elevational range is approximately 800 ft (244 m). The WRRNA is predominantly east-facing with moderately steep slopes ranging from 30 to 50 percent (16-26°). Several steep draws and intermittent stream courses incised the slope creating a topography with very broken relief.

Chamise chaparral is the dominant botanical feature occupying most of the area. The eastern edge of the RNA contains scattered blue oak and oak-savannah grasslands. Some of the ephemeral creeks contain cottonwood trees (Populus trichocarpa and P. fremontii) and willow species (Salix spp.).

E. Location

1) National Forest involved

Wilder Ridge RNA is located on the Corning Ranger District of Mendocino National Forest, in Tehama County, California.

2) Latitude and longitude

The approximate center of the RNA is at 39°49'15"N latitude and 122°37'30"W longitude.

3) Boundary description

Boundary of WRRNA can be easily identified in the field. It basically follows ridge lines and section lines. The sections lines are marked by old fences which demarcate land ownership (Map 1).

Beginning at the northeastern found corner of sec. 26 (Point a);

(a) thence, due west, following the section line for approximately 0.9 mile (1.5 km) to the northwestern corner of sec. 26 (Point b);

(b) thence, due south, in a direct line, following the section line for approximately 0.3 mile (0.6 km) to the point where the Wilder Ridge runs toward southeast (Point c);

(c) thence, southeastwardly, following the ridgetop for approximately 0.8 mile (1.2 km) to the point where the southern section line of sec. 26 is met (Point d);

(d) thence, due east, in a direct line, following the section line for approximately 0.8 mile (1.2 km) to the southeast found corner of sec. 26 (Point e);

(e) thence, due north, in a direct line, following the section line for exactly 1 mile (1.6 km) to the northeast corner of sec. 26, the point of beginning.

4) Acreage

The total area in WRRNA is 570 acres (231 ha).

5) Elevation

Elevations range from 1000 ft (305 m) at the eastern border of the RNA to 1854 ft (565 m) at the top of Wilder Ridge.

6) Access

Access to the WRRNA can be made from the northeast and southwest (Map 2). Round Valley Road is the major road for both routes. It is a all-weather paved road. The northeast access goes through private land (Murphy Ranch) and permission is needed. The southwest access is on the west side of Wilder Ridge, which is difficult to climb for casual visitors but not for people with a purpose.

From Paskenta, take Round Valley Road west (A9 then M4) and travel for approximately 6.1 miles (10 km), passing the Newville turnoff, then:

(a) for the northeast access, turn south at the Murphy Ranch turnoff and travel through Murphy Ranch for approximately 1.7 miles (2.8 km) to the end of the road. The northern boundary of the RNA is approximately 98 ft (30 m) south from that point.

(b) for the southwest access, stay on the Round Valley Road for approximately 4 miles (6.4 km) past the Murphy Ranch turnoff to an off

highway parking area at Salt Creek Saddle, which is right at a sharp turn of the road. From there, the southwestern edge of the RNA, i.e. the ridge top, can be reached by a 15 minute walk on a small path.

F. Area by cover type

Table 1: Area by cover type (Map 3)

Type (code)	Area: Acre	Hectare	Percent
Holland (1986)			
Chamise Chaparral (37200)	340	138	59.7
Foothill Pine-Oak Woodland (71410)	85	34	14.9
Non-native Grassland (42200)	145	59	25.4
Total	570	231	100.0
SAF (Eyre 1980)			
Blue Oak-Foothill Pine (250)	85	34	14.9
Unclassified	485	197	85.1
Total	570	231	100.0
Kuchler (1966)			
California Oakwoods (K26)	85	34	14.9
Unclassified	485	197	85.1
Total	570	231	100.0

G. Physical/Climatic conditions

Wilder Ridge is on an outlying range to the east of the main body of the Coast Range. Topographically, it is typical for the Coast Range north of the Carquinez Strait, where the main body of the range is flanked by smaller outlying ridges along its east side.

The elevation range of Wilder Ridge is about 854 ft (260 m) from the valley bottom to the crest of the ridge. It runs north-south on the western edge of the RNA, with several small ridges branching to the east. The slopes on the main ridge are extremely precipitous with some up to 80% (38°). The branching ridges are gentle, with 5-15% (3-8°) slopes on top and 20-30% (11-17°) on slopes between the ridgetops and the drainages. There are several knobs in the interior of the area. Elevations of the knobs range from 1200 ft (366 m) to just over 1500 ft (457 m).

There are several unnamed ephemeral drainages flowing to the east to meet Salt Creek, which then flow southeastwardly. No perennial surface flow of water is present, but the presence of willows and poplars suggests that a subsurface flow is present throughout the year. Soils in the area are generally shallow to very shallow.

The climate is Mediterranean with wet cool winters and warm dry summers. More than 90 percent of the precipitation is concentrated in months between October and April, with an average annual precipitation approximately 24 inches (61.1 cm).

The nearest weather station is the Paskenta Ranger Station, from which complete precipitation data is available. Other stations in the area with

complete climatological data are Covelo and Orland. Table 2 lists their locations and years of weather records. Climate in WRRNA is in the middle of a gradient from coastal on the west to inland (Sacramento Valley) on the east. Therefore, Covelo and Orland's weather represent WRRNA's range extremes (Table 3, 4).

Table 2: Weather stations near WRRNA

Name	Latitude Longitude	Elevation	Distance to WRRNA	Years of Record Temperature	Precipitation
Paskenta Ranger Station	39°53'N 122°32'W	755 ft (230 m)	5.5 mi NE (8.9 km)	0	53
Covelo	39°47'N 123°15'W	1430 ft (436 m)	34 mi W (54.8 km)	51	73
Orland	39°45'N 122°12'W	254 ft (77 m)	23 mi E (37.0 km)	108	109

From: National Oceanic and Atmospheric Administration (NOAA) 1990

Table 3: Monthly precipitation normals (inches [mm])

	Paskenta R.S.	Covelo	Orland
Jan.	4.90 (125)	9.82 (250)	4.24 (108)
Feb.	3.98 (101)	6.58 (167)	3.20 (81)
Mar.	2.84 (72)	5.21 (133)	2.11 (54)
Apr.	1.78 (45)	2.43 (62)	1.35 (34)
May	0.68 (17)	1.03 (26)	0.61 (16)
Jun.	0.49 (12)	0.30 (8)	0.35 (9)
Jul.	0.13 (3)	0.06 (2)	0.11 (3)
Aug.	0.20 (5)	0.43 (11)	0.25 (6)
Sept.	0.34 (9)	0.58 (15)	0.35 (9)
Oct.	1.24 (32)	2.35 (60)	1.05 (27)
Nov.	3.23 (82)	5.45 (139)	2.85 (73)
Dec.	3.93 (100)	8.12 (207)	3.42 (87)
Annual	23.74 (604)	42.36 (1078)	19.89 (506)

From: NOAA 1989, 1990

Table 4: Monthly average temperature normals (°F [°C])

	Covelo	Orland
Jan.	40.8 (4.9)	44.6 (7.0)
Feb.	45.0 (7.2)	49.4 (9.7)
Mar.	47.4 (8.6)	52.9 (11.6)
Apr.	52.1 (11.2)	58.6 (14.8)
May	58.4 (14.7)	66.6 (19.2)
June	65.6 (18.7)	74.0 (23.3)
July	72.0 (22.2)	78.7 (25.9)
Aug.	70.8 (21.6)	76.7 (24.8)
Sept.	66.2 (19.0)	72.8 (22.7)
Oct.	56.8 (13.8)	63.9 (17.7)
Nov.	47.1 (8.4)	52.6 (11.4)
Dec.	41.3 (5.2)	45.4 (7.4)
Annual	55.3 (12.9)	61.4 (16.3)

From: NOAA 1990

H. Values

1) Flora

There are at least 95 vascular plant species occur in the WRRNA (Appendix B). As mentioned earlier, two of them are CNPS listed 1B sensitive plants, Eriastrum brandegeae and Antirrhinum subcordatum. Both occur in the chamise chaparral. The following description of the flora is taken from Rundel and Shultz (1992).

Pure chamise covers the upper third of the slope and on all but the northern aspects of draws. The north-facing slopes contain a mixed brush type of manzanita (Arctostaphylos spp.), toyon (Heteromeles arbutifolia), California bay (Umbellularia californica), scrub oak (Quercus dumosa), and some interior live oak (Quercus wislizenii). The middle third of the area is predominantly chamise with small groups of young foothill pine and scattered older foothill 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 sparse blue oak overstory (Map 3).

(a) Chamise chaparral (Holland 37200)

This is the major vegetation type in WRRNA. It covers approximately 340 acres (138 ha) and is dominated by Adenostoma fasciculatum, which virtually solely covers the western third of WRRNA at higher elevations.

In the western third of the WRRNA, Adenostoma fasciculatum has nearly 100 percent cover and a height of 5.0 to 6.6 ft (1.5-2.0 m). Fuel loading of these pure stands of chamise chaparral was estimated to be 17,848-26,771 pounds per acre (20 to 30 metric tons per hectare). Few understory herbs were present.

Chamise chaparral in the central portion of the site is much more open

in growth, and often interspersed with foothill pine and manzanita (Arctostaphylos manzanita), particularly on the north-facing slopes of the steep ridges. As a result of edaphic conditions, there are areas of extremely sparse vegetation which occur in bands and support both yerba santa (Eriodictyon californicum) and the sensitive species Eriastrum brandegeae. Eriastrum brandegeae is an annual herb growing on open sites with shallow soils. Brush browsing and periodic disturbance probably enhance conditions for its regeneration.

The chamise chaparral in the eastern third of RNA is open with highly diversified annual and perennial herbaceous species. This area has received some trampling and chiseling from grazing, cattle traveling through sevaral major trails in the open chaparral was observed. Impacts of cattle on this vegetation type are limited to these trails.

Steeply plunging slopes (84-173% [40-60°]) within the chamise chaparral vegetation type frequently support an open woody population of Eriodictyon californicum, wedge-leaved ceanothus (Ceanothus cuneatus), Eriogonum nudum, and Eriophyllum confertifolium. Scattered herbaceous species included Avena barbata, Linanthus ciliatus, and Sanicula bipinnata. Many of the steepest slopes, particularly south-facing slopes had little or no vegetation.

Within this vegetation type, small areas of woodland with scattered shrubs and trees are also included. They are associated with ephemeral riparian systems occurring in the bottoms of the highly dissected terrain. Individuals of interior live oak reach to 24 in (60 cm) diameter and cottonwood (Populus fremontii) reach 18 in (45 cm) diameter. The later species, together with scattered willows (Salix spp.), indicates that subsurface groundwater is present and perennial. Other notable woody species in this narrow woodland are toyon, California buckeye (Aesculus californica), mountain mahogany (Cercocarpus betuloides), western redbud (Cercis occidentalis), foothill pine and poison oak (Rhus diversilobum).

(b) Foothill Pine-Oak Woodland (Holland 71410)

Foothill pine and blue oak form the characteristic arboreal species of this woodland community that interdigitates with chamise chaparral throughout the WRRNA. The fragmentation of this woodland type is a result of the soil conditions in this area. Soils here are shallow lithosol, classified as Millsholm clay loam which support the chaparral community. However, in places where soils are deeper or fracture planes in the parent material allow tree roots to penetrate deeply, the woodland community replaces the chaparral. Other woody species occurring in this vegetation type include Ceanothus cuneatus and Haplopappus linearifolius with an understory of Elymus caput-medusae, Gilia tenerrima, Bromus rubens and Bromus mollis.

Foothill pines occur on a range of slopes and exposures, but are most apparent on gently sloping, broad ridge lines and on north-facing slopes. They are also present along the drainage bottoms. The woodland stand along the south-central margin of the RNA is dominated by young growth of foothill pine, while the larger stands along the north-central part of the

site have a mix of age classes present. This difference may reflect edaphic and or historic fire events. Individual foothill pines reach 31 inches (80 cm) in diameter. Fairly dense stands of blue oak are also present, with small trees (6-8 inches [15-20 cm] diameter) as close as 6-10 ft (2-3 m) in spacing. The understory of the stand has a scattered occurrence of manzanita (Arctostaphylos viscida) and chamise.

Small areas along the northern margin of the RNA are dominated by Arctostaphylos manzanita, with scattered foothill pine and blue oak jutting out. The height of Arctostaphylos manzanita ranges approximately from 6 to 20 ft (2-6 m). The largest one has a diameter of 18 inches (45 cm). Chamise and mountain mahogany are also present in these stands. Poa scabrella and Melica californica are prominent perennial grasses in this area.

(c) Non-native Grassland (Holland 42200)

The eastern margin of the WRRNA is an open grassland, which has received disturbance from cattle grazing and possibly other forms of human disturbance. Along with introduced annual grasses, there are also native grasses and forbs, such as Plantago hookeriana, Salvia columbariae, and few Melica californica and Poa scabrella. Rarely, on the ephemeral stream bank, small patches of deergrass (Muhlenbergia rigens) can be found. On the shallow soil in the northeast corner of sec. 26 grows Eriogonum wrightii ssp. membranaceum (undetermined) (Isle 1996). Most of the introduced annual grasses are of Mediterranean-origin. They are Aira caryophyllea, Avena barbata, Bromus rubens, Bromus mollis, and Festuca dertonensis.

In this vegetation type scattered individuals of foothill pine and blue oak can be found on areas with deeper soil. Present particularly on more protected north-facing slopes are scattered chaparral shrubs including: mountain mahogany, chamise, yerba santa, and wedge-leaved ceanothus.

2) Fauna

Black tail deer is the most common large mammal in the area. Black bear and mountain lion are seasonal visitors. Coyote, fox, skunk, raccoon, and numerous rodents are also found within the WRRNA. Feral pigs are common in the vicinity, but none have been sighted, nor are there any sign of them within the WRRNA. The bird population is typical of the low elevation hills and of the barren/rock/cliff habitat on the high ridge at the western border of the RNA. American kestrels and white-tailed kites are the predominant raptors. Acorn woodpeckers, northern flickers, scrub jays, and numerous small permanent and neo-tropical migrant birds are found within the RNA. Wild turkeys are also commonly found in the area. The reptiles include racers, gopher snakes, garter snakes, and western rattlesnakes, as well as several species of lizards (Likins

1995). As for amphiaian species, calls resemble the Pacific treefrog (Hyla regilla[3]) was noticed during spring (Isle 1996).

There was no formal wildlife survey conducted in the RNA, however, a potential wildlife list can be generated from a Wildlife Habitat Relationship (WHR) Model (Tatum 1996). On the list are 36 mammal, 13 reptile, and 93 avian species (Appendix C). Among them, 27 species are considered threatened, endangered, or sensitive (TES) species. Occurrences of these species within the WRRNA are not confirmed except for the peregrine falcon. The presence of a prairie falcon in the WRRNA is strongly suggested by the results of surveys conducted by the Forest Service personnel in 1995 (Tatum 1996). Following lists the TES species, their protection status and associated habitats:

SPECIES	STATUS	HABITAT
Mountain lion (Felis concolor)	CP	All
Ringtail (Bassariscus astutus)	CP	CC, FOW, BRC
Yuma myotis (Myotis yumanensis)	C2	FOW
Long-eared myotis (Myotis evotis)	FC	CC, FOW, BRC
Long-legged myotis (Myotis volans)	FC	All
Spotted bat (Euderma maculatum)	FC, CS	All
Townsend's big-eared bat (Plecotus townsendii)	FC, CS	CC, FOW, NG
Western mastiff bat (Eumops perotis)	FC, CS	All
Peregrine falcon (Falco peregrinus)	FE, CE, CP	All
Merlin (Falco columbarius)	CS, CP	FOW, NG
Swainson's hawk (Buteo swainsoni)	CP, CT	FOW, NG, BRC
Ferruginous hawk (Buteo regalis)	C2, CP, CS	FOW, NG, BRC
Yellow warbler (Dendroica petechia)	CS	FOW
Purple martin (Progne subis)	CS	FOW, NG
Mountain quail (Oreortyx pictus)	C2	CC, FOW
Prairie falcon (Falco mexicanus)	CP, CS	All

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[3]Nonmenclature for fauna species follows Laudenslayer, Grenfell, and Zeiner 1991.

SPECIES	STATUS	HABITAT
American kestrel (Falco sparverius)	CP	All
Sharp-shinned hawk (Accipiter striatus)	CP, CS	CC, FOW
Cooper's hawk (Accipiter cooperii)	CP, CS	FOW
Red-tailed hawk (Buteo jamaicensis)	CP	All
Golden eagle (Aquila chrysaetos)	CP, CS	CC, FOW, BRC
Great horned owl (Bubo virginianus)	CP	All
Common barn owl (Tyto alba)	CP	All
Western sreech owl (Otus kennicottii)	CP	CC, FOW
Burrowing owl (Athene cunicularia)	CP, CS, FC	All
Loggerhead shrike (Lanius ludovicianus)	C2, CS	FOW, NG
Rufous-crowned sparrow (Aimophila ruficeps)	C2	CC, NG, BRC

STATUS:
CE - CA Endangered
CP - CA Proposed Endangered
CS - CA Species of Special Concern
CT - CA Threatened
C2 - Fed Category 2 Candidate
FC - Fed Candidate
FE - Fed Endangered

HABITAT:
All - All habitats in RNA
BRC - Barren/Rock/Cliff
CC - Chamise Chaparral
FOW - Foothill Pine/Blue Oak Woodland
NG - Non-native Grassland

3) Geology

The following information is provided by John Brooks (1995) (Appendix D), Geologist of the Mendocino National Forest.

Wilder Ridge, along the west edge of the RNA, is a Jurassic conglomerate, which is overlain by Jurassic sandstone dipping east and extends to the middle of sec. 26. Overlying the sandstone and extending to approximately the east edge of sec. 26 is Jurassic mudstone.

These Jurassic rocks are known collectively as the Great Valley Sequence and were deposited upon the Coast Range Ophiolite in a shallow water environment. The Coast Range Ophiolite is a layering of peridotite, gabbro, basalt and sheeted dikes. In most places there has been extensive serpentinization of the peridotite. A sedimentary contact between the Great Valley Sequence and the Ophiolite was discovered by Dr. M.C. (Clark) Blake north of Paskenta, however in the vicinity of the WRRNA the contact is a thrust fault known as the Stony Creek Fault.

The lower member of the Stony Creek Formation consists of over 4000 ft (1219 m) of mudstone, siltstone and recemented conglomerate ascribed to the Tithonian stage of the Upper Jurassic. This age is determined by the presence of Buchia piochii fossils. The coarse grained deposits, such as conglomerates, are thought to have been derived from the ancestral Klamath and Sierra Nevada mountains.

4) Soils

Soils of the WRRNA are rocky, shallow and highly eroded. They are derived from sandstone and shale parent materials. These foothill soils are broadly mapped as the Millsholm-Lodo association which forms a band 2-9 miles (3-15 km) wide from north to south along the eastern margin of the foothills of the Coast Ranges (U.S.D.A. 1967). Sandstone and shale parent materials in this association are commonly tilted to the west at an angle of about 45°, producing steep slopes that are readily eroded. To the west of the WRRNA there is a band 1-3 miles (2-5 km) wide of the Hennecke-Stonyford Association which are underlain by volcanic parent materials. The dominant Hennecke soils of this band are derived from serpentine rock and support dense communities of mixed chaparral and foothill pine.

Four mapped soil units are present on the WRRNA (Fig. 1):

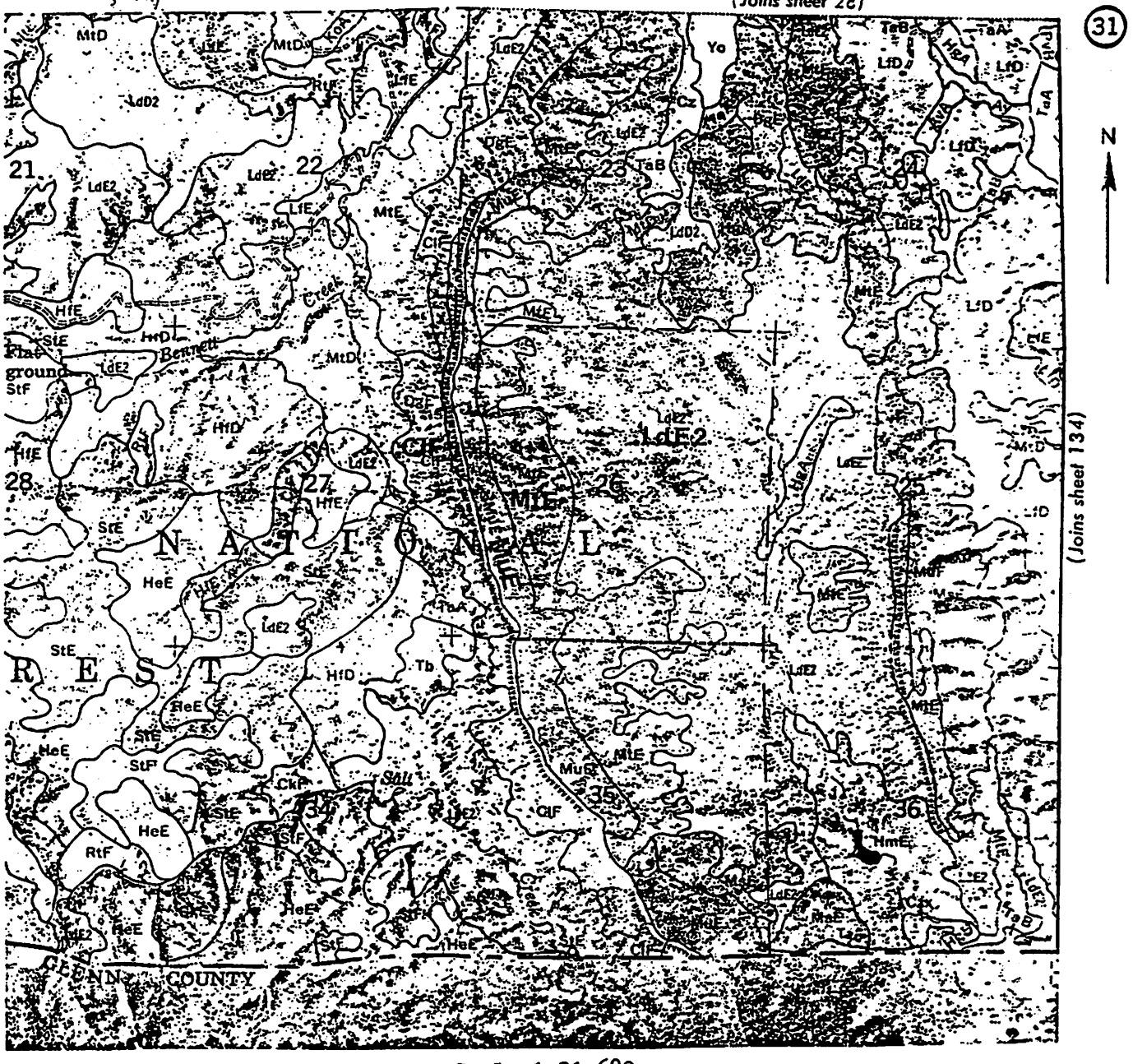
(a) Millsholm Rocky-Sandy Loam, 30 to 50 percent slopes (MuE)

The upper ridge along the western boundary of the RNA covered by chamise chaparral has Millsholm rocky-sandy loam (MuE) soils which are formed in material of hard conglomerate. The soil is brown to pale brown, and slightly acid to neutral. The surface soil is shallow, well drained, and includes rock outcrops. Stones of moderate size, some of which are nearly 3 feet (0.9 m) in diameter, cover up to 10% of the soil surface. Slopes are commonly 30-50% (17-27°) except on the ridgetop. This soil is notable for its severe erosion hazard rating.

(b) Millsholm Clay Loam, 30 to 50 percent slopes (MtE)

The intermediate slopes of the ridge are mapped as Millsholm clay loam (MtE) with slopes of 30-50% (17-27°). Vegetation types found on this soil are foothill pine-oak woodland and chamise chaparral. Depth of the soil to partly weathered sandstone ranges from 12 to 30 inches (30.5-76.3 cm). Roundoff is medium to rapid, and the erosion hazard is severe.

One soil profile of this type reveals the surface soil has two layers. An A1 horizon at depth from 0 to 2 inches (0-5.1 cm) with a texture of light clay loam. The color is yellowish-brown (10YR 5/4) when 3ry and dark brown (10YR 3/3) when moist. Structure is weak, thick, and platy, slightly hard when dry, friable when moist, and slightly sticky when wet. The A12 horizon is at a depth from 2 to 9 inches (5.1-22.9 cm), and is a yellowish-brown (10YR 5/4) clay loam. The color is dark brown (10YR 4/3) when moist. The structure is moderate, coarse, subangular blocky, hard when dry, firm when moist, and sticky when wet.



Scale 1:31,680

MuE - Millsholm Rocky-Sandy Loam, 30 to 50 percent slopes
MtE - Millsholm Clay Loam, 30 to 50 percent slopes
ClF - Colluvial Land, Sedimentary Rocks
LdE2 - Lodo and Maymen Shaly Loams, 30 to 65 percent slopes, eroded

Figure 1: Soil map of the Wilder Ridge Research Natural Area (from U.S.D.A. 1967)

The subsoil doesn't have a B horizon and the C1 horizon starts at 9 inches (22.9 cm) and ends at 14 inches (35.6 cm). It is a yellowish-brown (10YR 5/4) clay loam. The structure is moderate, coarse, subangular blocky, hard when dry, firm when moist, and sticky when wet. The C2 horizon (at depth from 14 down to 16 inches [35.6-40.7 cm]) is a light yellowish-brown (10YR 6/4), very gravelly clay loam. It is massive and hard when dry, firm when moist, and sticky when wet.

However, the "A horizon" described above may not be the actural A horizon but a residual B horizon with the A layer eroded away (James 1996).

(c) Colluvial Land, Sedimentary Rocks (ClF)

A narrow band formed by the steep west-facing escarpment of Wilder Ridge is almost bare of vegetation and is classified as colluvium because of the loose rock and soil material deposited from the ridge above. The rocks are of sandstone, shale, and mica schist.

(d) Lodo and Maymen Shaly Loams, 30 to 65 percent slopes, eroded (LdE2)

This soil unit consists of Lodo shaly loam, 30 to 65 percent ($16-33^{o}$) slopes, eroded, and Maymen gravelly loam, 30 to 65 percent ($16-33^{o}$) slopes. Either soil may occupy from 40 to 60 percent of the soil complex. The erosion hazard is severe to very severe on both Lodo and Maymen soils. Depth to partly weathered, fractured rock ranges from 6 to 10 inches (15.3 to 25.4 cm) in the Lodo soil but is 6 to 20 inches (15.3 to 50.9 cm) in the Maymen.

This soil type covers approximately 65% of the area. Woody plant cover on this formation is highly variable and depends on the ability of plant roots to penetrate the underlying shales.

A typical soil profile of Lodo shaly loam on a south-facing 15 percent (8^{o}) slope, under a cover of annual grasses, forbs, blue oaks and shrubs is as follows:

A1 -- 0 to 7 inches (0-17.8 cm), pale brown (10YR 6/3) shaly loam, brown (10YR 5/3) when moist; weak, coarse, subangular block structure; soft when dry, very friable when moist, nonsticky when wet.

R -- 7 inches (17.8 cm) +, fractured dark-gray shale.

A typical soil profile of Maymen gravelly loam on a south-facing slope of 30 percent (16^{o}) covered by dense shrubs is as follows:

A11 -- 0 to 1 inch (0-2.5 cm), brown (10YR 5/3) gravelly loam, dark brown (10YR 3/3) when moist; weak, thick, platy structure; slightly hard when dry, very friable when moist, non-sticky when wet; many fine roots and pores; a few angular fragments of shale; slightly acid; abrupt, smooth boundary. 1 to 2 inches (2.5-5.0 cm) thick.

A12 -- 1 to 7 inches (2.5-17.8 cm), brown (10YR 5/3) gravelly loam, dark brown (10YR 3/3) when moist; medium, subangular blocky structure; slightly hard when dry, very friable when moist, nonsticky when wet; slightly acid; abrupt, irregular boundary. 5 to 18 inches (12.7-45.7 cm) thick.

R -- 7 inches (17.8 cm) +, partly weathered, fractured, hard, gray shale.

Detailed descriptions of each soil type can be found in Appendix E.

5) Lands

All land within the WRRNA are under the management of Mendocino National Forest, no private holdings are involved. However, as mentioned earlier, lands to the north and east of the WRRNA are private lands belonging to the Murphy Ranch.

6) Cultural sites

A small part of the RNA was surveyed for cultural sites in 1993. There is one recorded site within the RNA, which is associated with an important village site located outside the boundary of RNA on private property. This village site, "Mountain House", is the primary Paskenta Nomlaki village site. Forest Archeologists believe that more sites will be discovered if a formal survey is conducted (Likins 1995).

Establishment of WRRNA will enhance the protection of cultural resources in the area, since only non-manipulative research activities are allowed.

7) Fire regime

Fire regime is important for the chaparral plant community. Most of the chaparral areas in California are characterized by relatively frequent wildfire. Many plants in chaparral community are dependent on fire to maintain their productivity and fire is essential for the chaparral community to maintain its diversity.

In WRRNA, the last fire to occur was in 1952 (Fuller 1992). It apparently started on private land to the north of the RNA. There are no records of other fire events within the RNA. This relatively rare occurrence of fire may be a result of the unique geological stratum, topographical position, and vegetation mosaic of the WRRNA. Fires from human ignitions are unlikely to spread into the WRRNA except from the north side. The ridgetop along the west edge of the RNA is underlain by a stratum that presents an unstable surface of very low fertility which provides a broad firebreak of rocks almost bare of vegetation. Along the east boundary, vegetation is extremely sparse and appears to act more as a fuel break than as a source of ignitions. Vegetation along the southern

boundary is more continuous, a mosaic of chaparral, woodland and savannah similar to the RNA. Fire could spread into WRRNA from this side, but there are no road or habitations for many miles (Dennis and Isle 1992).

Therefore, as stated above, WRRNA provides an unusually good opportunity for allowing a pre-European fire regime to exist because there is a low risk of fire escaping out of the RNA. Also, it is protected from human caused fires originating outside the RNA, and has clear logical lines for controlling burns from within (Dennis and Isle 1992).

I. Impacts/Conflicts

1) Mineral resources

Establishment of the WRRNA will have no impact on the mineral resources of the area, since there is no existing lease in the area and the mineral potential is none (Brooks 1995).

2) Grazing

There is one grazing allotment in WRRNA. It is an "on-off" type, which permits 50 cattle between September 15 and March 15 for a total of 24 Animal Unit Months. Most of the grazing takes place in the main valley along the east edge of the RNA, in the open savannah with moderate slopes. Cattle trails traveling through open chaparral in eastern portion of the RNA are visible, but the impact is limited to those routes only (Fuller 1995, Dennis and Isle 1992).

The primary impact of grazing on the vegetation of WRRNA has been the replacement of native grasses with introduced annuals. This is typical of much of California and current grazing levels are not thought to worsen this condition. The current grazing allotment will not be affected by the establishment of the RNA. However, opportunities to reduce grazing levels and restore native vegetation to the RNA should be explored.

3) Timber

WRRNA doesn't support a forest of timber value. It is not suitable for timber production. Therefore, establishment of RNA will not have an impact on the timber resource of the area.

4) Watershed value

The watershed which the WRRNA is located in contributes to the Sacramento River drainage. WRRNA is on the headwaters of Salt Creek, which drains into Black Butte Lake (reservoir), where the primary use is irrigation. Establishment of WRRNA will help maintain the water quality in the drainage and prevent sedimentation in the Black Butte Lake.

Even though there is no perennial stream in the WRRNA, the intermittent stream courses and subsurface groundwater support a woodland of cottonwood and willows, which enrich the biological diversity of the area. Establishment of WRRNA will provide protection and maintain the intermittent and subsurface flows and their associated plant and wildlife communities.

5) Recreation value

There is very little recreational use of the area because it is surround by a very steep ridge on the east side and private land on the west side. Establishment of WRRNA will have no impact on the recreational use of the area (Fuller 1995).

6) Wildlife & plant value

As stated earlier, the principal target element, Chamise Chaparral, has been little affected by livestock grazing.

The sensitive plants, Antirrihinum subcordatum and Eriastrum brandegeae, occur in areas in the center portion of chamise chaparral. These sites have not received influence from cattle grazing and establishment of RNA will be compatible with the maintenance of habitat for these sensitive species.

7) Special management area

WRRNA is not within any special management or congressionally designated area. Establishment of RNA will have no conflict with current land management.

8) Transportation plans

There is no plan to construct new roads within or nearby the area. Establishment of WRRNA will have no impact on the transportation plan for the Forest.

J. Management prescription

Appendix A contains the management prescription for the WRRNA as stated in the Mendocino National Forest LRMP (U.S.D.A. Forest Service 1995c). Within it standards and guidelines are provided.

1) RNA Management Plan

The Mendocino National Forest will develop a specific management plan to maintain the target element and other resource values in the best possible condition after the establishment of WRRNA.

K. Administration records and protection

The official responsibility for administration and protection of the RNA is with the District Ranger, Corning/Stonyford Ranger District, 825 N. Humboldt Ave., Willows, CA 96021. Attention should be given to the management of grazing use in the RNA.

The research coordinator is the Director, Pacific Southwest Research Station, P.O. Box 245, Berkeley, CA 94701. This person is responsible for approving and coordinating observational or nonmanipulative applied research, and maintaining a research data file.

L. Archives

The Station Director shall establish and maintain a system for archiving data and reports from Research Natural Areas in a manner that will facilitate the exchange and transfer of information among Stations, Forests, and scientists.

M. Reference list

Brooks, J. Geologist, Mendocino National Forest. Personal communication. Oct. 1995.

Dennis, A. and D. Isle 1992. Wilder Ridge Candidate Research Natural Area - Report of site visit. Unpublished report to R5/PSW RNA Committee.

Eyre, F.H., ed. 1980. Forest cover types of the United States and Canada. Society of American Foresters. 148p.

Fuller, M. Implementation Officer, Mendocino National Forest. Personal communication. July 1992.

Fuller, M. Implementation Officer, Mendocino National Forest. Personal communication. Oct. 1995.

Holland, R. 1986. Preliminary descriptions of the terrestrial natural communities of California. Unpublished report to California Department of Fish and Game.

Isle, D. Botanist, Mendocino National Forest. Personal communication. Mar. 1996.

James, A. Forest Soil Scientist, Mendocino National Forest. Personal communication. April 1996.

Kuchler, A.W. 1966. Potential natural vegetation. U.S. Department of Interior, Geological Survey, 1969. Washington, D.C.

Laudenslayer, W.F., Jr., W.E. Grenfell, Jr., and D.C. Zeiner 1991. A check-list of amphibians, reptiles, birds, and mammals of California. California Fish and Game 77(3):109-141.

Likins, P. Archeologist, Stonyford Ranger Station, Mendocino National Forest. Personal communication. Sept. 1995.

Little, E.L. Jr. 1979. Check list of United State trees (native and naturalized). Agricultural Handbook No. 541. Washington, D.C.: U.S. Department of Agriculture.

Munz, A.P. 1968. A California flora. University of California Press.

National Oceanic and Atmospheric Administration 1989 Climatological data, annual summary, California. Vol. 93, No. 13.

National Oceanic and Atmospheric Administration 1990 Climatological data, annual summary, California. Vol. 94, No. 13.

Rundel, P.W. and L.M. Shultz 1992. An ecological survey of the Candidate Wilder Ridge Research Natural Area, Mendocino National Forest, Tehama County, California. Unpublished report to U.S.D.A. Forest Service, Pacific Southwest Research Station.

Skinner, M.W. and B.M. Pavlik, eds. 1994. California Native Plant Society's inventory of rare and endangered vascular plants of California. California Native Plant Society.

Tatum, L. Forest Assistant Wildlife Biologist, Mendocino National Forest. Personal communication. Jan. 1996.

U.S. Department of Agriculture 1967. Soil survey: Tehama County. U.S. Government Printing Office, Washington, D.C.

U.S.D.A. Forest Service 1995a. Final Environmental Impact Statement for Mendocino National Forest Land and Resource Management Plan. Supervisor's Office of the Mendocino National Forest. Willows, CA.

U.S.D.A. Forest Service 1995b. Final Environmental Impact Statement Appendices Mendocino National Forest. Supervisor's Office of the Mendocino National Forest. Willows, CA.

U.S.D.A. Forest Service 1995c. Mendocino National Forest Land and Resource Management Plan. Supervisor's Office of the Mendocino National Forest. Willows, CA.

Appendices

A. Excerpts from Mendocino National Forest Land and Resource Management Plan (U.S.D.A. Forest Service 1995c)

   A1. Location of Wilder Ridge RNA in the Mendocino National Forest
   A2. Management Direction - Forest Goals of Mendocino National Forest
   A3. Management Direction - Standards and Guides of Mendocino National Forest
   A4. Management Prescription for Research Natural Area

B. Plant list of Wilder Ridge RNA (from Rundel and Shultz 1992)

C. List of fauna species generated by Wildlife Habitat Relationship (WHR) Model (Tatum 1996)

D. Geology of Wilder Ridge RNA (Brooks 1995)

E. Descriptions of soil types in the Wilder Ridge RNA (from U.S.D.A. 1967)

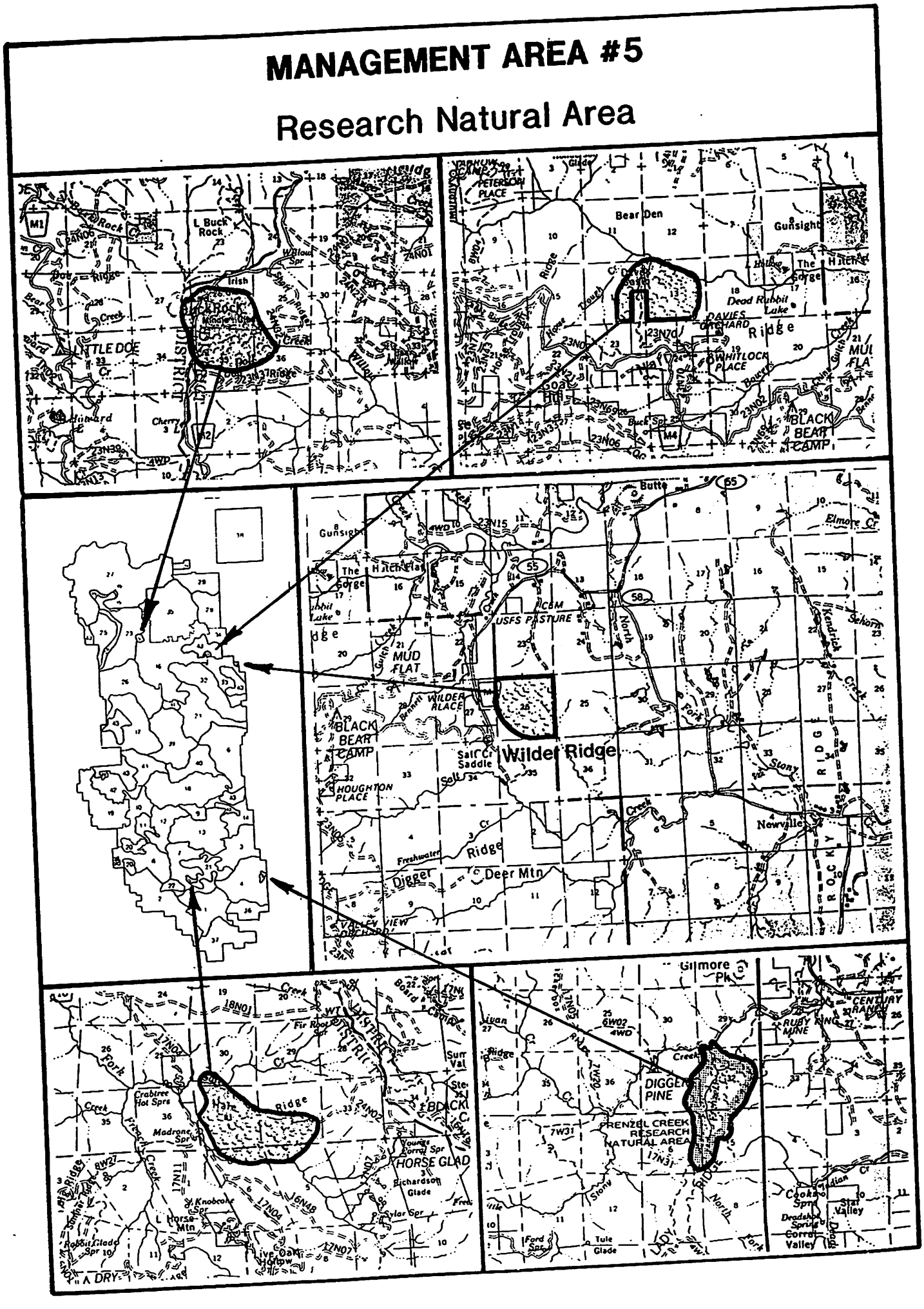
Appendix A. Excerpts from Mendocino National Forest Land and Resource Management Plan (1995)

A1. Location of Wilder Ridge RNA in the Mendocino National Forest
A2. Management Direction - Forest Goals of Mendocino National Forest
A3. Management Direction - Standards and Guides of Mendocino National Forest
A4. Management Prescription for Research Natural Area

Appendix A1. Location of Wilder Ridge RNA in the Mendocino National Forest

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	

Appendix A2. Management Direction - Forest Goals of Mendocino National Forest

FACILITIES

Provide and maintain those facilities necessary for the protection, use, and safe and efficient management of Forest resources and programs.

FIRE AND FUELS

Maintain a cost effective detection, prevention, suppression, and fuels management program mix in support of other resource programs.

HERITAGE RESOURCES

Inventory, evaluate, and manage heritage resources to prevent loss or damage to cultural values. Foster enhancement of heritage resources through interpretation, scientific study, public education, public participation, partnerships, rehabilitation, and use.

LANDS

Consolidate landownership patterns to improve overall management efficiency and to accomplish resource management objectives.

Provide for uses of National Forest lands which are consistent with law, regulation, and accomplishment of resource management objectives.

LAW ENFORCEMENT

Maintain a visible law enforcement program that provides for resource and property protection as well as public safety.

MINERALS AND ENERGY

Maintain the availability of National Forest System lands for the exploration and development of mineral and energy resources consistent with protection of surface resources.

PEST MANAGEMENT

Provide an integrated pest management program to prevent or control insect and disease outbreaks on forest and rangeland resources. Eradicate Class A noxious weed populations within the Forest.

RANGE

Manage livestock to utilize available forage. Complete restoration of depleted rangelands and maintain suitable rangelands in satisfactory condition.

RECREATION

Provide a full range of developed and dispersed recreation opportunities at levels meeting projected demand and within the physical limits and resource capabilities of the Forest.

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.

Appendix A3. Management Direction - Standards and Guides of Mendocino National Forest

ble with other management objectives for given areas (e.g. riparian condition goals), and/or d) where current use is causing soil erosion or adverse impacts to riparian and watershed resources. Inventory and evaluate heritage resources before proceeding with the abandonment or elimination of existing trails or portions of trails.

16. Avoid developing or expanding recreation facilities within RMZs unless no other suitable locations can be found, riparian condition goals (see Forest Goals) can still be met, and design criteria to minimize impacts to the riparian area are utilized. Recreation facilities within the 100-year floodplain will be guided by Executive Orders 11514, 11988, 11990 (FSM 2527). Minimize impacts to riparian dependent resources when access to water oriented recreation must be located within RMZs.

17. Do not permit surface occupancy for mineral exploration, extraction or other operations within developed recreation sites under any proposed plan of operation.

18. Continue recreation special use tracts and special use permits for isolated cabins, unless a higher public need is identified through a future use determination. Future use determinations will be scheduled prior to expiration of existing permits to allow sufficient time for public comment and permittee notification.

19. Monitor and evaluate the impacts of dispersed and developed recreation in RMZs on riparian condition goals (see Forest Goals) and on anadromous fish during critical low flow periods. When riparian goals are not met or fish disturbance is too high, consider using area closures, public awareness/interpretive services, use limits, etc., to reduce impacts.

RESEARCH NATURAL AREAS

1. Complete Establishment Report documents for those areas recommended by the proposed Plan for establishment as Research Natural Areas within two years of Plan approval. Include specific recommendations for fire suppression.

2. Protect Candidate Research Natural Areas from activities which could detract from their inclusion in the RNA System until final classification decisions are reached.

3. Complete an inventory of potentially suitable Research Natural Areas representing the aquatic and geologic elements of the Research Natural Area System prior to scheduled Plan revision. This inventory should also include identification of areas to be considered for Special Interest Area classification as well as areas eligible for the National Registry of Natural Landmarks.

RIPARIAN AREAS

1. Protect riparian areas by establishing Riparian Management Zones (RMZs) to maintain desired ecological functions and processes in riparian and aquatic ecosystems. RMZ 1 is the area of primary importance, and RMZ 2 is a zone of consideration for impacts to the riparian ecosystem. These areas will be managed to protect and enhance riparian ecosystems and the dependent resources. The integrity and diversity of these areas will be maintained for use by both resident and migratory wildlife for cover, forage, breeding, travel, and resting areas.

RMZ 1 CLASS I AND CLASS II STREAMS—That area from the edge of the active stream channel to the top of the inner gorge; or to the extent of the associated high and extreme landslide areas; or to the extent of the 100 year flood plain; or to the outer edge of the riparian vegetation; or as wide as twice the height of the tallest tree the

Appendix A4. Management Prescription for Research Natural Area

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.

Appendix B. Plant list of Wilder Ridge RNA (from Rundel and Shultz 1992)

Table 2. Checklist of vascular plant species encountered in field studies at the Wilder Ridge cRNA. Taxonomy follows Munz (1968).

family	genus	species	growth form
Adiantaceae	Pityogramma	triangularis	herbaceous
Anacardiaceae	Rhus	diversilobum	woody
Apiaceae	Anthriscus	scandens	herbaceous
Apiaceae	Daucus	carota	herbaceous
Apiaceae	Lomatium	macrocarpum	herbaceous
Apiaceae	Lomatium	tomentella	herbaceous
Apiaceae	Sanicula	bipinnata	herbaceous
Asteraceae	Antennaria	sp.	herbaceous
Asteraceae	Centaurea	solstistialis	herbaceous
Asteraceae	Cirsium	coulteri	herbaceous
Asteraceae	Eriophyllum	confertifolium	herbaceous
Asteraceae	Haplopappus	linearifolius	woody
Asteraceae	Lessingia	sp.	herbaceous
Asteraceae	Senecio	sp.	herbaceous
Asteraceae	Stenotopsis	linearifolia	woody
Asteraceae	Stephanomeria	sp.	herbaceous
Asteraceae	Wyethia	angustifolia	herbaceous
Boraginaceae	Cryptantha	intermedia	herbaceous
Brassicaceae	Athysanus	sp.	herbaceous
Caprifoliaceae	Sambucus	sp.	woody
Caryophyllaceae	Symphoricarpos	sp.	woody
Caryophyllaceae	Tunica	prolifera	herbaceous
Cercidyphyllaceae	Cercis	occidentalis	woody
Cyperaceae	Carex	spp.	herbaceous
Ericaceae	Arcostaphylos	viscida	woody
Ericaceae	Arctostaphylos	manzanita	woody
Ericaceae	Arctostaphylos	glandulosa	woody
Euphorbiaceae	Euphorbia	spp.	herbaceous
Fabaceae	Cercis	occidentalis	woody
Fabaceae	Lotus	humistrataus	herbaceous
Fabaceae	Lupinus	spp.	herbaceous
Fabaceae	Medicago	lupulina	herbaceous
Fabaceae	Medicago	sativa	herbaceous
Fabaceae	Melilotus	indica	herbaceous
Fabaceae	Trifolium	spp.	herbaceous
Fagaceae	Quercus	douglasii	woody
Fagaceae	Quercus	dumosa	woody
Fagaceae	Quercus	wizlizenii	woody
Garryaceae	Garrya	elliptica	woody
Geraniaceae	Erodium	cicutaria	herbaceous
Geraniaceae	Geranium	sp.	herbaceous
Hippocastanaceae	Aesculus	californica	woody
Hydrophyllaceae	Eriodictyon	californicum	woody
Hydrophyllaceae	Gilia	capitata	herbaceous
Hydrophyllaceae	Phacelia	cicutaria	herbaceous
Lamiaceae	Monardella	macrantha	woody
Lamiaceae	Origanum	vulgare	herbaceous
Lamiaceae	Salvia	columbarae	herbaceous
Liliaceae	Brodaea	volubilis	herbaceous
Liliaceae	Brodaea	multiflora	herbaceous
Liliaceae	Calochortus	sp.	herbaceous
Liliaceae	Calochortus	luteus	herbaceous
Liliaceae	Chlorgallum	sp.	herbaceous

family	genus	species	growth form
Malvaceae	Sidalcea	sp.	herbaceous
Oleaceae	Fraxinus	dipetala	woody
Onagraceae	Epilobium	spp.	herbaceous
Orobanchaceae	Orobanche	uniflora	herbaceous
Pinaceae	Pinus	sabiniana	woody
Plantaginaceae	Plantago	hookeriana	herbaceous
Poaceae	Aira	caryophyllea	grass
Poaceae	Avena	barbata	grass
Poaceae	Bromus	rubens	grass
Poaceae	Bromus	mollis	grass
Poaceae	Bromus	rigidus	grass
Poaceae	Elymus	triticoides	grass
Poaceae	Lolium	perenne	grass
Poaceae	Melica	californica	grass
Poaceae	Poa	scabrella	grass
Poaceae	Polypogon	monspeliensis	grass
Poaceae	Sitanion	jubatum	grass
Poaceae	Sitanion	hystrix	grass
Poaceae	Elymus	caput-medusae	grass
Poaceae	Festuca	dertonensis	herbaceous (R)
Polemoniaceae	Eriastrum	brandegea	herbaceous
Polemoniaceae	Gilia	tenerrima	herbaceous
Polemoniaceae	Linanthus	ciliatus	herbaceous
Polemoniaceae	Navarretia	sp.	herbaceous
Polygonaceae	Eriogonum	nudum	woody
Polygonaceae	Eriogonum	sp.	herbaceous
Polygonaceae	Oxytheca	sp.	herbaceous
Polygonaceae	Rumex	salicifolius	woody
Rhamnaceae	Ceanothus	cuneatus	woody
Rhamnaceae	Rhamnus	croceus	woody
Rosaceae	Adenostoma	fasciculatum	woody
Rosaceae	Cercocarpus	betuloides	woody
Rosaceae	Heteromeles	arbutifolia	woody
Rubiaceae	Galium	bolanderi	woody
Salicaceae	Populus	trichocarpa	woody
Salicaceae	Populus	fremontii	woody
Salicaceae	Salix	spp.	woody
Scrophulariaceae	Antirrhinum	subcordatum	herbaceous (R)
Scrophulariaceae	Castilleja	sp. (white pubesc	herbaceous
Scrophulariaceae	Mimulus	guttatus	herbaceous
Viscaceae	Phoradendron	californicum	woody
Vitaceae	Vitis	californica	woody

Appendix C. List of fauna species generated by Wildlife Habitat Relationship (WHR) Model (Tatum 1996)

WILDLIFE LIST FOR WILDER RIDGE RNA

Status key: FE - Federally Endangered
FT - Federally Threatened
FP - Federally Proposed
FC - Federal Candidate
C1 - Category 1 Candidate State
C2 - Category 2 Candidate State
CE - California Endangered
CT - California Threatened
CP - California Proposed
CS - California Species of Special Concern

Habitat key: CR - chamise-redshank chaparral
MC - mixed chaparral
VF - valley-foothill hardwood
AG - annual grass
BA - barren/rock/cliff
ALL - all habitats combined

MAMMALS

Common name	Scientific name	Status	Habitat
Coyote	Canis latrans		CR,MC,VF,AG
Gray fox	Urocyon cinereoargenteus		CR,MC,VF,AG
Black-tailed hare	Lepus californicus		CR,MC,VF,AG
Brush rabbit	Sylvilagus bachmani		CR,MC,VF
Desert cottontail	Sylvilagus audubonii		CR,MC,VF,AG
California ground squirrel	Spermophilus beecheyi		ALL
Sonoma chipmunk	Tamias sonomae		CR,MC,BA
Pinyon mouse	Peromyscus truei		CR,MC,VF,BA
Deer mouse	Peromyscus maniculatus		ALL
Brush mouse	Peromyscus boylii		CR,MC,VF
Western harvest mouse	Reithrodontomys megalotis	R.m.limicola CS	ALL
California kangaroo rat	Dipodomys californicus		CR,MC,AG,BA
Dusky-footed woodrat	Neotoma fuscipes	N.f.riparia CS	CR,MC,VF
Long-tailed weasel	Mustela frenata		CR,MC,VF
Mountain lion	Felis concolor	CP	ALL
Bobcat	Felis rufus		ALL
Mule deer	Odocoileus hemionus		CR,MC,VF,AG
Wild pig	Sus scrofa		CR,MC,VF,AG
Spotted skunk	Spilogale gracilis	S.g.amphiala CS	CR,MC,VF,AG
Striped skunk	Mephitis mephitis		CR,MC,VF
Ringtail	Bassariscus astutus	CP	CR,MC,VF,BA
Trowbridge shrew	Sorex trowbridgii		CR,MC,VF
Little brown myotis	Myotis lucifugus	M.l.occultus CS	ALL
Yuma myotis	Myotis yumanensis	C2	VF
Long-eared myotis	Myotis evotis	FC	CR,MC,VF,BA
Long-legged myotis	Myotis volans	FC	ALL
California myotis	Myotis californicus		CR,MC,VF,BA
Western pipistrelle	Pipistrellus hesperus		ALL
Big brown bat	Eptesicus fuscus		CR,MC,VF,AG
Red bat	Lasiurus blossevillii		CR,MC,VF,AG
Hoary bat	Lasiurus cinereus		VF
Spotted bat	Euderma maculatum	CS, FC	ALL
Pallid bat	Antrozous pallidus		ALL
Townsend's big-eared bat	Plecotus townsendii	CS, FC	CR,MC,VF,AG
Mexican free-tailed bat	Tadarida brasiliensis		ALL
Western mastiff bat	Eumops perotis	CS, FC	ALL

REPTILES

Common name	Scientific name	Status	
Western fence lizard	Sceloporus occidentalis		ALL
Sagebrush lizard	Sceloporus graciosus		CR,MC,VF,BA
Coast horned lizard	Phrynosoma coronatum		VF,AG,BA
Western skink	Eumeces skiltonianus		VF,AG,BA
Western whiptail	Cnemidophorus tigris		ALL
Southern alligator lizard	Gerrhonotus multicarinatus		ALL
Ringneck snake	Diadophis punctatus		ALL
Racer	Coluber constrictor		ALL
Coachwhip	Masticophis flagellum		ALL
California whipsnake	Masticophis lateralis	M.l.euryxanthus CT	CR,MC,VF,BA
Gopher snake	Pituophis melanoleucus		ALL
Night snake	Hypsiglena torquata		CR,MC,VF,BA
Western rattlesnake	Crotalis viridis		ALL

NEOTROPICAL MIGRATORY BIRDS

Common name	Scientific name	Status	Habitat
Peregrine falcon	Falco peregrinus	FE,CE,CP	ALL
Merlin	Falco columbarius	CP,CS	VF,AG
Swainson's hawk	Buteo swainsoni	CT,CP	VF,AG,BA
Ferruginous hawk	Buteo regalis	C2,CP,CS	VF,AG BA
Nashville warbler	Vermivora ruficapilla		VF
Orange-crowned warbler	Vermivora celata		CR,MC,VF
Yellow warbler	Dendroica petechia	CS	VF
Black-throated gray warbler	Dendroica nigrescens		VF
Wilson's warbler	Wilsonia pusilla		CR,MC,VF
Black-headed grosbeak	Pheucticus melanocephalus		VF
Lazuli bunting	Passerina amoena		MC,VF
Chipping sparrow	Spizella passerina		VF
Black-chinned sparrow	Spizella atrogularis		CR,MC
Grasshopper sparrow	Ammodramus savannarum		AG
House wren	Troglodytes aedon		CR,MC,VF
Dark-eyed junco	Junco hyemalis		VF
Western tanager	Piranga ludoviciana		VF
Western kingbird	Tyrannus verticalis		VF,AG
Ash-throated flycatcher	Myiarchus cinerascens		CR,MC,VF
Western wood-peewee	Contopus sordidulus		VF
Solitary vireo	Vireo solitarius		VF
Black-chinned hummingbird	Archilochus alexandri		VF
Rufous hummingbird	Selasphorus rufus		CR,MC,VF
Common poorwill	Phalaenoptilus nuttallii		CR,MC,VF,BA
Cliff swallow	Hirundo pyrrhonota		VF,AG,BA
Violet-green swallow	Tachycineta thalassina		VF,AG,BA
Northern rough-winged swallow	Stelgidopteryx serripennis		ALL
Barn swallow	Hirundo rustica		CR,MC,VF,AG
White-throated swift	Aeronautes saxatalis		ALL
Blue-gray gnatcatcher	Polioptila caerulea		CR,MC,VF
Purple martin	Progne subis	CS	VF,AG

Warbling vireo	Vireo gilvus		VF
Northern oriole	Icterus galbula		VF

RESIDENCE

California quail	Callipepla californica		CR,MC,VF,AG
Mountain quail	Oreortyx pictus	C2	CR,MC,VF
Wild turkey	Meleagris gallopavo		VF,AG
Band-tailed pigeon	Columba fasciata		MC,VF
Mourning dove	Zenaida macroura		MC,VF,AG
Greater roadrunner	Geococcyx californianus		CR,MC,VF
Common raven	Corvus corax		ALL
American crow	Corvus brachyrhynchos		VF,AG
Scrub jay	Aphelocoma coerulescens		CR,MC,VF
Yellow-billed magpie	Pica nuttalli		VF,AG
Prairie falcon	Falco mexicanus	CP, CS	ALL
American kestrel	Falco sparverius	CP	ALL
Sharp-shinned hawk	Accipiter striatus	CP, CS	CR,MC,VF
Cooper's hawk	Accipiter cooperii	CP, CS	VF
Red-tailed hawk	Buteo jamaicensis	CP	ALL
Golden eagle	Aquila chrysaetos	CP, CS	CR,MC,VF,BA
Great horned owl	Bubo virginianus	CP	ALL
Common barn owl	Tyto alba	CP	ALL
Western screech owl	Otus kennicottii	CP	CR,MC,VF
Burrowing owl	Athene cunicularia	CP, CS, FC	ALL
Turkey vulture	Cathartes aura		ALL
Anna's hummingbird	Calypte anna		CR,MC,VF
Lewis' woodpecker	Melanerpes lewis		VF
Acorn woodpecker	Melanerpes formicivorus		VF
Nuttall's woodpecker	Picoides nuttallii		VF
Downy woodpecker	Picoides pubescens		VF
Hairy woodpecker	Picoides villosus		VF
Northern flicker	Colaptes auratus		MC,VF
Say's phoebe	Sayornis saya		CR,MC,AG,BA
Horned lark	Eremophila alpestris		VF,AG,BA
Bewick's wren	Thryomanes bewickii		CR,MC,VF
Rock wren	Salpinctes obsoletus		CR,MC,BA
Ruby-crowned kinglet	Regulus calendula		MC,VF
Western bluebird	Sialia mexicana		VF,AG
Mountain bluebird	Sialia currucoides		VF,AG
Varied thrush	Ixoreus naevius		CR,MC,VF
Wrentit	Chamaea fasciata		CR,MC,VF
Northern mockingbird	Mimus polyglottos		CR,MC,VF
Cedar waxwing	Bombycilla cedrorum		MC,VF
Phainopepla	Phainopepla nitens		CR,MC,VF
Loggerhead shrike	Lanius ludovicianus	C2, CS	VF,AG
Hutton's vireo	Vireo huttoni		MC,VF
Yellow-rumped warbler	Dendroica coronata		CR,MC,VF,AG
Townsend's warbler	Dendroica townsendi		VF
Hermit warbler	Dendroica occidentalis		VF
Rufous-sided towhee	Pipilo erythrophthalmus		CR,MC,VF

California towhee	Pipilo crissalis		CR,MC,VF
Lark sparrow	Chondestes grammacus		MC,VF,AG
Rufous-crowned sparrow	Aimophila ruficeps	C2	MC,AG,BA
Sage sparrow	Amphispiza belli		CR,MC
Fox sparrow	Passerella iliaca		MC,VF
Western meadowlark	Sturnella neglecta		VF,AG
House finch	Carpodacus mexicanus		CR,MC,VF,AG
Lesser goldfinch	Carduelis psaltria		CR,MC,VF
Lawrence's goldfinch	Carduelis lawrencei		CR,MC,VF,AG
American goldfinch	Carduelis tristis		CR,MC,VF
Plain titmouse	Parus inornatus		VF
Bushtit	Psaltriparus minimus		CR,MC,VF
White-breasted nuthatch	Sitta carolinensis		VF
California thrasher	Toxostoma redivivum		CR,MC,VF

Appendix D. Geology of Wilder Ridge RNA (Brooks 1995)

Wilder RNA

A geologic report is not know to have been written for the Wilder RNA. Since a Geology program no longer exists for the Mendocino National Forest, there is only a limited amount of material available to base a report. The geologic map for the area, copied from graduate thesis, indicates NNW trending bands of sedimentary material. The ridge along the west edge of the RNA is indicated as Jurassic conglomerate, which is overlain by Jurassic sandstone dipping east and extends to the middle of Section 26. Overlying the sandstone and extending to about the east edge of Section 26 are Jurassic mudstones.

These Jurassic rocks are known collectivly as the Great Valley Sequence and were deposited upon the Coast Range Ophiolite, a layering of peridotite, gabbro, basalt and sheeted dikes. In most places there has been extensive serpentinization of the peridotite. A sedimentary contact between the Great Valley Sequence and the ophiolite was discovered by Dr. M.C. (Clark) Blake north of Paskenta, however in the vicinity of the Wilder RNA the contact is a thrust fault known as the Stony Creek Fault. The lower member of the the Stony Creek Formation consists of over 4000 feet of mudstone, siltstone and recemented conglomerate ascribed to the Tithonian stage of the Upper Jurassic. This age determined by the presence of Buchia piochii fossils. The coarse grained deposits, such as conglomerates are thought to have been derived from the ancestral Klamath and Sierra Nevada mountains

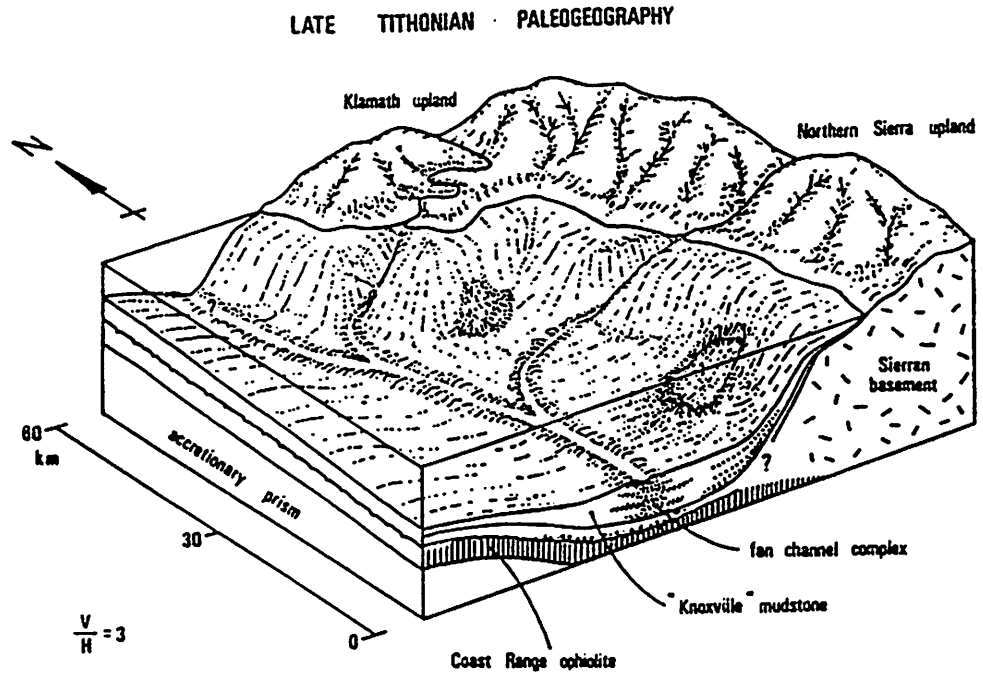
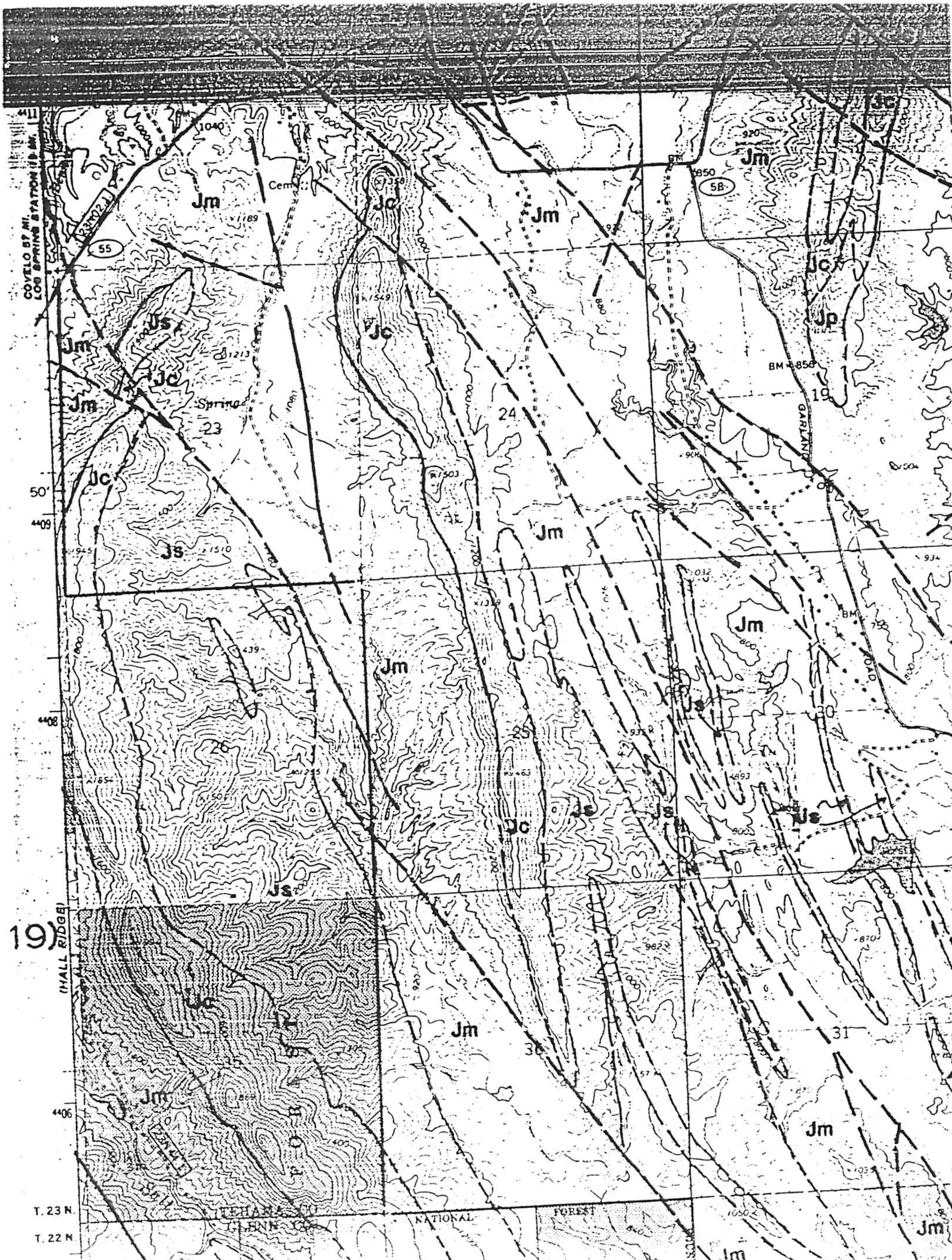


Figure 15. Paleogeographic setting of conglomerate-sandstone lenses of the Stony Creek Formation.

19)


COVELO 57 MI.
LOG SPRING STATION 10 MI.
Jm
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Js
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BM 856
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GARLAND
ROAD
50'
4409
4408
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4411
(HALL RIDGE)
T. 23 N.
T. 22 N.
TEHAMA CO
GLENN CO
NATIONAL
FOREST

Appendix E. Descriptions of soil types in the Wilder Ridge RNA (from U.S.D.A. 1967)

Cohasset gravelly loam, 30 to 50 percent slopes (CfE).—Because of its steep slopes, it is difficult to cultivate this soil and to harvest timber from it. Capability unit VIe–4.

Colluvial Land, Sedimentary Rocks

Colluvial land, sedimentary rocks (ClF) consists of areas of loose rock and soil material. Slopes are very steep. The rocks are of sandstone, shale, and mica schist. Most areas are in the mountains on the west side of the county and have a dense cover of hardwoods or shrubs.

Included in mapping are small areas of Hugo, Josephine, Los Gatos, Maymen, Sheetiron, and Tyson soils.

Little use is made of areas of Colluvial land, sedimentary rocks, other than to provide browse and cover for wildlife. Capability unit VIIIs–8.

Colluvial Land, Volcanic Rocks

Colluvial land, volcanic rocks (CkF) is made up of areas of loose rock and soil material. Slopes are very steep. The rocks are from volcanic flow or are volcanic breccia. Most areas are in the eastern part of the county. The vegetation is grass, hardwoods, shrubs, and conifers.

Included in mapping are areas of Iron Mountain, McCarthy, Supan, Toomes, and Windy soils.

Some areas of Colluvial land, volcanic rocks, are used for limited grazing. Timber has been harvested from a few areas. Capability unit VIIs–7.

Columbia Series

The Columbia series consists of nearly level to gently sloping, brown, well-drained, neutral soils that are medium textured to moderately coarse textured. These soils formed in alluvium from sedimentary, metamorphic, and igneous rocks. They are on recent flood plains along the Sacramento River and Cottonwood Creek. The vegetation is hardwoods, shrubs, and grass.

Row crops, field crops, and orchard crops grow well in most areas of these soils. The soils are generally easy to cultivate and are located where water is available for irrigation. In areas near the Sacramento River the soils are cut by partly abandoned stream channels, and in places near the river they are subject to overflow during winters of high rainfall. Flooding has been considerably reduced, however, since Shasta Dam was built. The dam is about 40 miles north of Red Bluff on the Sacramento River.

Profile of Columbia silt loam in a nearly level grazing area that is cut by an abandoned stream channel; under a dense growth of valley oaks, sycamores, California wild grapes, wild carrots, bull thistles, and annual and perennial grasses (about 1 mile south and 5 miles east of Kirkwood or east of the center of the NW¼NE¼NE¼ sec. 22, T. 23 N., R. 2 W.):

A1 and C1—0 to 26 inches, brown (10YR 5/3) silt loam, dark brown (10YR 4/3) when moist; massive; hard when dry, friable when moist, slightly sticky when wet; many fine and medium pores and holes left by roots and worms; many fine roots; neutral; clear, smooth boundary.

C2—26 to 72 inches +, brown (10YR 5/3) fine sandy loam, dark brown (10YR 4/3) when moist; massive; slightly hard when dry, friable when moist, nonsticky when wet; many fine and medium pores; a few fine roots, and a few large roots; neutral; this horizon is stratified with layers of sand that are 2 to 4 inches thick.

These soils range in color from brown and pale brown to grayish brown throughout. Where organic matter has accumulated on the surface, an A horizon has formed, and the surface soil is a little darker than the horizons below. Texture of the surface soil ranges from silt loam to loamy sand, and in places near the river the subsoil is gravelly. These soils are slightly acid to neutral in the surface soil and neutral to mildly alkaline in the subsoil. The lower part of the subsoil is very slightly calcareous in places.

Columbia fine sandy loam, 0 to 3 percent slopes (CmA).—This soil is on flood plains along the Sacramento River and Cottonwood Creek, and some areas are 100 acres or more in size. Most areas are nearly level and smooth and have been cut by abandoned stream channels in a few places. Drainage is good, runoff is very slow, and permeability is moderately rapid. The available water holding capacity and fertility are moderate. Plants growing in the greenhouse on this soil respond to fertilizer that contains nitrogen and phosphate. Streambank erosion is a hazard to areas that adjoin the main stream channel. The soil is easy to cultivate.

Included with this soil in mapping are small areas that have a gravelly subsoil and some areas of Zamora soils.

If this Columbia fine sandy loam is irrigated, alfalfa, beans, corn, milo, melons, sugarbeets, almonds, peaches, walnuts, and prunes are grown. Areas that are not clear of vegetation are used for grazing. Capability unit I–1.

Columbia fine sandy loam, moderately deep, 0 to 3 percent slopes (Cn).—This soil has a layer of gravel and sand at a depth of 30 to 40 inches but is otherwise similar to Columbia fine sandy loam, 0 to 3 percent slopes. In some places the gravelly and sandy layer is several feet thick. The areas are near the Sacramento River and are generally subject to overflow during winter when rainfall is high. Most areas are fairly smooth, but a few areas are cut by channels of abandoned streams.

Many kinds of crops grow well on this soil. The gravelly and sandy subsoil make this soil somewhat droughty. Irrigation runs should therefore be shorter and the water applied more frequently than on Columbia fine sandy loam, 0 to 3 percent slopes. Capability unit IIs–0.

Columbia fine sandy loam, 3 to 8 percent slopes (CmB).—This soil is in areas that are cut by several channels of abandoned streams. The surface is mostly smooth but is partly rounded in places cut by stream channels. Runoff is slow, and the erosion hazard is slight.

Crops grown on this soil are similar to those grown on Columbia fine sandy loam, 0 to 3 percent slopes. The areas must be leveled before they can be irrigated or before overhead sprinklers can be used. Capability unit IIe–1.

Columbia loam, 0 to 3 percent slopes (Co).—This soil is loam throughout the profile but is otherwise similar to Columbia fine sandy loam, 0 to 3 percent slopes. The available water holding capacity is high. Water moves through the soil at a moderate rate. Capability unit I–1.

Columbia loamy fine sand, 1 to 8 percent slopes (CpB).—Except for the texture of the surface soil, this soil is similar to Columbia fine sandy loam, 0 to 3 percent slopes. Water moves through it more rapidly than

soil. Depth to dense, cemented tuff ranges from 15 to 36 inches. Except along cracks, roots and water penetrate this tuff very slowly. The erosion hazard is slight.

Included with this soil in mapping are small areas of Inks and Tuscan soils.

Most areas of this Laniger soil are too uneven and too shallow to be used intensively for agriculture. All of the soil is therefore used for pasture and range. Some areas were used as feeding sites during winter. In such areas excessive trampling by livestock has exposed the soil to wind and caused blowouts to form. Capability unit IVe–8.

Laniger fine sandy loam, 8 to 30 percent slopes (LaD).—This soil is on moderately steep, rounded hills and on ledges around breaks of terraces. Depth to the massive tuff ranges from 15 to 30 inches. The erosion hazard is moderate to severe.

Included with this soil in mapping are areas of Newville and Tuscan soils. This Laniger soil is used for pasture and range. In most areas the slopes are short and too uneven for the soil to be used intensively for agriculture. Capability unit VIe–8.

Laniger fine sandy loam, 30 to 50 percent slopes (LaE).—This soil is on the strata of tuff that are exposed on the slopes of terrace breaks. The erosion hazard is severe. The soil is used for pasture and range. Capability unit VIe–8.

Laniger fine sandy loam, deep, 0 to 8 percent slopes (LeB).—This soil is on low rounded hills that have somewhat uneven slopes. It is deeper to the massive tuff but is otherwise similar to Laniger fine sandy loam, 0 to 8 percent slopes. Depth to the massive tuff ranges from 30 to 48 inches.

Included with this soil in mapping are small areas of Tuscan soils.

This Laniger soil is used for pasture and range. In areas where irrigation water is available, it is suited to specialty crops. The hazard of erosion increases in cultivated areas. Capability unit IVe–8.

Lodo Series

In the Lodo series are moderately steep to very steep, somewhat excessively drained soils. These soils formed in material from hard, dark-gray shale that weathers and cracks to fine, angular gravel. They are pale-brown, slightly acid shaly loam throughout.

The available water holding capacity and fertility are low. Permeability is moderate, and runoff is medium to rapid. The erosion hazard is moderate on slopes of 10 to 30 percent but severe on steeper slopes. Depth to partly weathered and fractured shale ranges from 6 to 10 inches on slopes of 30 to 65 percent but is as much as 12 inches where slopes are 10 to 30 percent. Except along cracks, roots and water penetrate the shale to a limited depth.

Lodo soils are in foothills and mountainous areas in the western part of the county. The size and shape of the areas vary considerably. In places the areas are as small as 10 acres or less, and in other places they are as large as 500 acres. Slopes vary in length, and in many places are cut by short streams. In most places small patches of shale are exposed. In places small areas of the Millsholm and Millsap soils and of Rock land are within areas of the Lodo soils.

The vegetation is mostly a sparse cover of grasses and forbs but includes a few scattered oaks and shrubs. Lodo soils are used for pasture and range. Yields of forage are better on slopes of 10 to 30 percent than on steeper slopes, and the quality is better.

Soils of the Lodo series are mapped only as undifferentiated units with the Maymen soils or as complexes with the Millsholm and Hillgate soils. The Maymen, Millsholm, and Hillgate soils are described under their respective series.

Profile of Lodo shaly loam on a slope of 15 percent that faces south in a field used for grazing cattle in winter and spring; under a cover of annual grasses and forbs and blue oaks and shrubs (1½ miles north of Cold Fork in the SE¼NE¼ sec. 18, T. 27 N., R. 7 W.):

A1—0 to 7 inches, pale-brown (10YR 6/3) shaly loam, brown (10YR 5/3) when moist; weak, coarse, subangular blocky structure; soft when dry, very friable when moist, nonsticky when wet; many fine roots; many fine and medium pores; 20 to 30 percent of the soil is fine, angular shale fragments; slightly acid.

R—7 inches +, fractured dark-gray shale.

These soils are pale brown, brown, or gravish brown in color, but they appear darker because of the dark-gray shale fragments they contain. They range from slightly acid to neutral. Depth of the soils varies within short distances.

Lodo and Maymen shaly loams, 30 to 65 percent slopes, eroded (LdE2).—This mapping unit consists of Lodo shaly loam, 30 to 65 percent slopes, eroded, and of Maymen gravelly loam, 30 to 65 percent slopes (fig. 3). Either soil may occupy from 40 to 60 percent of any one area. The soils are in mountainous areas, and some areas are more than 500 acres in size.

The erosion hazard is severe to very severe on the Lodo and Maymen soils. Depth to partly weathered, fractured rock ranges from 6 to 10 inches in the Lodo soil but is 6 to 20 inches in the Maymen. Roots and water penetrate the shale underlying the Lodo soil to a limited depth, except along cracks in the shale. Penetration of the hard, fairly dense rock underlying the Maymen soil is slow.

Except in areas where the soil is deeper, yields of annual grasses and forbs used for forage are very low on the Lodo soil. The large amount of shale fragments in the soil and shallowness of the soil to shale reduce yields. Dense stands of brush cover the Maymen soil. Both parts, capability unit VIIs–8.

Lodo and Maymen shaly loams, 10 to 30 percent slopes, eroded (LdD2).—This mapping unit consists of Lodo shaly loam, 10 to 30 percent slopes, eroded, and Maymen gravelly loam, 10 to 30 percent slopes. Either soil may occupy from 40 to 60 percent of any one area. Both soils, capability unit VIIs–7.

Lodo-Millsholm complex, 10 to 30 percent slopes (LfD).—This complex consists of Lodo shaly loam, 10 to 30 percent slopes, eroded, and Millsholm clay loam, 10 to 30 percent slopes. Either soil may occupy from 40 to 60 percent of any one area. The areas are 10 acres or less in size in many places. Lodo part, capability unit VIIs–7; Millsholm part, capability unit IVe–5.

Lodo-Millsholm complex, 30 to 50 percent slopes (LfE).—This complex consists of Lodo shaly clay loam, 30 to 65 percent slopes, eroded, and Millsholm clay loam, 30 to 50 percent slopes. Either soil may occupy from 40 to 60 percent of any one area. Each area is 10 acres or less in size.

799–518—66——4

soil. Depth to dense, cemented tuff ranges from 15 to 36 inches. Except along cracks, roots and water penetrate this tuff very slowly. The erosion hazard is slight.

Included with this soil in mapping are small areas of Inks and Tuscan soils.

Most areas of this Laniger soil are too uneven and too shallow to be used intensively for agriculture. All of the soil is therefore used for pasture and range. Some areas were used as feeding sites during winter. In such areas excessive trampling by livestock has exposed the soil to wind and caused blowouts to form. Capability unit IVe–8.

Laniger fine sandy loam, 8 to 30 percent slopes (LaD).—This soil is on moderately steep, rounded hills and on ledges around breaks of terraces. Depth to the massive tuff ranges from 15 to 30 inches. The erosion hazard is moderate to severe.

Included with this soil in mapping are areas of Newville and Tuscan soils. This Laniger soil is used for pasture and range. In most areas the slopes are short and too uneven for the soil to be used intensively for agriculture. Capability unit VIe–8.

Laniger fine sandy loam, 30 to 50 percent slopes (LaE).—This soil is on the strata of tuff that are exposed on the slopes of terrace breaks. The erosion hazard is severe. The soil is used for pasture and range. Capability unit VIe–8.

Laniger fine sandy loam, deep, 0 to 8 percent slopes (LeB).—This soil is on low rounded hills that have somewhat uneven slopes. It is deeper to the massive tuff but is otherwise similar to Laniger fine sandy loam, 0 to 8 percent slopes. Depth to the massive tuff ranges from 30 to 48 inches.

Included with this soil in mapping are small areas of Tuscan soils.

This Laniger soil is used for pasture and range. In areas where irrigation water is available, it is suited to specialty crops. The hazard of erosion increases in cultivated areas. Capability unit IVe–8.

Lodo Series

In the Lodo series are moderately steep to very steep, somewhat excessively drained soils. These soils formed in material from hard, dark-gray shale that weathers and cracks to fine, angular gravel. They are pale-brown, slightly acid shaly loam throughout.

The available water holding capacity and fertility are low. Permeability is moderate, and runoff is medium to rapid. The erosion hazard is moderate on slopes of 10 to 30 percent but severe on steeper slopes. Depth to partly weathered and fractured shale ranges from 6 to 10 inches on slopes of 30 to 65 percent but is as much as 12 inches where slopes are 10 to 30 percent. Except along cracks, roots and water penetrate the shale to a limited depth.

Lodo soils are in foothills and mountainous areas in the western part of the county. The size and shape of the areas vary considerably. In places the areas are as small as 10 acres or less, and in other places they are as large as 500 acres. Slopes vary in length, and in many places are cut by short streams. In most places small patches of shale are exposed. In places small areas of the Millsholm and Millsap soils and of Rock land are within areas of the Lodo soils.

799-518—66——4

The vegetation is mostly a sparse cover of grasses and forbs but includes a few scattered oaks and shrubs. Lodo soils are used for pasture and range. Yields of forage are better on slopes of 10 to 30 percent than on steeper slopes, and the quality is better.

Soils of the Lodo series are mapped only as undifferentiated units with the Maymen soils or as complexes with the Millsholm and Hillgate soils. The Maymen, Millsholm, and Hillgate soils are described under their respective series.

Profile of Lodo shaly loam on a slope of 15 percent that faces south in a field used for grazing cattle in winter and spring; under a cover of annual grasses and forbs and blue oaks and shrubs (1½ miles north of Cold Fork in the SE¼NE¼ sec. 18, T. 27 N., R. 7 W.):

A1—0 to 7 inches, pale-brown (10YR 6/3) shaly loam, brown (10YR 5/3) when moist; weak, coarse, subangular blocky structure; soft when dry, very friable when moist, nonsticky when wet; many fine roots; many fine and medium pores; 20 to 30 percent of the soil is fine, angular shale fragments; slightly acid.

R—7 inches +, fractured dark-gray shale.

These soils are pale brown, brown, or gravish brown in color, but they appear darker because of the dark-gray shale fragments they contain. They range from slightly acid to neutral. Depth of the soils varies within short distances.

Lodo and Maymen shaly loams, 30 to 65 percent slopes, eroded (LdE2).—This mapping unit consists of Lodo shaly loam, 30 to 65 percent slopes, eroded, and of Maymen gravelly loam, 30 to 65 percent slopes (fig. 3). Either soil may occupy from 40 to 60 percent of any one area. The soils are in mountainous areas, and some areas are more than 500 acres in size.

The erosion hazard is severe to very severe on the Lodo and Maymen soils. Depth to partly weathered, fractured rock ranges from 6 to 10 inches in the Lodo soil but is 6 to 20 inches in the Maymen. Roots and water penetrate the shale underlying the Lodo soil to a limited depth, except along cracks in the shale. Penetration of the hard, fairly dense rock underlying the Maymen soil is slow.

Except in areas where the soil is deeper, yields of annual grasses and forbs used for forage are very low on the Lodo soil. The large amount of shale fragments in the soil and shallowness of the soil to shale reduce yields. Dense stands of brush cover the Maymen soil. Both parts, capability unit VIIIs–8.

Lodo and Maymen shaly loams, 10 to 30 percent slopes, eroded (LdD2).—This mapping unit consists of Lodo shaly loam, 10 to 30 percent slopes, eroded, and Maymen gravelly loam, 10 to 30 percent slopes. Either soil may occupy from 40 to 60 percent of any one area. Both soils, capability unit VIIs–7.

Lodo-Millsholm complex, 10 to 30 percent slopes (LfD).—This complex consists of Lodo shaly loam, 10 to 30 percent slopes, eroded, and Millsholm clay loam, 10 to 30 percent slopes. Either soil may occupy from 40 to 60 percent of any one area. The areas are 10 acres or less in size in many places. Lodo part, capability unit VIIs–7; Millsholm part, capability unit IVe–5.

Lodo-Millsholm complex, 30 to 50 percent slopes (LfE).—This complex consists of Lodo shaly clay loam, 30 to 65 percent slopes, eroded, and Millsholm clay loam, 30 to 50 percent slopes. Either soil may occupy from 40 to 60 percent of any one area. Each area is 10 acres or less in size.

lar fragments of quartzite; slightly acid; clear, irregular boundary. 3 to 8 inches thick.

B2t—8 to 19 inches, brown (7.5YR 4/4) gravelly loam, dark brown when moist; moderate, medium, subangular blocky structure that breaks to strong, fine, granular; slightly hard when dry, friable when moist; nonsticky when wet; many roots; very porous; strongly acid; clear, irregular boundary. 8 to 20 inches thick.

C1—19 to 37 inches, light yellowish-brown (10YR 6/4) very gravelly loam, yellowish brown (10YR 5/6) when moist; strongly acid; moderate, medium, subangular blocky structure that breaks to strong, fine, granular; slightly hard when dry; friable when moist; nonsticky when wet; a few roots; very porous; strongly acid; abrupt, very irregular boundary. 12 to 30 inches thick.

R—37 inches +, broken, partly weathered, light-colored, hard schist; in places roots of medium size penetrate the rock to a depth of many feet.

The surface layer is brown or dark brown. The upper part of the subsoil is brown or yellowish brown, and the lower part is brownish yellow or light yellowish brown. Texture of the surface layer is sandy loam or loam, and that of the subsoil is loam or loam near clay loam. The soils are gravelly or very gravelly and have cobblestones in places. The surface soil is slightly acid or medium acid, and the subsoil is medium acid or strongly acid. Depth to partly weathered rock ranges from 20 to 48 inches.

Masterson gravelly loam, 10 to 30 percent slopes (MbD).—This is the only Masterson soil mapped in the county. It is on the more nearly level ridges on top of the Coast Range Mountains in the western part of the county. The ridgetops are partly rounded and have an uneven surface because of drainageways that cut through the areas. Depth to broken and weathered schist is 20 to 40 inches.

This soil is well drained. Runoff is slow to medium, and permeability is moderately rapid. The available water holding capacity and fertility are moderate to low, depending on the soil depth. The erosion hazard is moderate.

Included with this soil in mapping are small areas of Sheetiron and Yollabolly soils.

This Masterson soil is used for timber. White fir is dominant, but a few sugar pine and Douglas-fir trees grow in the area. In a few places at elevations of more than 6,000 feet, red fir is dominant. Christmas trees are harvested from a few areas. Campsites and homesites are located in several gently sloping areas because springs flow along the lower edges of this soil. Capability unit IVe–4.

Maymen Series

The Maymen series consists of steep to very steep, shallow, somewhat excessively drained soils. These soils formed in material from such sedimentary and metamorphic rocks as hard sandstone, shale, and mica schist. The soils are brown, medium textured, and slightly acid throughout.

These soils are moderately permeable. The available water holding capacity and fertility are low. Runoff is medium to rapid, and the erosion hazard is moderate. Depth to broken and partly weathered rock ranges from 6 to 20 inches, but some areas of gravelly loam, where the slope ranges from 10 to 30 percent, are likely to be deeper in places. The rock is hard and relatively dense, and roots and water penetrate it slowly.

Maymen soils are under a dense cover of shrubs in narrow, mountainous areas in the western part of the county at elevations of 1,000 to 4,000 feet. Most of the areas vary considerably in size and shape, and some areas of gravelly loam, where the slope ranges from 30 to 65 percent, are more than 500 acres in size. The areas are cut by streams. Deep canyons have formed, and the surface is therefore uneven. In places rocks outcrop. In places small areas of Los Gatos and Parrish soils and of Rock land are within areas of Maymen soils.

Soils of the Maymen series are mapped only as undifferentiated units with the Lodo soils or as complexes with the Los Gatos soils. The Lodo and Los Gatos soils are described under their respective series.

Profile of Maymen gravelly loam on a slope of 30 percent that faces south; under a dense stand of shrubs; elevation of 2,100 feet (2½ miles south and 1 mile west of Cold Fork, near the center of the SE¼ sec. 31, T. 27 N., R. 7 W.):

A11—0 to 1 inch, brown (10YR 5/3) gravelly loam, dark brown (10YR 3/3) when moist; weak, thick, platy structure; slightly hard when dry, very friable when moist, nonsticky when wet; many fine roots and pores; a few angular fragments of shale; slightly acid; abrupt, smooth boundary. 1 to 2 inches thick.

A12—1 to 7 inches, brown (10YR 5/3) gravelly loam, dark brown (10YR 3/3) when moist; medium, subangular blocky structure; slightly hard when dry, very friable when moist, nonsticky when wet; slightly acid; abrupt, irregular boundary. 5 to 18 inches thick.

R—7 inches +, partly weathered, fractured, hard, gray shale.

In color the soils are brown, pale brown, light brownish gray, or light gray throughout, but in places the surface horizon is thin and darker colored. The soils range from slightly acid to medium acid. The texture ranges from loam to sandy loam and in places is gravelly, shaly, or stony.

Maymen and Lodo gravelly loams, 30 to 65 percent slopes (MbgE).—This mapping unit consists of Maymen gravelly loam, 30 to 65 percent slopes, and of Lodo shaly loam, 30 to 65 percent slopes, eroded. Either soil may make up from 20 to 80 percent of any one area. These soils are in mountainous areas in the western part of the county.

The erosion hazard is severe to very severe. Depth to broken and partly weathered rock ranges from 6 to 20 inches in the Maymen soil but is 6 to 10 inches in the Lodo. Roots and water penetrate the hard, fairly dense rock underlying the Maymen soil very slowly. Penetration of the shale underlying the Lodo soil is limited, except along cracks in the shale.

Chamise, wedgeleaf ceanothus, and common manzanita are dominant on the Maymen soil. These shrubs protect the watershed and provide cover and browse for wildlife. Except in areas where the soil is deeper, yields of annual grasses and forbs on the Lodo soil are very low. Both parts, capability unit VIIIs–8.

Maywood Series

The Maywood series consists of nearly level, well-drained soils formed in recent alluvium. The alluvium was derived mainly from softly consolidated sedimentary rocks. Maywood soils are pale brown, medium textured and neutral or slightly acid throughout. They are on flood plains west of the Sacramento River at elevations that range from 200 to 500 feet. Nearly all of the acreage is cultivated.

areas the soils are more than 5 percent angular fragments of rock.

Millsap loam, 30 to 50 percent slopes (MsE).—This moderately deep soil is on rounded hills in the western part of the county. The surface is uneven because of streams and rock outcrops.

This soil is well drained. Runoff is rapid, and permeability is slow. The surface layer, a loam to clay loam 10 to 15 inches thick, overlies a clayey subsoil. Roots and water penetrate the clayey subsoil slowly. Broken, partly weathered sandstone is at a depth of 24 to 36 inches. Angular fragments of sandstone, some of which are nearly 3 feet in diameter, cover 5 percent of the surface in places and in other places nearly 10 percent. The available water holding capacity and fertility are low, and the erosion hazard is severe.

Included with this soil in mapping are small areas of Millsholm, Sehorn, and Lodo soils. All of this Millsap soil is used for pasture and range. The quality of the forage is fair. The value of the forage is decreased in most areas because a fairly dense stand of blue oak, Digger pine, common manzanita, and wedgeleaf ceanothus grows on the areas. Capability unit VIe–3.

Millsap loam, 10 to 30 percent slopes (MsD).—This soil is along ridges and benchlike areas near steeper slopes but is otherwise similar to Millsap loam, 30 to 50 percent slopes. Seeding, fertilizing, removal of trees, and similar management practices are easier to apply in pastures on this soil. Also, cattle cause less trailing. Runoff is medium. The erosion hazard is moderate. Capability unit IVe–3.

Millsap loam, 50 to 65 percent slopes (MsF).—This soil has steeper slopes but is otherwise similar to Millsap loam, 30 to 50 percent slopes. It is on the walls of deep canyons. In many areas stands of trees and shrubs are very dense. Runoff is very rapid, and the erosion hazard is very severe. Cattle trails are well entrenched on the contour across these areas, and some of the trails cause landslips during wet winters. This soil has low value for pasture and range because it is difficult for cattle to graze on the very steep slopes. Capability unit VIIe–3.

Millsholm Series

The Millsholm series consists of hilly to steep soils formed in material from sandstone, shale, and conglomerate. These soils are brown to pale brown, moderately coarse textured to moderately fine textured, and slightly acid to neutral throughout. They are shallow and well drained, and are near rock outcrops in many places. Millsholm soils are in foothills in the western part of the county at elevations of 500 to 2,000 feet. The vegetation is grasses or blue oaks and grasses. Most of the acreage is used for pasture and range.

Profile of Millsholm clay loam on a slope of 35 percent that faces south; area is under grasses and blue oaks and is used by cattle for winter grazing; elevation of 1,200 feet (4 miles north and 1 mile west of Cold Fork in the NE¼ sec. 6, T. 27 N., R. 7 W.):

A1—0 to 2 inches, yellowish-brown (10YR 5/4) light clay loam, dark brown (10YR 3/3) when moist; weak, thick, platy structure; slightly hard when dry, friable when moist, slightly sticky when wet; many fine roots and pores; neutral; abrupt, wavy boundary. 1 to 3 inches thick.

A12—2 to 9 inches, yellowish-brown (10YR 5/4) clay loam, dark brown (10YR 4/3) when moist; moderate, coarse, subangular blocky structure; hard when dry, firm when moist, sticky when wet; many fine roots; many fine and medium pores; neutral; gradual, irregular boundary. 5 to 10 inches thick.

C1—9 to 14 inches, yellowish-brown (10YR 5/4) clay loam, dark brown (10YR 4/3) when moist; moderate, coarse, subangular blocky structure; hard when dry, firm when moist, sticky when wet; slightly acid; clear, irregular boundary. 4 to 8 inches thick.

C2—14 to 16 inches, light yellowish-brown (10YR 6/4) very gravelly clay loam, dark yellowish brown (10YR 4/4) when moist; massive; hard when dry, firm when moist, sticky when wet; a few fine roots; many fine and medium pores; thin, continuous clay films in pores and around rocks; slightly acid; abrupt, irregular boundary. 2 to 10 inches thick.

R—16 inches +, hard, dark-gray shale that is partly weathered to a light-brown color on the exposed faces and is fractured and broken to a depth of several feet.

The color of the surface layer ranges from yellowish brown to pale brown or brown, and the subsoil is about the same range in color or is a little lighter. These soils range from neutral to slightly acid throughout. In most areas rock outcrops are common.

Millsholm clay loam, 10 to 30 percent slopes (MtD).—This soil is on low rounded hills. It has a somewhat uneven surface because of short streams that cut the areas and a few rock outcrops. This soil is one of the most important soils for pasture and range in the western part of the county in areas that are underlain by hard sandstone. Some of the areas are more than 1,000 acres in size.

This soil is well drained. Runoff is medium, and permeability is moderate. The available water holding capacity and fertility are low. The platy surface soil, common in many areas, slows the movement of water into the soil and also restricts penetration of roots. Depth to hard, brown, partly weathered sandstone ranges from 12 to 30 inches but is predominantly about 15 inches. Roots and water penetrate this rock slowly. The erosion hazard is moderate.

Included with this soil in mapping are small areas of Lodo, Millsap, and Sehorn soils.

This Millsholm soil is used for pasture and range and for dryfarmed grain. Desirable annual grasses and forbs are the dominant range plants. In excessively grazed areas, however, undesirable grasses and forbs are dominant and sheet erosion is evident in places. In some areas this soil is too shallow to hold enough moisture for plants, especially during years of low rainfall. Dryfarmed grain is grown in a few areas, but in most areas the soil is too shallow to consistently produce good yields. In addition, uneven slopes, and in places stones on the surface, interfere with cultivation. Capability unit IVe–5.

Millsholm clay loam, 30 to 50 percent slopes (MtE).—Most of this soil is on the steep slopes of rounded hills in the western part of the county, but a small acreage is in the deep canyons of Deer, Mill, and Antelope Creeks east of the Sacramento River. The surface is uneven because of short streams and rock outcrops. Depth of the soil to partly weathered sandstone ranges from 12 to 30 inches. Sandstone fragments, some of which are 3 feet wide, cover 1 to 10 percent of the surface in places. Runoff is medium to rapid, and the erosion hazard is severe.

Included with this soil in mapping are small areas of Lodo, Millsap, and Sehorn soils.

All of this Millsholm soil is used for pasture and range, mostly for cattle, but sheep also graze the areas. The density of stands of blue oaks on this soil varies. On slopes that face north, blue oaks cover 50 to 80 percent of the area, and on slopes that face south, they cover 10 to 50 percent of the area. A few areas have been cleared of oaks, and in these areas the forage is generally of greater value. Capability unit VIe–5.

Millsholm clay loam, 50 to 65 percent slopes (MtF).—This soil has very steep, irregular slopes, but it is otherwise similar to Millsholm clay loam, 30 to 50 percent slopes. Areas of this soil are used for pasture and range. The erosion hazard is very severe. Capability unit VIIe–5.

Millsholm rocky sandy loam, 30 to 50 percent slopes (MuE).—This soil is on partly rounded hills in the western part of the county. It formed in material from hard conglomerate. Stones, some of which are nearly 3 feet in diameter, are scattered over 1 to 10 percent of the surface. Runoff is rapid, and the erosion hazard is severe.

Included with this soil in mapping are rock outcrops and small areas of Sehorn soils.

All of this Millsholm soil is used for pasture and range. Capability unit VIIs–7.

Millsholm rocky sandy loam, 50 to 65 percent slopes (MuF).—This soil has steeper slopes but is otherwise similar to Millsholm rocky sandy loam, 30 to 50 percent slopes. Runoff is very rapid, and the erosion hazard is very severe.

All of this soil is used for pasture and range, though the very steep slopes make it difficult for cattle and sheep to graze the areas. Capability unit VIIs–7.

Millsholm-Millsap complex, 10 to 30 percent slopes (MvD).—This complex consists of Millsholm clay loam, 10 to 30 percent slopes, and Millsap loam, 10 to 30 percent slopes. Either soil may occupy from 20 to 80 percent of any one area. Millsholm part, capability unit IVe–5; Millsap part, capability unit IVe–3.

Millsholm-Millsap complex, 30 to 50 percent slopes (MvE).—This complex consists of Millsholm clay loam, 30 to 50 percent slopes, and Millsap loam, 30 to 50 percent slopes. Either soil may occupy from 20 to 80 percent of any one area. Millsholm part, capability unit VIe–5; Millsap part, capability unit VIe–3.

Millsholm-Millsap complex, 50 to 65 percent slopes (MvF).—This complex consists of Millsholm clay loam, 50 to 65 percent slopes, and Millsap loam, 50 to 65 percent slopes. Either soil may occupy from 20 to 80 percent of any one area. Millsholm part, capability unit VIIe–5; Millsap part, capability unit VIIe–3.

Moda Series

In the Moda series are nearly level to gently sloping, well-drained soils that are moderately deep to an indurated hardpan. These soils formed in old alluvium derived from sedimentary rock. The surface soil is yellowish brown, medium textured, and slightly acid. The subsoil is brown that grades toward reddish brown and is neutral and is moderately fine to fine textured. Moda soils are on terraces, mainly west of the Sacramento River at elevations of 250 to 500 feet. All the acreage has been cultivated.

Profile of Moda loam in a nearly level area under oat hay; elevation of 280 feet (1.5 miles west and 0.5 mile south of Proberta near the center of the SE¼ sec. 28, T. 26 N., R. 3 W.):

A1—0 to 15 inches, yellowish-brown (10YR 5/4) loam, dark yellowish brown (10YR 4/4) when moist; weak, granular structure; hard when dry, friable when moist, slightly sticky when wet; many fine roots and pores; slightly acid; abrupt, wavy boundary. 10 to 20 inches thick.

B2t—15 to 30 inches, brown (7.5YR 5/4) clay, dark brown (7.5YR 4/4) when moist; coarse, prismatic structure; very hard when dry, very firm when moist, very sticky and plastic when wet; a few fine roots and pores; thick, continuous clay films around aggregates and in pores; neutral; abrupt, smooth boundary. 3 to 15 inches thick.

Cm—30 to 34 inches, brown (7.5YR 5/4), indurated iron-silica hardpan; the upper part of this horizon is most cemented; clear, irregular boundary. 4 inches to several feet thick

C—34 inches +, light yellowish-brown (10YR 6/6) loam, yellowish brown (10YR 5/6) when moist; massive; hard when dry, friable when moist, slightly sticky when wet; a few fine pores; mildly alkaline.

The color of the surface soil is brown, light brown, yellowish brown, or light reddish brown, but the color of the subsoil is brown or is brown that grades toward reddish brown or yellowish red. The surface soil is loam or fine sandy loam. The subsoil ranges from clay to clay loam. Depth to the hardpan ranges from 15 to 32 inches, and the less deep soils have a surface soil near fine sandy loam and a subsoil of clay loam. Thickness of the hardpan varies from place to place. In some places the substratum is consolidated to a depth of many feet, but in others it is a few inches thick.

Moda loam, 0 to 3 percent slopes (Mx).—Most areas of this soil are on low terraces south of Red Bluff. A small area is across the Sacramento River from Red Bluff, and another small area is in the district of Bend. All areas have a fairly smooth surface.

The soil is well drained. Runoff is slow, and permeability is very slow. The hardpan restricts the movement of water and roots through the soil. The available water holding capacity and fertility are low. The erosion hazard is slight.

Included with this soil in mapping are small areas of Kimball, Perkins, and Corning soils.

If this Moda soil is irrigated, pasture, milo, corn, and olives grow well. Other areas are used for barley, oats, and pasture and range. Capability unit IIIs–3.

Moda gravelly loam (Mw).—This soil is 10 to 20 percent rounded gravel but is otherwise similar to Moda loam, 0 to 3 percent slopes. Also, the two soils have similar uses. The gravel causes extra wear to cultivation equipment and interferes with preparation of a seedbed. Capability unit IIIs–3.

Molinos Series

The Molinos series consists of well-drained to somewhat excessively drained, moderately coarse textured soils that are mostly nearly level. These soils formed in recent alluvium derived from basic igneous rocks, mainly basalt and andesite. Molinos soils are dark grayish brown and neutral. In many places they contain some gravel in the subsoil or throughout the profile. These soils are along active streams east of the Sacramento River at elevations of 200 to 1,000 feet. More than half of the acreage is cultivated.