United States Department of Agriculture | Forest Service | Washington Office | 12th & Independence SW
P.O. Box 96090
Washington, DC 20090-6090

~~Stewart~~ ~~Element~~ RNA file

Reply to: 4060-3 Date: March 14, 1990

R&I

Subject: Moses Mountain Research Natural Area

To: Regional Forester R-5 and Station Director PSW

Congratulations! Moses Mountain RNA was approved by the Chief on March 8, 1990. It has been entered into the database on the DG for easy access by the Regions and Stations and bears the TMIS 00213. Enclosed is one copy of the establishment record containing a signed copy of the new Designation Order. The original record and designation order are on file in the WO.

We call to your attention to the excellent cooperation we received from Dave Diaz in providing information essential to having this establishment record approved. It is because of folks like Dave that the RNA program has come alive. It is a pleasure working with him.

Russell M. Burns

Russell M. Burns, Coordinator
Forest Service RNA Program

DECISION NOTICE/DESIGNATION ORDER

Decision Notice
Finding of No Significant Impact
Designation Order

By virtue of the authority vested in me by the Secretary of Agriculture under regulations 7 CFR 2.42, 36 CFR 251.23, and 36 CFR Part 219, I hereby establish the Moses Mountain Research Natural Area. It shall be comprised of lands described in the section of the Establishment Record entitled "Location."

The Regional Forester has recommended the establishment of this Research Natural Area in the Record of Decision for the Sequoia National Forest Land and Resource Management Plan. That recommendation was the result of an analysis of the factors listed in 36 CFR 219.25 and Forest Service Manual 4063.41. Results of the Regional Forester's Analysis are documented in the Sequoia National Forest Land and Resource Management Plan and Final Environmental Impact Statement which are available to the public.

The Moses Mountain Research Natural Area will be managed in compliance with all relevant laws, regulations, and Forest Service Manual direction regarding Research Natural Areas. It will be administered in accordance with the management direction/prescription identified in the Establishment Record.

I have reviewed the Sequoia National Forest Land and Resource Management Plan (LRMP) direction for this RNA and find that the management direction cited in the previous paragraph is consistent with the LRMP and that a Plan amendment is not required.

The Forest Supervisor of the Sequoia National Forest shall notify the public of this decision and will mail a copy of the Decision Notice/ Designation Order and amended direction to all persons on the Sequoia National Forest Land and Resource Management Plan mailing list.

Based upon the Environmental Analysis, I find that designation of the Moses Mountain Research Natural Area is not a major Federal action significantly affecting the quality of the human environment. (40 CFR 1508.27.)

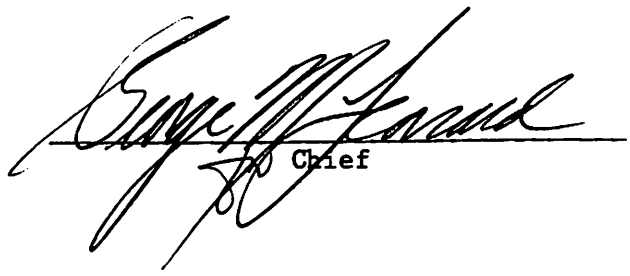
This decision is subject to appeal pursuant to 36 CFR Part 217. A Notice of Appeal must be in writing and submitted to:

The Secretary of Agriculture
14th & Independence Ave., S.W.
Washington, D.C. 20250

and simultaneously to the Deciding Officer:

Chief (1570)
USDA, Forest Service
P.O. Box 96090
Washington, D.C. 20090-6090

The Notice of Appeal prepared pursuant to 36 CFR 217.9(b) must be submitted within 45 days from the date of legal notice of this decision. Review by the Secretary is wholly discretionary. If the Secretary has not decided within 15 days of receiving the Notice of Appeal to review the Chief's decision, appellants will be notified that the Chief's decision is the final administrative decision of the U.S. Department of Agriculture (36 CFR 217.17(d)).



Chief

3/8/90

Date

SIGNATURE PAGE

for

RESEARCH NATURAL AREA ESTABLISHMENT

Moses Mountain Research Natural Area

Sequoia National Forest

Tulare 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 Todd Keeler-Wolf Date Mar. 17, 1989
Todd Keeler-Wolf, Consulting Ecologist to The Nature Conservancy

Recommended by Del Pengilly Date 9/21/89
Del Pengilly, District Ranger, Tule River Ranger District

Recommended by J. Crates Date 9/24/89
James A. Crates, Forest Supervisor, Sequoia National Forest

Recommended by David M. Lay Date 1-12-90
for Paul F. Barker, Regional Forester, Pacific Southwest Region

Recommended by Enoch J. Bell Date 1-23-90
for Ronald E. Stewart, Station Director, Pacific Southwest Forest and Range Experiment Station

TITLE PAGE
ESTABLISHMENT RECORD FOR
MOSES MOUNTAIN RESEARCH NATURAL AREA
WITHIN SEQUOIA NATIONAL FOREST
TULARE COUNTY, CALIFORNIA

A. INTRODUCTION

The Moses Mountain Research Natural Area (MMRNA) lies within the Tule River Ranger District, Sequoia National Forest. The area was selected and nominated by the Sequoia N. F. as a candidate RNA in 1986.

1. Land Management Planning
The final Land and Resource Management Plan and Environmental Impact Statement for the Sequoia N.F. recommends the establishment of the MMRNA (Appendix 3).

B. OBJECTIVES

The MMRNA was selected to preserve an example of the giant sequoia (*Sequoiadendron giganteum*)[1] target element for the Region 5 RNA system (Appendix 4). No other proposed or established RNA's contain this target element.

C. JUSTIFICATION STATEMENT FOR ESTABLISHMENT OF AREA

The well-known and spectacular vegetation type dominated by giant sequoia is restricted to 75 groves in the central and southern Sierra Nevada (Rundel 1972a). The Moses Mountain RNA consists of three more-or-less separate entities lying on both E and W-facing exposures above the banks of the North Fork of the Middle Fork of the Tule River (Map 3). It is included within the Middle Tule River Grove as defined by Rundel (1972a).

Moses Mountain RNA contains an excellent representation of giant sequoia within white fir- and red fir-dominated forests. The area lies largely within the Golden Trout Wilderness and has not been impacted significantly by human activities.

A unique feature of the MMRNA giant sequoia groves is that each grove is well-stocked with giant sequoia under 100 years old. In an extensive study of the ecology and structure of giant sequoia groves (Rundel 1971), only one of the 13 studied groves showed any marked reproduction in young age classes. Another unusual feature of the MMRNA is the presence of 10-200

[1] In this establishment record all trees are named following Little, E.L., Jr. 1979. Checklist of United States trees (native and naturalized). Agricultural Handbook No. 541. U.S.D.A. Washington D.C.
Plants other than trees are named in accordance with Munz, Philip A. 1968. A California Flora and Supplement. Univ. of CA. Press, Berkeley. 1905 p.

year old trees extending beyond the edge of the main groves. This may have resulted from a combination of fires and avalanches which have disturbed the forest several times in the past few hundred years (Keeler-Wolf 1989). The presence of young trees in the groves and in outlying areas allows the long-term status of the groves to be monitored.

In addition to the numerous young giant sequoias there are a number of specimen trees with diameters greater than 16 ft. (4.9 m) dbh. The largest measured was ca. 21 ft. (6.4 m) dbh and had an estimated age of 2500 years (based on ring counts of nearby cut and fallen trees in similar environments).

Another distinguishing feature of the MMRNA is that it contains the largest population (over 5 million plants Shevock, 1988) of the Forest sensitive *Erythronium grandiflorum* ssp. *pusateri*, the Kaweah fawn lily (see Appendix 3). This species is a localized endemic to Tulare County and is considered rare and endangered (list 1b) by the California Native Plant Society (Smith and Berg 1988).

The MMRNA contains a diverse assemblage of riparian plants associated with the streamside of the North Fork of the Middle Fork (also known as the Wishon Fork) of the Tule River. A rich flora of hydrophilic species is also associated with several seeps and meadows within the area. See Appendix 1 for a complete listing of vascular plants from various habitat types in the RNA.

D. PRINCIPAL DISTINGUISHING FEATURES

The MMRNA is underlain by both granitic and schistose metamorphic rocks. The latter generally occupy the lower slopes while the former are predominant on the ridges and upper slopes. The RNA occupies a portion of the southward-flowing North Fork of the Middle Fork of the Tule River (NFMF Tule River). A large portion of the east face of Moses Mountain (9331 ft. or 2844 m elevation) stretching from the river up to the summit is included (Map 2). Red fir, white fir and giant sequoia grow on the lower half of this E-facing slope, while the upper slope is a precipitous rocky escarpment with well-developed rupicolous vegetation (photo 1). Several steep shallow ravines dissect the east slope of Moses Mountain and are conductors of frequent avalanches. The resulting effects of the avalanches are apparent

well down into the body of coniferous forest along these conduits (photo 2). The valley bottom is occupied by the moderate-sized permanent NFMF Tule River with associated riparian vegetation and the small moist opening known as Long Meadow, which occupies an old river terrace on the east side of the stream. The W-facing slopes above Long Meadow are vegetated primarily with young white fir forest with a local dominance in two areas by Giant Sequoia. The boundary on the eastern side of the area roughly corresponds with the beginning of extensive rock outcrops stretching up to the summits of Maggie Mountain to the east.

E. LOCATION

1) National Forests Involved
The MMRNA is located on the Sequoia National Forest. No other National Forest System Lands are involved.

2) Latitude and Longitude
The approximate center of the RNA is Latitude 36° 17' N., Longitude 118° 39' W. (see maps 1 and 2).

3) Boundary Description
The MMRNA falls within portions of sections 12, 13, and 24 T19S, R30E and sections 7, 18, and 19 T19S, R31E Mount Diablo Base and Meridian (MDBM).

The boundaries of the MMRNA are delineated using a combination of topographic and political features. The following is a narrative description of the boundaries. Refer to map 2 for further clarification.

Beginning at the summit of Moses Mountain elevation 9331 ft. (2844 m) in the NW 1/4 Sect. 13 T19S, R30E the boundary runs in a southerly direction along the prominent ridge south of the peak for approximately 1 mile (1.6 km) to the knob marked 8955 (2730 m) on the 1977 edition of the U.S.G.S. Mineral King S.W. 7.5 minute quadrangle. From this point in the NW 1/4 of Sect. 24 T19S, R30E MDBM the boundary turns eastward and follows a spur ridge of this knob down toward the bottom of the NFMF Tule River valley for approximately 0.85 mile (1.37 km) until the ridge intersects the boundary of the Mountain Home State Forest (MHSF) in the extreme NW corner of Section 19 T19S, R31E. This point lies along the section boundary between Sects. 19 and 18 and is approximately 400

ft. (122 m) east of the corner of Sects. 13 and 24 T19S, R30E and Sects. 18 and 19 T19S, R31E MDBM. The boundary turns W at this point and runs to said corner, then turns north following the MHSF boundary for approximately 0.5 miles (0.8 km) to the midpoint along the section boundary between Sects. 13 and 18. At the midpoint the boundary turns east, again following the boundary of the MHSF for 0.25 mile (0.4 km) then turns south for another 0.25 mile (this boundary conforms here with both the MHSF and the Golden Trout Wilderness boundaries), thence turning east for another 0.25 mile, and south for 0.25 mile. At this point the boundary turns in a NE direction away from the political stair-step boundaries and follows a shallow ravine up the SW-facing slope of Maggie Mountain to the base of a steep escarpment in the SE 1/4 Sect. 18 T19S, R31E MDBM. At this point at the 7600 ft. (2316 m) contour on the 1977 edition of the Mineral King S.W. 7.5 minute USGS quadrangle, the boundary turns northwest and follows the 7600 ft. (2316 m) contour approximately 1.5 miles (2.4 km) until the bed of an intermittent stream flowing off the NW slopes of Maggie Mountain is met (NW 1/4 Sect. 7 T19N, R31E). At this point the boundary follows the streambed in a southwesterly direction until it joins the main NFMF Tule River in the SW 1/4 Sect. 7 T19S, R31E. From this point the boundary crosses the river and turns southward, paralleling the stream 50 yards (45.7 m) from its west bank for approximately 1300 ft. (396 m) until the intersection with the section line forming the boundary between the SW 1/4 Sect. 7 and the NW 1/4 Sect. 18 T19S, R31E MDBM. At this point the boundary turns W for approximately 1000 ft. (305 m), following the section line to the corner of Sects. 7 and 18 T19S, R31E and 12 and 13 T19S, R30E MDBM. From said corner the boundary follows the section line between Sect. 12 and 13 for approximately 3000 ft. (914 m) up to the ridgecrest N of Moses Mountain. From this point, which also marks the western boundary of the Golden Trout Wilderness Area, the boundary runs southward along the ridgecrest for approximately 2700 ft. (823 m) to the summit of Moses Mountain, the point of beginning.

4) Acreage

The Moses Mountain RNA as described above is 960 acres (388.5 ha). This may be broken down into sections in the following way:

	acres	hectares
Section 7	105	42.5
Section 13	376	152.2
Section 18	329	133.1
Section 19	6	2.4
Section 24	144	58.3
Totals:	960	388.5

5) Elevations
Elevations range from ca. 6480 ft. (1975 m) along the NFMF Tule River to 9331 ft. (2844 m) atop Moses Mountain for a range of 2851 ft. (869 m).

6) Access (reference Map 1)
The MMRNA is accessible from the south through the Mountain Home State Forest via the following route. From the Tule River District Ranger Station, approximately 13 miles (21 km) E of Porterville on State Route 190, drive E on route 190 through Springville turning N on M-220 (Bear Creek Road) approximately 0.5 miles (0.8 km) beyond Springville. Follow the paved M-220 for approximately 14.5 miles (23 km) to the Tulare County-maintained Balch Park. At this point, drive on a good dirt road within the Mountain Home State Forest to Shake Camp pack station approximately 3 miles (5 km) to the N. At Shake Camp, park at the trailhead for trail 31E15 and walk approximately 2.5 miles (4 km) to Redwood Crossing. Just beyond the crossing is the edge of the RNA. Time involved for road travel from the Tule River RS is approximately one hour and walking time from Shake Camp to Redwood Crossing is also about 1 hour.

The trail 31E15 parallels the NFMF Tule River through the entire RNA and affords access to the surrounding slopes. Cross-country travel off the trail is moderately easy on the eastern side of the river except where young forest and dense understory brush occur near the eastern boundary. Travel off the trail on the west side of the river is generally more difficult because of steeper slopes particularly at the upper elevations along the Moses Mountain escarpment.

F. AREA BY COVER TYPES

	% total	acres	hectares
SAF TYPES (Eyre 1980)			
Red fir (207)	23	222	89.9
White fir (211)	25	240	97.1
Sierra Nevada Mixed Conifer (243)	13	129	52.2
unclassified	39	369	149.3
total	100	960	388.5

	%	acres	hectares
KUCHLER TYPES (Kuchler 1966)			
Mixed Conifer Forest (K-5)	38	369	149.3
Red fir forest (K-7)	23	222	89.8
Chaparral (K-29)	5	45	18.2
Alpine meadows/barren (K-45)	31	297	120.2
unclassified	3	27	10.9
total	100	960	388.5
HOLLAND TYPES (Holland 1986)			
Mixed montane chaparral (37510)	5	45	18.2
Wet montane meadow (45110)	1	7	2.8
Dry montane meadow (45120)	trace	trace	trace
Montane riparian scrub (63500)	2	20	8.1
Sierran mixed coniferous forest (84230)	6	59	23.9
Sierran white fir forest (84240)	25	240	97.1
Big tree forest (84250)	7	70	28.3
Red fir forest (85310)	23	222	89.8
Alpine talus and scree slope (91200)	31	297	120.2
unclassified	0	0	0
total	100	960	388.5

G. PHYSICAL AND CLIMATIC CONDITIONS

The Moses Mountain RNA lies on the west slope of the southern Sierra Nevada. The topography drops precipitously to the west of the RNA (in some

places at a rate of over 1760 ft./mile [333 m/km]) to the Tulare Basin (southern Central Valley). The area is drained by the NFMF Tule River. The steep slopes are dominated by granitic outcrops at the upper elevations, but the lower slopes are a mixture of granitic and metamorphic substrates, with some areas of deeper soil covered by well-developed coniferous forest and small meadow and riparian habitats.

Apparently the precipitous rise in elevation contributes to the relatively high average annual precipitation for an area so far south in the Sierra Nevada. According to Rantz (1972) the area receives at least 50 inches (1270 mm) per year. By contrast, other sites of similar elevation and vegetation in the southern Sierra such as Giant Forest average 44.4 inches (1127 mm) annually (Rundel 1972b).

No weather stations exist within the area. The closest temperature and precipitation recording station with a climate similar to the RNA is at Lodgepole Ranger Station in Sequoia National Park, which began recording weather data in 1967. This site lies at latitude 36° 36' N and longitude 118° 44' W. or approximately 19.5 miles (31.4 km) NNW of Moses Mountain. Lodgepole Ranger Station is at an elevation of 6735 ft. (2053 m) along the Marble Fork of the Kaweah River. The Lodgepole Ranger Station is flanked by taller mountains than the NFMF Tule River at the same elevation within the RNA. Therefore, it may have somewhat cooler temperatures in similar valley positions to MMRNA. The following tables summarize the data from the Lodgepole Ranger Station for the years 1974-1985.

Table 1: Temperature data (°F) summarized from the years 1974-1985 at Lodgepole Ranger Station, Sequoia National Park.

year	$\bar{x}$ ann. temp.	highest temp. (w/date)	lowest temp. (w/date)	last spr. frost	first fall frost	# days between 1st & last frost
74	41.9	83 (6/13)	-4 (1/3)	6/20	10/4	106
75	-	84 (7/27)	-1 (4/7)	6/24	7/2	8
76	41.8	86 (9/1)	-2 (3/4)	6/12	7/20	20
77	42.4	85 (8/1)	2 (3/17)	5/29	9/15	109
78	39.9	86 (8/6)	-7 (12/7)	6/25	7/1	6
79	40.5	86 (7/17)	-10 (1/30)	6/19	7/6	17
80	41.0	86 (7/28)	5 (12/8)	6/15	7/4	19
81	43.0	89 (8/8)	-3 (2/1)	6/13	9/25	104
82	-	83 (7/30)	-4 (1/22)	6/8	7/1	23
83	40.3	84 (8/7)	1 (1/20)	6/21	7/20	29
84	41.9	87 (7/6)	-4 (12/17)	6/10	9/24	106
85	41.1	88 (7/28)	-5 (2/4)	6/3	9/10	99

Table 2: Precipitation data for Lodgepole Ranger Station, Sequoia National Park 1974-1985.

year	January		July		Total	
	in.	mm	in.	mm	in.	mm
1974	11.50	292	-	-	41.94	1065
1975	2.29	58	T	T	40.79	1036
1976	0.10	3	0.60	15	24.74	628
1977	2.55	65	0.17	4	30.46	774
1978	14.50	368	0.44	11	-	-
1979	6.54	166	0.30	8	40.26	1023
1980	29.11	739	0.19	5	69.65	1769
1981	10.08	256	0.02	1	40.55	1030
1982	13.99	355	0.43	11	90.47	2298
1983	12.93	328	0	0	83.27	2115
1984	0.03	1	2.63	67	33.49	851
1985	3.82	97	0.72	18	38.95	989

As can be seen from Table 1 the temperatures at MMRNA are relatively low with the highest temperature over the 12 year period less than 90° F (32°C) and the lowest temperature -10° F (-23° C). The frequent records of frost (32°F or 0°C, or lower) in late June and even in July are an indication of the relatively short growing season. Although temperatures are probably slightly higher in the valley of the NFMF Tule River, as indicated by the absence of lodgepole pine (*Pinus contorta* var. *murrayana*), which grows at Lodgepole Ranger Station, temperatures probably do drop below 0°F (-17.7 °C) on occasion, particularly at the upper elevations of the RNA.

The precipitation pattern at Moses Mountain is probably similar to that of Lodgepole with January and February averaging the highest precipitation and the summer months relatively dry. In comparison to the central Sierra the area probably receives somewhat more summer precipitation from thunderstorms. Over the 12 year period shown in Table 2 75% of all July months had measurable precipitation largely resulting from thunderstorms. Rundel (1972b) hypothesized that these summer thunderstorms have been responsible for recharging the ground water supply in the summer months and thus, reducing the moisture stress on giant sequoia trees in the southern Sierra at this time of year.

According to Kahrl (1979) the Moses Mountain area averages 50-75 inches (127-191 cm) of snow on April 1. A snow course at the old Enterprise Mill at 6600 ft. (2012 m) in the Mountain Home State Forest (36° 14.6' N, 118° 40.7' W) approximately 3 miles (5 km) S of the RNA has an average April 1 water content of 16.6 inches (42.2 cm) (California Department of Water Resources 1988). Snow depths, as indicated by lichen growth on tree trunks at the lower elevations of the RNA, average ca. 36-45 inches (914-1143 mm).

H. DESCRIPTION OF VALUES

1) Flora

The flora of the MMRNA is relatively rich and includes at least 220 taxa of vascular plants. The diversity is primarily due to the herbaceous flora of the meadow and riparian habitats. The flora of the MMRNA contains at least 26 taxa that reach the southern limits of their range in Tulare County (*fide* Munz 1968) and at least six endemics to the southern Sierra Nevada (see Appendix 1 for species in these categories). In

addition to these species, the RNA is the principal location for the Kaweah fawn lily. This species, as was previously mentioned, is abundant on the upper rocky slopes of Moses Mountain. It flowers in early summer and occupies vernally moist gravelly patches amongst the larger boulders and outcrops (photo 3). Another species of the Moses Mountain rocky escarpment, *Dicentra nevadensis*, was a past member of the California Native Plant Society's list 4 (plants of limited distribution), but has recently been delisted (due to commonness) in the latest CNPS inventory (Smith and Berg 1988).

Vegetation Types:

The vegetation map (Map 3) is organized using the system of Holland (1986) with Kuchler (1966) and SAF (Eyre 1980) equivalents indicated. Following is a brief description of the major plant associations occurring in the RNA. All scientific names are in accordance with Munz (1968), and code numbers following the association names are Holland type numbers. The associations are listed following the order in which they occur in Holland (1986).

Mixed montane chaparral (37510): No extensive stands of montane chaparral exist at present in the RNA. However, small patches are interspersed with white and red fir (*Abies magnifica*) forest in openings created by avalanches or by shallow rocky soil. These are particularly evident on the mid-slopes of Moses Mountain at the interface between talus, outcrop, and red fir forest. The dominant species in this association are bush chinquapin (*Chrysolepis sempervirens*), greenleaf manzanita (*Arctostaphylos patula*), bitter cherry (*Prunus emarginata*), snowbrush (*Ceanothus cordulatus*), and small-leaf rock spiraea (*Holodiscus microphyllus*).

Wet montane meadow (45110): Besides the well-developed meadow at Long Meadow (photo 4) there are two other wet meadows within the RNA (see vegetation map). All are associated with permanent springs and at least one occurs where the schistose metamorphic rock underlies a massive granitic block. A large number of species are associated with wet meadows, the most conspicuous include: *Aster occidentalis, Carex* spp., *Oxypolis occidentalis, Deschampsia elongata, Dodecatheon jeffreyi, Epilobium brevistylum, Habenaria dilitata* var. *leucostachys, Helenium bigelovii, Juncus macandrus,*

Mimulus primuloides, Parnassia palustris ssp. *californica, Perideridia bolanderi, Polygonum bistortoides, Potentilla drummondii, Potentilla gracilis* ssp. *nuttallii, Senecio clarkianus, Sidalcea oregona* ssp. *spicata, Sisyrinchium elmeri, Veratrum californicum,* and *Viola adunca.*

Dry montane meadow (45120): This association typically forms a border around the wet meadows. The association is vernally moist, but becomes dry by mid summer. Soil is typically shallower and rockier than the previous type. Typical species include: *Gilia leptalea, Linanthus ciliatus, Rumex angiocarpus, Bromus laevipes, Calochortus venusus, Collinsia parviflora, Madia elegans, Orthocarpus hispidus, Polygonum douglasii,* and *Stipa californica.* This association is too small locally to be represented on the vegetation map.

Montane riparian scrub (63500): This diverse association occurs along several rivulets descending the slopes of Moses and Maggie mountains and also forms a border along much of the NFMF Tule River within the RNA. The type is dominated by hydrophilic shrubs such as: mountain alder (*Alnus tenuifolia*), Sierra currant (*Ribes nevadense*), the willows *Salix caudata* var. *bryantiana* and *S. melanopsis,* twinberry (*Lonicera involucrata*), and creek dogwood (*Cornus stolonifera*). There is also a strong herbaceous component including several species more shade-tolerant than the typical wet meadow species. These include: *Lilium kelleyanum, L. parvum, Aconitum columbianum, Delphinium polycladon, Dicentra formosa, Aquilegia formosa* ssp. *truncata, Epilobium glaberrimum, Galium trifidum* var. *pusillum, Glyceria elata, Heracleum lanatum, Montia chamissoi,* and *Stachys albens.*

Sierran mixed coniferous forest (84230): This widespread mid-elevation Sierra forest type occurs only at the lower elevations and on relatively xeric exposures. The dominant species on modal SW-facing slopes on the SE side of the RNA is white fir (*Abies concolor*) with sugar pine (*Pinus lambertiana*), and incense-cedar (*Calocedrus decurrens*) as subdominants. On higher, rockier slopes Jeffrey pine (*Pinus jeffreyi*) and small shrubby California black oak (*Quercus kelloggii*) become fairly common. In some areas as on the SE-facing slope on schist in the NW 1/4 Sect 18, Jeffrey pine dominates in an

open forest with little understory.

Sierran white fir forest (84240): This forest type is widespread at the mid-elevations of the RNA on both W-and E-facing slopes. Typically it is dominated by trees of rather small stature between 1.5 and 2.5 ft. (46-76 cm) dbh. Occasional larger and older trees up to 4.5 ft. (137 cm) dbh occur. The average age of the dominant trees is ca. 110 years, indicating a widespread crown fire was likely in the 1870's. Understory of the white fir forest is typically sparse due to heavy duff and shade.

Big tree forest (84250): This forest, the type element for the RNA is strongly dominated by giant sequoia. Unlike many groves described by Rundel (1971) the local sampled stands are not only basally dominated by giant sequoia, but are also often dominated in density and total importance value by them. Ten 900 m^2 plots were sampled in this type. Two plots were sampled in the small isolated grove on the E-facing slope of Moses Mtn. at ca 7800 ft. (2377 m), while eight plots were sampled in the larger grove in the SW 1/4 of Sect. 18 between 6600 and 7200 ft. (2012-2195 m). Basal area cover for giant sequoia on the plots ranged from 12.3 to 45.6 m^2 (per 900 m^2). Importance values (relative density + relative frequency + relative basal area cover X 100) for trees at the E-facing sample were: giant sequoia 173.4; red fir 67.6; and white fir 58.9. Importance values for the W-facing sample were: giant sequoia 136.1, white fir 113.0, sugar pine 34.9, California black oak 9.9 and incense-cedar 6.1. Densities on both sampled groves were particularly high for giant sequoia with the E-facing stand averaging 170 giant sequoias over 31 cm dbh/ha and 70/ha on the other site. This contrasts with average densities of only 6-10 trees over 31 cm dbh/ha on most other sampled sites (Rundel et al. 1977). The high densities of more than an order of magnitude greater than cited averages is largely due to the excellent representation of younger age classes (photos 5, 6, and 7).

The understory vegetation of the giant sequoia groves is generally relatively sparse, averaging only about 5% cover on the W-facing plots and 25% on the E-facing plots. Typical understory species at the higher elevation and more mesic E-facing plots include: *Symphoricarpos parishii*, *Osmorhiza chilensis*, *Pteridium aquilinum*

ssp. *pubescens, Chrysopsis breweri, Lilium kelleyanum, Ribes roezlii, Lupinus polyphyllus* ssp. *supurbus,* and *Smilacina racemosa* ssp. *amplexicaulis*. At the other lower elevation sampled locations, species included: bush chinquapin, California hazelnut *(Corylus cornuta* ssp. *californica),* snowbush, *Pyrola picta, Draperia systyla, Potentilla glandulosa* ssp. *nevadensis, Chamaebatia foliosa, Galium sparsiflorum* and *Carex multicaulis*. Both sample localities had several small springs where a subset of shade-tolerant riparian and meadow species occur. As is typical for giant sequoia groves (Rundel 1972b), those at Moses Mountain appear to be strongly tied to abundant ground water.

Red fir forest (85310): This forest type occupies the upper forested slopes of Moses Mountain and the valley bottom above 7000 ft. (2134 m). It is dominated by red fir, but at the lower elevations may have a large admixture of white fir and in some cases, Jeffrey pine. The highest E-facing forested slopes of Moses Mountain as in the NE 1/4 of Sect 24 have a large component of western white pine (*Pinus monticola*). The forests may be dense with little understory, or as a result of rocky substrate, may be open with a moderately dense understory of mountain chaparral shrubs such as bush chinquapin and greenleaf manzanita, or more mesophilic species such as mountain maple (*Acer glabrum* var. *torreyi*). The structure of the local red fir forest is similar to the white fir forest with the majority of the trees in denser stands being under 120 years old. At the upper elevations or rocky sites, where protection from fire may be generally better, numerous large trees up to 6.5 ft. (2 m) dbh occur.

Alpine talus and scree slope (91200): Although not technically alpine, the upper slopes of Moses Mountain are related to this vegetation type. The large expanse of open granitic slabs and innumerable crevices and decomposed granite benches support an extensive rupicolous community of plants similar to those of higher alpine environments. The species of this association may be divided into hydric and xeric subtypes. The former occur along moist to wet cracks and intermittent rivulets (including the avalanche chutes) and the latter occurring on the more exposed sunny substrates. Species of the xeric type include: *Sedum obtusatum, Holodiscus microphyllus, Arctostaphylos nevadensis, Calyptridium umbellatum, Cheilanthes*

gracillima, Dudleya cymosa, Eriophyllum confertiflorum, Eriogonum saxatile, Lomatium torreyi, Melica stricta, Pellaea breweri, Penstemon newberryi, Poa incurva, Pteryxia terebinthina, Selaginella watsonii, and *Zauschneria latifolia*. Those species on relatively hydric areas include: *Acer glabrum* ssp. *torreyi, Tritelia dudleyi, Cryptogramma acrostichoides, Erythronium grandiflorum* ssp. *pusateri, Heuchera rubescens, Juncus parryi, Luzula divaricata, Silene sargentii, Smilacina racemosa* ssp. *glauca,* and *Zigadenus exaltus*.

2) Fauna

Appendix 2 lists all species of vertebrates noted in the RNA during the ecological survey. There are no State or Federally listed threatened or endangered species definitely known from the area. The MMRNA, by virtue of its proximity to large expanses of wilderness in both the Golden Trout Wilderness and the southern portion of the Sequoia National Park Wilderness, contains good habitat for a number of large, rare vertebrates. black bear, mountain lion, blue grouse, mule deer, and golden eagle have been seen or evidence of their presence detected in the area, and possibly the state listed and Forest sensitive pine marten and peregrine falcon also occur. The state listed wolverine and Forest sensitive fisher are known from part of the Moses Further Planning and Wilderness Study Area (Appendix 3) and may occur within the RNA.

A group of black swifts (*Cypseloides niger*) was seen flying over the summit of Moses Mountain. This species is an uncommon and widely scattered breeder in the Sierra with a known nesting locality along the Marble Fork of the Kaweah River in Sequoia National Park (Grinnell and Miller 1944, Small 1974). The pika (*Ochotona princeps*) is locally common in the talus along the Moses Mountain escarpment to as low as 8000 ft. (2438 m). This is a relatively low elevation for these typically alpine mammals and is also very near the southern end of the species' range. According to Ingles (1965) pikas in the Sierra Nevada do not occur south of Mount Whitney. Mt. Whitney is ca. 26 miles (42 km) NE of Moses Mountain. However, Hall and Kelson (1959) report *Ochotona princeps albata* as far south as Mineral King (approximately 11 miles or 18 km) NNE of Moses Mountain. Thus, the pikas at Moses Mountain may be the southernmost population in the Sierra Nevada.

3) Geology

The MMRNA is underlain by a portion of the huge Sierra Nevada Batholith, which is composed of Mesozoic granitic rocks (Jennings et al. 1977). Granitic rock occurs as boulders along the river and local outcrops at lower elevations, but is most abundant on the upper slopes of Moses Mountain where it forms the impressive eastern escarpment.

A second rock type present in the RNA is pre-Cenezoic metasedimentary rock (Jennings et al. 1977). This rock is primarily schistose with a fair amount of mica visible in most outcrops. The age of these metasediments is debatable . However, some of these rocks are likely to be Paleozoic (Schweickert 1981). These rocks have been considered as part of the Calaveras Formation by many authors, but this term has been so broadly applied as to afford little specificity (Schweickert 1981). These metasediments are conspicuous in small outcrops along the W side of the NFMF Tule River in the west-central part of Section 18 and also occur along the eastern edge of the RNA in the center of Section 18.

4) Soils

According to the order three Soil Survey of Sequoia National Forest (Sequoia National Forest 1982), the area may be divided into two mapping units (see soils map, Map 4). The forested and valley segment of the RNA is underlain by the Woolstalf-Hotaw Variant-Rock outcrop complex 50-75% slopes. This unit is ca. 40% Wolstalf soils, 30% Hotaw Variant soils, and 20% rock outcrop. There are also small inclusions of Toem, Cagwin, and Brownlee family soils (totaling ca 10%). The Woolstalf soil is deep and well-drained, formed primarily from metasedimentary rock. The soil is 35-75% gravel and cobbles. Typically the surface layer is dark brown or brown gravelly and very gravelly fine sandy loam about 37 inches (93 cm) thick. The subsoil is yellowish-brown extremely gravelly fine sandy loam about 22 inches (55 cm) thick over weathered metasedimentary rock. Permiability of the Woolstalf soil is moderately rapid. Available water capacity is moderate. Effective rooting depth is 20-30 inches (50-75 cm). Runoff is medium and the maximum erosion hazard is high.

The Hotlaw Variant soil is moderately deep and well-drained and is also formed from metasediments. Typically the surface layer is dark brown loam about 5 inches (13 cm) thick. The subsoil is dark brown gravelly

loam and gravelly clay loam about 23 inches (58 cm) thick over fractured metasedimentary rock. Permiability is moderately slow. Available water capacity is low. Effective rooting depth is 20-30 inches (50-75 cm). Runoff is medium to rapid, and the maximum erosion hazard is high.

The other mapping unit is Rock outcrop. It covers the steep upper slopes of Moses Mtn. and portions of the lower slopes of Maggie Mountain near the eastern boundary of the RNA. These areas are typically granitic, but local metasediment outcrops occur. Runoff is very rapid. Large quantities of water concentrate on soils down-slope and increase the erosion hazard of the soils.

5) Lands
All lands within the MMRNA are controlled by the Sequoia National Forest and are within the Tule River Ranger District. No private inholdings are involved. There are no acquired lands within the MM RNA.

6) Cultural
According to Forest Archaeologists (pers. comm. July 1987) no evidence of Indian occupation exists in the RNA. The area was limited to summer and fall use due to its high elevation and was probably used primarily as a hunting ground for deer and other game. In a talk with a frequent traveler on the trail through the RNA (July 1987) he disclosed that he had found what was presumed to be an obsidian spear point near the RNA several years previously. The area was within the area inhabited by the Foothill Yokuts (Spier 1978) and was probably most heavily used by the Yawdanchi tribe, which had villages along the North Fork and the Wishon Fork of the Tule River at lower elevations near Springville.

7) Other
No other natural values are known for this RNA.

I. IMPACTS AND POSSIBLE CONFLICTS

1) Mineral Resources
There are no known mineral deposits within the MMRNA. Thus, there should be no conflict with the withdrawal of the area from mineral entry, following its establishment. Only one productive mine out of 155 listed claims since 1899 was noted in the entire Moses Further Planning

Area. Most of the mining interest in this area is in the area to the south of the RNA (Appendix 3).

2) Grazing

The MMRNA is not within any currently active grazing allotment. However, the relatively heavy use of the trail by pack animals coming from the Shake Camp Pack Station and the frequent use of two campsites at Long Meadow by packers does impact the vegetation of the Long Meadow area. Most packers who camp at Long Meadow have several horses and mules and stay for generally short periods (1-2 days according to packers contacted in July 1987). Food pellets are typically the main source of nourishment for the animals, but the meadow around the campsites is still regularly lightly grazed. The grazing by horses and mules has not created widespread damage to the meadow environment. Stock is generally tied or hobbled close to the camp and thus the areas of heavy trampling are relatively restricted. The few introduced plants noted for the RNA are closely associated with areas of stock use at Long Meadow and are likely to have been inadvertently brought in with feed. The author feels that impacts are insignificant and that no boundary change is warranted. D. DIAZ 3/1/90 DG. Rec'd

3) Timber

The MMRNA is located largely within the Golden Trout Wilderness Area, which is excluded from the timber harvesting base. The southwest portion of the RNA, outside of the wilderness is vegetated primarily with rock outcrop species and an open forest of red fir and western white pine. This forest is on steep rocky slopes and is not economically feasible to harvest. The portion of Mountain Home State Forest adjacent to the southern boundary is isolated from the main body of MHSF now used for timber harvesting. This outlier contains a small, but well-developed forest dominated by giant sequoia with some large sugar pine, Jeffrey pine and white fir. However, its location and proximity to the wilderness boundary is likely to ensure its preservation.

4) Watershed Values

The NFMF (Wishon Fork) of the Tule River is a perennial stream with its source in Sequoia National Park at Summit Lake. The bed of this stream within the RNA shows evidence of recent flooding with numerous cut banks, some of which are undercutting mature giant sequoias. Clearly rapid runoff resulting from unusually precipitous snow melt has and will continue to effect the area. The forest cover surrounding the majority of

the stream in the RNA is thus important in water uptake and stabilizing the stream on these highly erosive soils.

5) Recreation Values

The trail (31E15) through the area receives relatively heavy use from packers with destinations primarily to the north in Sequoia National Park. Because the Shake Camp trailhead is only 2 hours by car from Bakersfield it is one of the most accessible points to the southern Sierra Nevada high country. Use may typically be concentrated on summer weekends and consists largely of through-passage with overnight camping at several sites ranging from Redwood Crossing to the N. end of Long Meadow. In all, I noticed six regularly used campsites along the trail within the RNA. Four of these were occupied during my short stay in the area. Despite the moderately heavy trail use, the human impact on most of the area is slight. Giant sequoia groves appear to be lightly visited except for the trees along the trail. Fishing is apparently a common pastime along the river in the vicinity of the campsites, but has not heavily impacted the riparian vegetation.

The summit of Moses Mountain has a cairn and a register placed by the Sierra Club (Register #102). Records in the current register begin June 16, 1963, and there were under 100 entries since that time as of July 12, 1987. There is no established route to the top of Moses Mountain within the RNA.

6) Wildlife and Plant Values

Giant sequoia, the principal target element, will continue to thrive under RNA status, and should provide an excellent example of healthy reproducing stands of this localized endemic for many years. The secondary element of rare plant habitat on the upper rocky slopes of Moses Mountain has and should continue to receive little human impact, and will thus insure the protection of the Kaweah fawn lily. The proximity of the area to the Golden Trout Wilderness and Sequoia National Park will likely provide the best opportunity for survival of rare or uncommon montane vertebrates such as the golden eagle, wolverine, mountain lion and pine marten, which are likely to use the RNA for hunting or breeding.

7) Special Management Area Values
Approximately 64% (608 acres or 246 ha) of the MMRNA is within the 305,484 acre (123,721 ha) Golden Trout Wilderness, lying in portions of both the Sequoia and Inyo National Forests. This wilderness was established by Congress in 1978. No other special management decisions are involved. The other 36% of the RNA lies within the Moses Further Planning and Wilderness Study Area (Appendix 3). The decision to include the remainder of the area as part of the federal wilderness system will be made at a future date. Activities within the wilderness portion of MMRNA conflicting with established wilderness practice will not be allowed. Wilderness management policy prevails in cases where it is more restrictive. The Regional Forester must approve all research permits for RNA's within Wilderness Areas.

8) Transportation Plans
Designation of the MMRNA will not affect forest, county, or state transportation systems.

J.MANAGEMENT PRESCRIPTION

The management direction for the MMRNA will focus on perpetuation of the giant sequoia groves. This management will follow the general description of the "Preservation" category for giant sequoia management as outlined in the LRMP for the Forest (Appendix 3).

A detailed RNA Management Plan should be developed by the Sequoia National Forest in consultation with the Pacific Southwest Forest and Range Experiment Station which will outline management practices, project prescriptions, use, and monitoring of activities to achieve specific objectives for the MMRNA.

K. ADMINISTRATION, RECORDS, AND PROTECTION

The official responsibility for administration and protection of the RNA is with the District Ranger Tule River Ranger District, 32588 Highway 190, Springville California 93257-2035. ~~Attention will be given to eliminating the campsites along the portion of trail within the RNA and to periodic monitoring of the Sequoia groves within the RNA. When understory saplings and young trees become too dense, the fire prescription will be enacted.~~

Deleted as per DG MSG from D. Diaz 3/1/90 RWS

L. ARCHIVING

The research coordinator is the Director, Pacific Southwest Forest and Range Experiment Station, 1960 Addison St., Box 245, Berkeley, California 94701. This person is responsible for coordinating research in the area, maintaining a file or research data, and curating herbarium and species samples collected in the area. PLant specimens will be stored primarily at the Jepson Herbarium, University of California, Berkeley.

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APPENDIX 1
Vascular Plant List for Moses Mountain RNA

This list includes species identified for the MMRNA to date. Nomenclature generally follows Munz (1968). The following legend refers to abbreviations for habitat types following species names. Because of overlap with other coniferous vegetation types and hydric spring and meadow associations, following the reasoning of Rundel et al. (1977), the giant sequoia element is not listed as a specific vegetation type.

rf.....red fir forest
wf.....white fir forest
mcf.....mixed conifer forest
ro.....rock outcrop (includes xeric and mesic types)
m.....moist to wet meadow
r.....riparian scrub
dm.....dry meadow

The phrase "S. limits" denotes a plant which is at the southern limit of its range in Tulare County.

Abies concolor; mcf, rf, wf
Abies magnifica var. *shastensis*; rf, wf
Acer glabrum var. *torreyi*; ro, mc
Achillea millefolium; m
Aconitum columbianum; r
Agastache urticifolia; r, ro
Agrostis diegoensis; m
Agrostis scabra; m
Allium burlewii; ro
Allium campanulatum; open wf, mcf,dm
Allotropa virgata; wf
Amelanchier pallida; low ro, open mcf
Angelica culbertsonii; r, m S. limits
Apocynum pumilum; mcf, open rf, wf
Aquilegia formosa; r, m
Arabis glabra; open rf, dm
Arabis davidsonii; ro
Arabis inyoensis ?; wf, rf openings S. limits

Arabis platysperma ; ro
Arctostaphylos nevadensis ; ro
Arctostaphylos patula ; open rf, mc
Artemisia douglasiana ; r, open rf
Aster occidentalis ; m
Athyrium felix-femina ; r
Barbarea orthoceras ; r, m
Brodiaea (Triteleia) dudleyi ; ro
Bromus laevipes ; dm
Bromus richardsonii ; open mcf
Calocedrus decurrens ; mcf
Calochortus venustus ; dm
Calyptridium umbellatum ; ro, open rf
Calystegia malacophyllus ; openings in wf, rf, mcf S. limits
Cardamine breweri ; m
Carex eurycarpa ; m S. limits
Carex fracta ; r, m (semi-shade)
Carex jonesii ; r
Carex mariposana ; m, r
Carex multicaulis ; mcf
Carex ormantha ; r, m, semi shade
Carex raynoldsii ; m S. limits
Carex sp.; ro summit Moses ridge
Castilleja applegatei ; ro, open rf, wf
Castilleja miniata ; r
Ceanothus cordulatus ; mc, rf, wf, mcf
Ceanothus integerrimus var. *californicus* ; rf openings
Chamaebatia foliosa ; mcf s. limits
Cheilanthes gracillima ; ro
Chrysolepis sempervirens ; rf, mc
Chrysopsis breweri ; rf, wf
Cirsium eatonii ; rf, wf openings (below elev. listed in Munz) S. limits
Clarkia rhomboidea ; open xeric mcf
Claytonia perfoliata ; rf, m
Collinsia parviflora ; dm
Collinsia torreyi ; open rf, wf, mcf
Collomia linearis ; m edge
Corallorhiza maculata ; rf, wf
Corethrogyne filaginifolia var. *brevicula* ; m, open mcf

Cornus stolonifera ; r
Corylus cornuta var. *californica* ; mcf
Cryptantha affinis ; rf, wf, dry openings
Cryptogramma acrostichoides ; ro
Cuscuta californica ; on *Penstemon newberryi* , etc. ro
Cystopteris fragilis ; r, m
Dactylus glomerata ; m
Delphinium polycladon ; r, rf S. limits
Delphinium pratense ; rf, wf (openings), endemic S. Sierra
Deschampsia elongata ; m
Descurania richardsonii ; open rf
Dicentra formosa ; r
Dicentra nevadensis ; ro (endemic to S. Sierra)
Disporum hookeri ; mcf
Dodecatheon jeffreyi ; m
Draperia systyla ; mcf, wf, rf S. limits
Dudleya cymosa ; orange flrs. ro
Elymus glaucus ; open rf, wf
Epilobium brevistulum ; r, m
Epilobium glaberrimum ; r
Equisetum arvense ; m
Erigeron coulteri ; m S. limits
Erigeron foliosus ; mcf, wf openings
Erigeron peregrinus var. *angustifolius* ; m S limits
Eriogonum nudum ; open rf
Eriogonum saxatile ; ro (xeric)
Eriogonum umbellatum ; ro
Eriogonum wrightii ssp. *subscaposum* ; ro
Eriophyllum confertiflorum ; ro, mc
Erythronium grandiflorum ssp. *pusateri* ; ro endemic Tulare Co.
Eupatorium occidentale ; ro
Galium aparine ; open rf
Galium bifolium ; r
Galium bolanderi ; open rf S limits
Galium sparsiflorum ; rf, mcf
Galium trifidum var. *pusillum* ; r
Galium trifidum var. *subbiflorum* ; r
Gayophytum diffusum ssp. *parviflorum* ; mcf, wf openings
Gilia leptalea ; m edge
Glyceria elata ; r

Habenaria elegans ; wf, rf
Habenaria dilitata ssp. *leucostachys* ; r, m
Habenaria sparsiflora ; r
Hackelia mundula ; rf, wf openings S. limits
Helenium bigelovii ; m, r
Heracleum lanatum ; r
Heuchera rubescens var. *alpicola* ro
Hieracium albiflorum ; open rf, wf, mcf
Hieracium horridum ; open mcf, rf, ro
Holodiscus microphyllus ; ro, open rf, mc
Hydrophyllum occidentale ; rf, wf
Hypericum anagalloides ; r, m
Juncus macandrus ; r, m
Juncus parryi ; ro
Keckiella breviflorus ; ro (xeric low)
Kelloggia galioides ; open rf, wf, ro, mc
Lewisia triphylla; JS
Ligusticum grayi ; m, open rf
Lilium kelleyanum ; r S. limits
Lilium parvum ; r
Linanthus ciliatus ; m edge
Lomatium torreyi ; ro S. limits
Lonicera involucrata ; r
Lotus nevadensis ; rf, wf sandy openings
Lotus oblongifolius var. *nevadensis* ; r
Lupinus andersonii ; openings rf, wf
Lupinus polyphyllus ssp. *supurbus* ; m, r S. limits
Luzula comosa ; m, r
Luzula divaricata ; ro S. limits
Madia elegans ; dm
Melica fulgax ?; open mcf
Melica stricta ; rf, ro
Mertensia ciliata ; r S. limits
Mimulus cardinalis ; r in mcf
Mimulus guttatus ; r
Mimulus lewisii ; r
Mimulus moschatus ; m
Mimulus primuloides ; m
Mimulus viscidus ssp. *constrictus* ; open mcf, ro N. limits

Mimulus whitneyi; r (endemic S. Sierra)
Monardella odoratissima ssp. *pallida*; open rf, ro, mcf
Montia chamissoi; r
Nemophila pedunculata; ro
Onychium densum; ro
Orobanche fasciculata; open wf
Orthocarpus hispidus; m
Osmorhiza chilensis; rf, wf
Oxypolis occidentalis; m
Parnassia palustris ?; r, m
Pedicularis semibarbata; rf, wf, mcf
Pellaea breweri; ro S. limits
Pellaea bridgesii; ro
Penstemon bridgesii; mc, open wf
Penstemon grinnellii ssp. *scrophularioides*; ro
Penstemon laetus; occasional in drier jp forest
Penstemon newberryi; ro
Penstemon newberryi X ?; pale flowers, summit of Moses ridge
Perideridia bolanderi; r, m
Perideridia parishii; m
Phacelia eisenii; ro
Phacelia hydrophylloides; rf, wf
Phacelia imbricata; mcf, wf openings
Phacelia ramosissima var. *valida*; open rf and mcf
Pinus jeffreyi; mcf, rf, wf
Pinus lambertiana; mcf, wf
Pinus monticola; ro, rf
Pinus ponderosa; mcf
Pleuricospora fimbriolata; mcf
Poa incurva; ro, open rf
Poa pratensis; m
Polygonum bistortoides; m
Polygonum douglasii; m, edge mcf
Potentilla drummondii; m, rf, wf (openings) S. limits
Potentilla glandulosa ssp. *nevadensis*; m
Potentilla gracilis ssp. *nuttallii*; m
Prunus emarginata; mc, open rf, wf, ro, mcf
Pteridium aquilinum var. *pubescens*; open rf, wf, mcf
Pterospora andromedea; rf, wf

Pteryxia terebinthina var. *californica*; ro, open rf S. limits
Pyrola picta; rf, mcf
Pyrola picta ssp. *integra*; wf
Quercus chrysolepis; ro (low, xeric)
Quercus kelloggii; mcf, open wf
Rhamnus californicus; mc
Ribes cereum; open rf, wf, ro, etc.
Ribes nevadense; r
Ribes roezlii; rf, wf
Ribes viscossimum; rf, mcf, wf S. limits
Rubus leucodermis; open wf, mcf
Rubus parviflorus; wf, rf, r
Rumex angiocarpus; m
Salix caudata var. *bryantiana*; r
Salix melanopsis; r
Sambucus caerulea; open wf, r
Sarcodes sanguinea; rf, mcf
Sedum obtusatum; ro S. limits
Selaginella watsonii; ro
Senecio clarkianus; m S. limits
Senecio cymbalarioides; r S. limits
Senecio fremontii; ro
Senecio triangularis; m, r
Sequoiadendron giganteum; mcf, wf, rf
Sidalcea glaucescens; rf, wf, openings S. limits
Sidalcea oregana ssp. *spicata*; m
Silene lemmonii; rf, wf
Silene sargentii; ro, open rf S. limits
Silene verecunda ssp. *platyota*; occas ro, open rf
Sisyrinchium elmeri; m
Smilacina racemosa ssp. *amplexicaulis*; r, rf
Smilacina racemosa var. *glauca*; ro
Smilacina stellata; wf, r
Solidago canadensis; r, m
Sorbus californica; wf, rf, r
Stachys albens; r
Stachys rigida; r
Stellaria longipes; m
Stipa californica; dm
Streptanthus tortuosus var. *flavescens*; ro, rocky r (below elevation

listed in Munz) endemic to Tulare Co. high mtns.
Symphoricarpos parishii ; open mcf, rf, wf
Taraxicum officinale ; m
Thalictrum fendleri ; r
Trifolium microcephalum ; m
Trifolium monanthum ; m
Trifolium wormskioldii ; m, r
Veratrum californicum ; m
Veronica americana ; r, m
Viola adunca ; m
Viola lobata ; rf, wf
Viola macloskeyi ; r
Viola purpurea var. *xerophylla* ; open rf, mcf
Vulpia megalura ; dm, ro (xeric)
Zauschneria latifolia ; xeric ro S. limits
Zigadenus exaltatus ; ro up to 5000 ft. higher than listed in Munz
Zigadenus venenosus ; m

APPENDIX 2

VERTEBRATES NOTED DURING ECOLOGICAL SURVEY OF MOSES MOUNTAIN RNA

This is a partial list of vertebrates observed during the Ecological Survey of the MMRNA. Authorities for the species are Moyle (1976) for fish; Stebbins (1985) for reptiles and amphibians; Robbins et al. (1983) for birds; and Ingles (1965) for mammals.

FISH
Rainbow trout (*Salmo gaidneri*); common in NFMF Tule River

AMPHIBIANS
Western Toad (*Bufo boreas*): seen in wet section of Long Meadow
Mountain Yellow-legged Frog (*Rana muscosa*): seen in NFMF Tule River

REPTILES
Northern Alligator Lizard (*Gerrhonotus coeruleus*) common in open forest with patches of mountain chaparral

BIRDS
Golden Eagle (*Aquila chrysaetos*): seen soaring over Moses Mtn.
Blue Grouse (*Dendragapos obscurus*): several seen and heard in fir forest
Band-tailed Pigeon (*Columba fasciata*): seen flying over forest
Black Swift (*Cypseloides niger*): small flock seen flying over Moses Mtn.
Calliope Hummingbird (*Stellula calliope*): seen feeding at *Penstemon newberryi* near summit of Moses Mtn.
Anna's Hummingbird (*Calypte anna*) seen on slopes of Moses Mtn.
Rufous Hummingbird (*Selasphorus rufus*) males seen throughout, some immature or female types also.
Common Flicker (*Colaptes auratus*): fairly common in forest
Red-breasted Sapsucker (*Sphyrapicus ruber*): occasional, forests
White-headed Woodpecker (*Picoides albolarvatus*): occasional in forests
Hairy Woodpecker (*Picoides villosus*): fairly common in forests
Dusky Flycatcher (*Empidonax olberholseri*) fairly common in open forests
Western Wood Pewee (*Contopus sordidulus*): fairly common in open forest
Olive-sided Flycatcher (*Contopus borealis*): occasional in forest canopy
Violet-green Swallow (*Tachycineta thalassina*): common over area
Stellar's Jay (*Cyanocitta stelleri*): fairly common in forests

Clark's Nutcracker (*Nucifraga columbiana*): seen at summit ridge of Moses Mtn.
Common Raven (*Corvus corax*): occasional throughout, e.g. scavenging at campsite at Long Meadow.
Mountain Chickadee (*Parus gambeli*): common in forests
American Dipper (*Cinclus mexicanus*): occasional along river
White-breasted Nuthatch (*Sitta carolinensis*): uncommon in mixed conifer forest
Red-breasted Nuthatch (*Sitta canadensis*): fairly common in forest
Brown Creeper (*Certhia americana*): occasional in forest
House Wren (*Troglodytes aedon*): post-breeding wanderer to mountain chaparral
Winter Wren (*Troglodytes troglodytes*): seen in shady giant sequoia groves
Rock Wren (*Salpinctes obsoletus*): occasional on rocky upper slopes of Moses Mtn.
Canyon Wren (*Catherpes mexicanus*): occasional on upper slopes of Moses Mtn.
American Robin (*Turdus migratorius*): occasional in moist areas; e.g., riparian thickets and meadows.
Hermit Thrush (*Catharus guttatus*): common in fir forests.
Golden-crowned Kinglet (*Regulus satrapa*): occasional in forests.
Warbling Vireo (*Vireo gilvus*): uncommon in mixed conifer forest
Nashville Warbler (*Vermivora rufacapilla*): occasional post-breeding up-mountain wanderer in mountain chaparral.
Yellow-rumped (Audubon's) Warbler (*Dendroica coronata*): fairly common in conifers.
MacGillivray's Warbler (*Oporornis tolmiei*): uncommon Mtn. chaparral.
Western Tanager (*Piranga ludoviciana*): occasional mixed conifer forest
Evening Grosbeak (*Coccothraustes vespertinus*): one flock in mixed conifer forest.
Pine Siskin (*Carduelis pinus*): occasional flocks in conifers
Red Crossbill (*Loxia curvirostra*): a flock flying over northern end of RNA
Dark-eyed (Oregon) Junco (*Junco hymalis*): common in conifers
Fox Sparrow (*Passerella iliaca*): common in mountain chaparral

MAMMALS
Bat (*Myotis* sp.): fairly common small bat over river in evenings.
Pika (*Ochotona princeps*): common in talus on upper slopes of Moses Mtn.
Golden-mantled Ground Squirrel (*Callospermophilus lateralis*): fairly

common open forest and rocky areas.

Lodgepole Chipmunk (*Eutamias speciosus*): fairly common in forests and rocky areas.

Douglas Squirrel (*Tamiasciurus douglasii*): fairly common in conifers.

Mountain Pocket Gopher (*Thomomys monticola*): workings common throughout.

Deer Mouse (*Peromyscus maniculatus*): seen in my backpack in evenings, probably common.

Meadow Mouse (*Microtus* sp.) runways seen in meadows (probably *M. montanus*, the montane meadow mouse).

Coyote (*Canus latrans*): scat seen several places throughout the RNA

Black Bear (*Euarctos americanus*): scats (mostly containing insects) seen throughout forested and brushy areas of RNA.

Mustelid sp.: Tracks of a medium-sized mustilid (marten, mink, or fisher) were seen along the river bank at northern end of the RNA.

Mountain Lion (*Felis concolor*): tracks of this species were seen on the trail at northern edge of the RNA

Mule Deer (*Odocoileus hemonius*): several adults and one baby seen in forests throughout.

APPENDIX 3
INFORMATION RELATING TO MOSES MOUNTAIN RNA EXCERPTED FROM SEQUOIA NATIONAL FOREST LAND AND RESOURCE MANGEMENT PLAN

SEQUOIA NATIONAL FOREST

LAND AND RESOURCE MANAGEMENT PLAN

1988

Pacific Southwest Region
USDA Forest Service

James A. Crates

Forest Supervisor

Paul F. Barker

Regional Forester

This Forest Plan establishes the management direction and associated long-range goals and objectives for the Sequoia National Forest for the next 10 - 15 years.

Table 3.5 - Federal and State Listed Wildlife Species on the Sequoia NF

Listed by Federal, State or Forest Service as Endangered (E), Threatened (T), Fully Protected Under California State Fish and Game Code (CP), California Department of Fish and Game Species of Special Concern (CSC), or Sensitive (S)

Species Common Name	Federal	State	Forest Service
Little Kern Golden Trout	(T)		
"Revised Fisheries Management Plan For Little Kern Golden Trout" Apr. 1984			
Kern Canyon Slender Salamander		(T)	
Tehachapi Slender Salamander		(T)	
Southern Rubber Boa		(T)	
California Condor	(E)	(E,CP)	
"California Condor Recovery Plan" Feb. 1980 California Condor Recovery Team			
Coopers Hawk		(CSC)	
Northern Goshawk		(CSC)	(S)
Sharp-shinned Hawk		(CSC)	
Golden Eagle		(CP,CSC)	
Swainson's Hawk		(T)	
Bald Eagle	(E)	(E,CP)	
"Bald Eagle Recovery Plan"			
Prairie Falcon		(CSC)	
American Peregrine Falcon	(E)	(E,CP)	
"Recovery Plan for Peregrine Falcon" Aug. 1982 Pacific Coast American Peregrine Falcon Recovery Team			
Burrowing Owl		(CSC)	
Long-eared Owl		(CSC)	
Great Gray Owl		(E)	(S)
Spotted Owl		(CSC)	(S)
Willow Flycatcher		(CSC)	(S)
Yellow Warbler		(CSC)	
Sierra Red Fox		(T)	(S)
Wolverine		(T,CP)	
Fisher			(S)
Pine Marten			(S)

Due to abundant forage, available water, and rich variety of habitats, riparian areas and meadows have an importance to wildlife which is highly disproportionate to their limited acreage. They are also a focal point of conflicts between uses such as grazing, recreation, and timber. Cattle utilize the abundant forage resources; and, through overuse, can cause habitat damage. Recreationists are attracted to these areas for their scenic beauty, generally flat topography, and water. This recreational use can cause damage to habitats. Timber harvest adjacent to and in these areas can change the structural diversity.

Generally sensitive plants on the Sequoia NF fall into three broad categories. They are:

1) Plants are rare, but found in sufficient numbers and distributed widely enough that the potential for extinction is low at this time.

Unexpected larkspur	Delphinium inopinum
Muirs raillardella	Raillardella muirii
Tompkin's sedge	Carex tompkinsii

2) Occurrence of plants confined to several populations or one extended population.

Hall's daisy	Erigeron aequifolius
Kernville poppy	Eschscholzia procera
Congdons bitterroot	Lewisia congdonii
Coville's navarretia	Navarretia setiloba
Purple mountain parsley	Oreonana purpurascens
Piute jewel flower	Streptanthus cordatus var. piutensis
DeDecker clover	Trifolium dedeckerae
Charlotte's phacelia	Phacelia nashiana

3) Occurrence limited to one or a few highly restricted populations, or present in such small numbers that it is seldom reported.

Ertter milkvetch	Astragalus ertterae
*Shevock milkvetch	Astragalus shevockii
Kaweah brodiaea	Brodiaea insignis
*Shirley Meadows mariposa**	Calochortus westonii
Springville clarkia***	Clarkia springvillensis
*Kern River daisy	Erigeron multiceps
*Piute buckwheat	Eriogonum breedlovei var. breedlovei
Needles buckwheat	Eriogonum breedlovei var. shevockii
*Twisselmann's buckwheat	Eriogonum twisselmannii
Kaweah fawn lily	Erythronium grandiflorum ssp. pusaterii
Greenhorn adobe lily	Fritillaria striata
*Bald Mountain potentilla	Horkelia tularensis
*Twisselmann's nemacladus	Nemacladus twisselmannii
Nine Mile Canyon phacelia	Phacelia novenmillensis

* These seven sensitive plants are endemic to the Sequoia NF.
** See "Management Guide for Shirley Meadows Mariposa," Sequoia NF 1984.
***See "Management Guide for Springville Clarkia", Sequoia NF 1987.

All other sites will be protected until specific species management guides are written.

At this time, there are no plants on the Sequoia NF, that are federally listed as threatened or endangered. Kaweah brodiaea, Greenhorn adobe lilly, and Springville clarkia are listed as "endangered" under the California Endangered Species Act. Twisselmann's nemacladus, Twisselmann's buckwheat, and Congdons bitterroot are listed as "rare" by the State of

b. Golden Trout Wilderness

The 303,287-acre Golden Trout Wilderness was designated by Congress in 1978. Of this total, 111,146 acres is on the Sequoia and the remainder on the Inyo NF. The Golden Trout Wilderness (GTW) gets its name from the brightly colored native trout (California State fish) and its subspecies the Little Kern golden trout, a federally listed threatened species, and the South Fork Kern golden trout.

In the Sequoia NF portion of the GTW, elevations range from 4,700 feet at the Forks of the Kern river to 12,432 feet on Mt. Florence, the highest peak on the Forest. Vegetation ranges from digger and pinyon pine woodlands at lower elevations; extensive parklike Jeffrey pine forests at mid elevations; and red fir, lodgepole and foxtail pine at higher elevations. Portions of the GTW occur above timberline. The entire Little Kern River Drainage lies within the wilderness. The North Fork Kern, and South Fork Kern Wild and Scenic Rivers bisect this wilderness.

Approximately 150 miles of trails are located in the Sequoia NF portion of the GTW. Grey Meadow and Trout Meadows are located on the major trail network system for the GTW and receive high use.

The Golden Trout Wilderness Interim Management Plan was approved by the Regional Forester on March 29, 1982. Key values addressed are fisheries, historical and cultural resources, visual quality associated primarily with meadows, and recreation stock use. The plan calls for restoration and enhancement of these values and uses while managing other resources so as to prevent their degradation.

c. Monarch Wilderness

Monarch Wilderness contains 45,000 acres with 21,200 acres on the Sierra NF and 23,800 acres on the Hume Lake District of the Sequoia NF.. The Monarch Wilderness lies 70 miles east of Fresno. Between November and April the access road is closed because of snow.

This is a scenically dramatic area rising from elevations of 4,300 feet along the South Fork of the Kings River to 11,077 feet at Hogback Peak. The main drainage is Grizzly Creek. Vegetation ranges from Jeffrey-ponderosa pine forests and chaparral at the lower elevations to alpine conifer forests of white-bark pine above 10,000 feet, the only occurrence of this conifer on the Forest. Two small shallow lakes (Grizzly Lakes) occur in the Monarch Wilderness but contain no fish.

Because of the steep, rugged character of the area, trail access is extremely limited. The Sequoia NF's portion of the Monarch Wilderness contains approximately 25 miles of trails. Use is very light with the majority occurring during the hunting season. This wilderness was established by Congress in the California Wilderness Act of 1984 from the High Sierra Primitive Area and a portion of the Agnew Roadless Area.

non-recreational riparian uses take place with regard to forest industries, mining, and residential land use. New problems, both social and environmental, have been created by the increased number of recreational users. Increased recreational use may adversely affect plants, birds, and animals along rivers. Erosion of banks, campsites, and boat landings is a common problem in some locations. Growth in use without proper administration may result in more littering and vandalism to public and private property along waterways. The extent of sanitation maintenance and law enforcement may also be expected to increase.

Periodic crowding on the Kings, Tule and North Fork Kern Rivers may lessen the enjoyment of some users. Even small changes in the densities and kinds of river uses could greatly influence the quality of experiences for some visitors. In fact, people seeking low-density use and a solitary enjoyment of nature may be displaced altogether. Conversely, crowds appeal to some people, and certain river users may also enjoy the sociability afforded by crowds. The North Fork Kern between Kernville and the Johnsondale Bridge and the Tule River near Coffee Camp are examples of where this situation prevails.

Recreational use often generates other conflicts in addition to crowding. Conflicts have arisen between fishermen and boaters, and between recreationists and private landowners. As uses increase, conflicts will probably grow and so will debate over how to mediate such conflicts.

19. Research Natural Areas

The establishment of research natural areas (RNA's) recognizes the need to promote and protect natural diversity in all its forms. Research natural areas typify important forest, shrubland, grassland, alpine, aquatic, and geologic types and other natural conditions that have special unique characteristics of scientific interest and importance. RNA's are for non-manipulative research and education. Their demand is national in scope and is primarily dictated by the National Forest Management Act (NFMA). Uses other than research and education are discouraged.

RNA's serve many purposes. These include:

- provide opportunities for the study of plant succession and other biological and physical phenomenon over long periods of time;
- provide a source of baseline data for monitoring changes in natural processes and systems brought about by man's activities;
- provide "benchmark" values to aid managers in their resource management activities.

The nature of Research Natural Areas preclude most management practices. Maintenance of RNA's depend on the exclusion of all but non-manipulative research and educational activities. All RNA's would be recommended for

withdrawal from mineral entry. This will not significantly reduce the availability of minerals based on existing information. There are no RNA's currently established on the Sequoia NF. Target elements needed to complete the RNA system for the Sierra Nevada (south) Province were prioritized by the Region. The target elements selected for the Sequoia NF include Jeffrey pine, red fir, and giant sequoia.

In response, the Forest identified three areas possessing quality RNA characteristics. Each is accessible only by trails and is relatively pristine, generally unaffected by recreation uses. The areas were nominated as potential RNA's to the Regional RNA Committee and have since been approved.

Church Dome Jeffrey Pine RNA

Church Dome (Cannell Meadow District) has been identified as a recommended RNA for the Jeffrey pine element. The area is dominated by an open park-like Jeffrey pine forest within the Manter Creek Drainage, Dome Land Wilderness. The potential RNA is 1,380 acres in size.

South Mountaineer Creek Red Fir RNA

South Mountaineer Creek (Tule River District) has been identified as a recommended RNA for the red fir element. An extensive red fir forest dominates the area. This RNA lies within the watershed of South Mountaineer Creek in the Golden Trout Wilderness. This potential RNA is 1,325 acres in size.

Moses Mountain Giant Sequoia RNA

Moses Mountain (Tule River District) has been identified as a recommended RNA for the Giant Sequoia element. In addition to Giant Sequoia, the area contains rare plant habitat on the rocky east-facing slopes of Moses Mountain and aquatic habitat along the Wishon Fork Tule River. Of the 960 acre area, nearly two-thirds (610 acres) of the RNA lies within the Golden Trout Wilderness. The remaining 350 acres are outside of the wilderness boundary.

Long Canyon Conifer Woodland RNA

Long Canyon (Greenhorn District) has been identified as a potential RNA for the conifer woodland element. Located in the northeast corner of the Piute Mountains, this 1,000 acre area is a transition between desert shrub communities, chaparral communities, and coniferous woodlands. It is dominated by pinyon pine, digger pine, California juniper and Piute Cypress. Geologically, the area is dominated by metamorphic rocks with one prominent limestone outcrop rising over 1,500 feet along the north slope of Heald Peak.

Additional opportunity exists to increase grazing capacity by 20,000 AUM's and increase habitat capability for deer on winter range by 5,000 animals. Potential recreational benefits include increased hunter success, greater visual diversity and increased recreational access to the chaparral zone.

Another potential use is harvesting the chaparral for heat ("chaparral briquets") producing purposes. Harvesting chaparral on the Sequoia appears unlikely during this planning period due to very high harvesting and processing costs.

Benefits to resource protection from chaparral management are difficult to measure since wildfires will still occur. Actual benefits will be realized in terms of lower resistance to control and lower rates of spread which will substantially reduce suppression costs and the danger to life, property and high value Forest resources over time.

The greatest sustained benefits for range, wildlife, water yield and recreation can be gained by burning or treating the chaparral on a continuing or rotating cycle of 20 to 40 years. Protection objectives may require more frequent treatment to maintain hazard reduction values. Slopes, vegetation aspect, and resource objectives will control actual age when retreatment is needed. Burning on a rotational cycle maintains a broad diversity of habitat and vegetative age classes.

b. Giant Sequoia

Giant sequoia or sierra redwood (Sequoiadendron giganteum) grows in mixed conifer forests on the western slope of the Sierra Nevada at elevations ranging from 5,000-8,000 feet. Common conifer associates are white fir, sugar pine, ponderosa pine, Jeffrey pine, and incense-cedar.

The location of individual sequoia stands in the Sequoia NF is controlled by an interaction of soil moisture, temperature, and the ecological tolerance of the seedling stages. About thirty-seven groves, totalling approximately 13,200 acres, are scattered within the Forest.

Giant sequoias are resistant to insects and disease because of the presence of tannin in the wood, which inhibits wood-boring insects and destructive fungi. Since these organisms are also responsible for the decomposition of dead timber, whether standing or fallen, toppled sequoias may remain virtually intact for decades or even centuries.

Unlike most trees, which eventually succumb to insects, fire, or fungal activity, the giant sequoia, is relatively resistant to all three. Giant sequoias are supported by vast but, for such large trees, remarkably shallow root systems that make the trees vulnerable to windthrow and undercutting by floodwaters. Their root systems may also be damaged by compaction.

The size of a giant sequoia is not a function of age so much as soil moisture. Sequoia groves receive between 45 and 60 inches of precipitation a year, which is typical for the mixed conifer forest type as a whole.

However, sequoias are restricted to sites where soil moisture is ample throughout the dry summer months. Mature giant sequoias on the best sites grow at a rate unequalled by any other kind of tree on the Forest. Annual growth rings one-half inch thick are typical of large sequoias on good sites, amounting to an increase in trunk diameter of one inch a year. Thus, even though several giant sequoias in the Forest are estimated to be over 3,000 years old, age is not necessarily a criterion for size.

Bare mineral soil is essential for successful germination. Sequoia seeds are too light to sift down through the deep forest litter, which is characteristic of most stands. The seeds need to lie within a half-inch of the soil surface in order to survive. Periodic disturbance or fires which reduces litter depth and opens up the forest to more sunlight are essential for giant sequoia's reproduction. Although fire suppression in the last 80 years has minimized such disturbance, present stand boundaries are believed to have been influenced more by available soil moisture than local fire occurrence.

Preliminary mapping and inventory of all 37 groves in the Forest is completed. Standing inventory is estimated at 960 MMBF. Very few giant sequoias are less than 80 years old which correlates well to fire suppression activities since the creation of the Forest.

Current management direction is found in Forest Service Manual 2405.12g which states:

> The Sierra redwood is remarkable for its great size and long life. Because of the limited occurrence of virgin Sierra redwoods and the aesthetic values of individuals and groves of these specimen or museum trees, they warrant special treatment prescribed in Ranger District Multiple Use Plans. The management objective is the preservation of the species and of individual old growth trees for public enjoyment.

Further direction is provided in Sequoia NF Supplement #26, FSM 2471:

> The management objectives for stands of Giant Sequoias shall be established by Management Category. The primary objectives shall be the perpetuation of the species, the preservation of old growth "specimen" trees, and sawtimber production. A "specimen" tree is defined as a standing Giant Sequoia, live or dead, that has mature characteristics such as: columnar form of stem, deeply furrowed bark, lower stem free of limbs, red bark, etc. In addition, it must be older than 150 years and larger than 8 feet in diameter, measured at 6 feet above ground level.
>
> 1. Preservation. This Management Category will be reserved for those stands or groves of present or potential high aesthetic or scientific values. Although this designation is generally restricted to large, prominent groves, it may also apply to one, or a few, "specimen" trees, the protection of which is desirable because of unique size or location. It may also apply to Research Natural Areas or Botanical Areas.

The potential future supply of products and public use could be enhanced by:

(1) reducing excessive fuels within the groves.

(2) producing a seedbed for natural regeneration by a combination of timber harvesting activities and prescribed burns.

(3) increasing aesthetic values by selectively removing dense "whitewoods" so that the giant sequoias can easily be seen.

(4) planting of giant sequoias in other mixed conifer stands or plantations.

(5) selectively thinning young growth giant sequoias to promote growth of future specimen or museum trees.

(6) constructing recreation trails through selected groves and providing interpretation.

(7) increasing publicity about giant sequoia groves.

Demand for giant sequoia is primarily for recreational use and for lumber. The wood in mature trees is more brash and brittle than coast redwood but is very resistant to rot. However, structural quality in young giant sequoia trees is similar, if not better than coast redwood. Rapid growth and commercial value make this species very desirable in the managed forest.

The giant sequoia groves have attracted visitors since their discovery in the mid 1800's. The size and granduer of the old growth trees makes them unique and aweinspiring. People still journey many miles to walk through the groves and look at the specimen trees. On the Sequoia NF in 1982, the groves received 70,000 visitor days of use. This was concentrated in groves which are located near roads (roaded natural ROS Class).

There are several opportunities to increase recreational use of the giant sequoia groves. These include providing intrepretive facilities such as trails and signs, improving access to the groves and encouraging reproduction to insure replacement of specimen trees. Management activities within the groves could include fuel reduction and removal of whitewood tree species to improve vistas and increases visitor mobility.

c. Meadows

The Forest currently has approximately 7,540 acres of mountain meadows ranging in size from about 2 acres to several hundred acres. All of these acres lie within the boundaries of the larger conifer ecosystem. They represent less than 2% of that ecosystem's gross acreage. Although the total area of meadows is a small percentage of the mountainous terrain,

6) MEADOWS

a) Maintain all meadows.

b) Consider meadows smaller than two acres as part of the riparian areas.

c) Develop Meadow Management Standards and Guidelines.

7) SENSITIVE PLANTS

a) Manage sensitive plants to ensure they do not become threatened or endangered.

8) RESEARCH NATURAL AREAS (RNA)

a) Protect and manage the following potential RNA's as if they are already established pending their final establishment or release by Chief of the Forest Service: Moses Mountain (960 acres), South Mountaineer Creek (1,325 acres), Church Dome (1,380 acres), and Long Canyon (1,000 acres).

b) Prepare establishment reports for submission to the Chief for the following areas recommended by the Regional RNA Committee for final establishment: Church Dome, South Mountaineer Creek, and Moses Mountain.

c) Submit the nomination of the Long Canyon site to the Regional RNA Committee. Upon favorable action by the committee, an establishment report will be prepared for submission to the Chief.

9) SPECIAL INTEREST AREAS (SIA)

a) Establish the Ernest C. Twisselmann (860 acres) Botanical Area located in the vicinity of Sirretta Peak.

b) Designate the following botanical areas and complete management plans as needed for Bald Mountain (440 acres), Slate Mountain (490 acres), Baker Point (780 acres), and Inspiration Point (270 acres).

c) Revise and implement a management plan for the Packsaddle Cave Geologic Area.

d) Revise and implement a management plan for the Bodfish Piute Cypress Botanical Area in cooperation with the Bureau of Land Management.

10) NATIONAL NATURAL LANDMARKS

a) Continue coordination with the National Park Service to conduct on-site landmark evaluation studies for the following sites: Moses Mountain, Long Canyon, Bald Mountain, Sirretta Peak, Inspiration

Emphasis

The Wild, Scenic, and Recreation River emphasis is on the preservation of the free-flowing condition of selected rivers with various outstandingly remarkable features, on the protection of water quality and the immediate environment, and to fulfill other vital national conservation purposes.

Opportunities

Intensive timber management will not occur. Firewood gathering will be limited to the immediate use of the recreationist. Recreational facilities may be developed along those river segments classified as "Recreation" to provide opportunities for engaging in activities that are enhanced by the river. Motorized access in specific locations; non-intensive timber management to control insect and disease outbreaks; inconspicuous fish and wildlife habitat improvement; and water management practices to correct resource problems may occur in "Scenic" or "Recreation" segments. Designated rivers within a wilderness will be managed in accordance with the specific wilderness plan. Within "Wild" segments, management will favor the protection of natural values while providing river-related outdoor recreation opportunities in a primitive setting that is generally inaccessible except by trail. Consider mineral withdrawal subject to existing claims.

MANAGEMENT AREA PRESCRIPTION RNA

This prescription emphasizes the management of Research Natural Areas. This management area encompasses 2,000 net acres outside wilderness and 3,000 net acres within wilderness.

Emphasis

These areas have been identified as areas of important vegetative or geologic type or areas that have special unique characteristics of scientific interest. These areas are set aside for non-manipulative research and education. Uses other than research and education are discouraged.

Opportunities

The proposed candidate sites, with the exception of Long Canyon and a portion of Moses Mountain, are already in wilderness. The areas will be managed as if they are already established. Future management will follow the establishment reports.

The proposed candidate sites are:

Church Dome	- 1,380 acres
South Mountaineer Creek	- 1,325 acres
Moses Mountain	- 960 acres
Long Canyon	- 1,000 acres
	7,265 acres

APPENDIX C
DESCRIPTION AND EVALUATION
FURTHER PLANNING AND WILDERNESS STUDY AREAS

The Further Planning and Wilderness Study Areas are displayed in numerical order in this Appendix. The list below is a quick reference to locate a specific area by name.

A. FURTHER PLANNING AREA DESCRIPTIONS AND EVALUATION

INTRODUCTION

The second Roadless Area Review and Evaluation (RARE II) inventory identified 21 individual roadless areas on the Sequoia National Forest with a total of 517,274 net acres. The RARE II Final EIS recommended some of these areas for wilderness or non-wilderness, and suggested that other areas be subject to further planning before final recommendations were made. However, as a result of litigation over the RARE II recommendations, and the 1984 wilderness legislation, only four Further Planning Areas (FPA's) are being evaluated by the Sequoia NF for possible wilderness recommendation. These include the Oat Mountain, Dennison Peak, Moses, and Scodies Further Planning Areas. The BLM Rockhouse Wilderness Study Area (WSA) is also being evaluated for possible wilderness recommendation.

The entire Kings River Further Planning Area was analyzed by the Sierra NF in its DEIS. During this time, a considerable amount of legislative activity regarding Wild and Scenic River designation on the Kings River occurred. The end result was enactment of Kings River Wild and Scenic River Legislation in November 1987, which included this area as a Special Management Area. This action negates the need for additional consideration as a Further Planning Area. A plan for managing the Special Management Area will be prepared jointly between the two Forests within three years of the legislation enactment date.

1/ Deleted (See discussion in the Introduction which follows.)

DESCRIPTION

The Moses FPA is located in Tulare County in the Tule River Ranger District. It is split into two geographically separated areas. The eastern boundaries of both sections are contiguous to the Golden Trout Wilderness. Moses FPA can be reached from Springville by California Highway 190 up the Tule River Canyon and Wishon road from the south; and Balch Park and Bear Creek roads from the north and west. It is approximately a four-hour drive from Los Angeles, and two hours from Bakersfield.

Moses FPA is diverse in topographical and vegetational characteristics. The boundary contiguous to the Golden Trout Wilderness is "high country", being over 8,000 feet in elevation. The western boundaries are dominated by diverse stands of chamise chaparral.

Primary ecosystems in the area are chaparral (24 percent), oak woodlands (24 percent), mixed conifer (20 percent), giant sequoia (13 percent), Jeffrey pine (six percent), and red fir (five percent). Rock outcrops comprise seven percent of the FPA.

CAPABILITY

Natural integrity and apparent naturalness are high in the higher elevations of the Moses FPA. In lower elevations, these characteristics have been diminished by the introduction of unnatural features such as fuelbreaks, a series of range improvements, motorized vehicles on trails, and nonnative forage species.

The area does provide opportunities for solitude and primitive recreation, particularly at the higher elevations. In the eastern half of the southern portion and the eastern three-fourths of the northern section, opportunities for solitude and primitive recreation are considered excellent due to the varied topography and vegetation communities. These areas also correspond to the areas of highest scenic and fisheries values for the Moses FPA. In contrast, the western quarter of the northern section and western half of the southern section have few opportunities for solitude and primitive recreation. Scenic views are often influenced by human developments such as roads, power lines and/or urban developments. Overall, the area offers a variety of opportunities for challenge and self-reliance.

The boundary of the area is clearly defined only along the eastern portion of the FPA adjacent to the Golden Trout Wilderness. In both sections, the eastern boundary is a topographical feature, being the ridge dividing the North Fork from the Wishon Fork Tule River on the northern section, and the ridge dividing Wishon Fork Tule River and the Little Kern River on the southern section.

The remainder of the boundary is not easy to manage since it contains a "stair-step" boundary adjacent to Mountain Home Demonstration State Forest,

and the remainder cuts across drainages and is located mid-slope. Opportunities for increasing manageability of the FPA are limited, but some modifications would be an improvement over the current boundary.

One option would be to drop the dense impenetrable chamise chaparral area in the southern section of the FPA. The Wishon Fork would provide for a more logical boundary above Doyle Springs to the Mountain Home Demonstration State Forest boundary. This split would be easy to manage and the best opportunities for solitude and primitive recreation within the southern section of the FPA would be maintained. The northern section also has a few opportunities for boundary adjustments that would improve the manageability of the area. The northern section contains the rocky and rugged west-face of Moses Mountain. At 9,331 feet, this is the highest point for the FPA. A much more logical boundary would be to follow Pine Creek down from the southern end of Moses Mountain to the current western boundary. Of the two sections, the northern portion is the most primitive and rugged. Hence, another logical split would be to recommend just the northern section for wilderness.

Special features include two sensitive plant species: Kaweah fawn lily (Erythronium grandiflorum ssp. pusaterii) and purple mountain parsley (Oreonana purpurascens); and a recommended Research Natural Area (RNA). The Moses Mountain RNA candidate is mostly within the Golden Trout Wilderness. The remaining 350 acres is within the Moses FPA. Designation as wilderness will not affect management of the RNA if it is established by the Chief. RNA status will ensure adequate protection regardless of wilderness status.

AVAILABILITY

Contiguous to the Golden Trout Wilderness, with high scenic values and opportunities for solitude and primitive experience, the FPA currently receives very light recreational use. Motorized recreation constitutes nearly 25 percent of the total use, much of it originating on adjacent private lands.

Over half of all use occurs in the Semi-Primitive Non-Motorized ROS class. The few trails in the FPA are used today; however, they were important in the early years of the Forest. Completion of the current road system provides better access to trailheads into the Golden Trout Wilderness.

In 1982 recreational use in the Moses FPA totalled 480 RVD's. If the area is not designated as wilderness, and present trends continue, use is expected to reach 600 RVD's in 1990 and 760 RVD's by 2000. If the area is designated, use is expected to reach 760 RVD's by 2000.

Moses FPA lies at the eastern edge of the Tule River airshed. The southern portion of the area is on the ridge separating the Tule and Kern airsheds; while the northern portion is adjacent to the Kaweah airshed. It is most likely that the primary air flow influence of the area is the Tule airshed. Ozone concentrations measured at nearby Mountain Home Demonstration State Forest from 1977-1981 consistently experienced the least number of hours exceeding the California standard of 10 pphm (parts per hundred million) as compared to two other monitoring sites on the Forest. Any pollutants

transported into the Moses FPA will likely have the most impact in the lower elevations of the area. Concentrations would be weaker as one ascends into the higher elevations.

Forest Service management activities (prescribed fires, timber harvest, road construction) nearby may temporarily impact air quality but this impact should be minimal compared to transported pollutants. The private tract of Camp Wishon and Doyle Springs lies adjacent to the southern portion of the FPA. A small number of private homes are located here and may produce a light concentration of particulates from wood burning stoves. It is assumed that these emissions occur primarily in the winter months when the cold dense air most likely allows for slow dispersion, retaining the highest particulate levels in the canyon near the private tract.

The Moses FPA is quite varied in wildlife habitat types, ranging from chaparral to exposed rocky peaks. Approximately 3,000 acres of this area are designated as key winter range for the Tule River deer herd. The remainder of the FPA is summer or transition range. Black bear are common in the area. Both the rare wolverine and sensitive fisher are known in the area. A spotted owl habitat area is also located in the FPA.

Opportunities exist to increase wildlife habitat and diversity by selected prescribed burning projects in the chamise chaparral ecosystem.

The FPA has a significant number of pristine fisheries which provide excellent fishing-exploring experiences. Minimal access to these streams has protected the fisheries from damage and overutilization.

The FPA is part of four separate livestock grazing allotments, held by four permittees. The forage resource is mostly annual grass and shrubs with some meadow habitat in the higher elevations. There are six springs developed with 250 feet of pipe, six troughs, and one stock pond.

Current production is 430 AUM's per year. The area has potential for increased forage production through chaparral manipulation, type conversions and water developments. Total potential production could be increased to 600 AUM's.

The majority of the commercial timber is located in the east half of the southern parcel of Moses. Approximately 50 percent of the southern parcel contains commercial timber within the drainages of the Middle Fork Tule River, Burro Creek, and the North and South Forks of Alder Creek. The commercial timber in the northern parcel is located south and east of the private land at Dillonwood. Approximately 40 percent of this parcel contains commercial timber. The estimated acres of commercial forest land in the Moses FPA is 9,800 acres. The maximum annual average yield possible for the next 50 years would be about 6.53 million board feet. Standing volume is approximately 442 million board feet. About 1.08 miles of road would be constructed each year to allow harvest.

Ecologically, vegetation in the Moses FPA is diverse and appears healthy. The extensive chamise chaparral areas are overmature due to fire prevention and suppression activities. This ecosystem which is fire dependent needs

to be burned periodically to maintain species diversity of both plants and animals.

Estimated average annual water yield for the study area is 19,000 acre-feet. The study area is almost entirely within the Tule River drainage. About 34 percent is in the North Fork, 51 percent in the Wishon Fork and 15 percent in the Middle Fork sub-watersheds. A flume, traversing the southwestern part of the FPA, supplies water to Springville and provides water for hydroelectric generation at the Southern California Edison plant east of Springville.

Average annual precipitation is 33 inches. Channels in the northern part of the FPA are rocky and fairly stable. The remainder of the area contains channels mostly comprised of granitic or metamorphic alluvium with some susceptibility to degradation.

The Moses FPA is composed of over 50 percent granitic with the remainder being metasedimentary material. A recent Bureau of Mines study states that 155 currently inactive claims have been located in the area since 1899. The Powell Mine which produced silver, lead, copper, and zinc was the only recorded productive mine. Along with the Powell Mine, the King Solomon Prospect shows potential for silicified phyllite containing zinc, and the Helen-Joyce Prospect shows potential for silver and zinc. Most mineral potential is in the southern section.

This FPA was inhabited by the Yandanchi branch of the Foothill Yokuts. The antiquity of the Yokuts occupation in this area goes back at least 8,000 years. Foothill Yokuts' technology relied upon the use of stone prior to contact with Europeans in the late 18th century. Obsidian, granite, and quartz were the primary lithic sources. Cordage, bows, baskets, and pottery were common to the Yokuts. House types were conical dwellings 12-15 feet in diameter, which were sometimes excavated for a depressed floor. The Foothill Yokuts had a relatively complex social and religious organization.

Of historic interest is the Hubbs Sawmill (1885) which was the first sawmill to operate commercially in the North Fork Tule River area.

Due to the lack of archaeological surveys in the area, the prehistory of the Moses FPA is scarcely known.

Under the existing Multiple-Use Plan direction, fire prevention and suppression in the Moses FPA averages $8.00 per acre.

There are no non-federal lands within this area.

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The nearest designated wilderness is the Golden Trout Wilderness which is adjacent to the Moses FPA. Use for the Golden Trout Wilderness was 101,900 RVD's in 1982. The northern boundary of the Moses FPA is also contiguous with Sequoia and Kings Canyon National Parks.

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Display of the "target" research natural area system for the California Region

MAJOR ELEMENTS	NOTES	CHARACTERISTIC SPECIES	PHYSIOGRAPHIC PROVINCES										
			1	2	3	4a	4b	5a	5b	7a	7b	8a	10
Forest Elements													
Aspen	SAP 217	Populus tremuloides								X	X		
California Black Oak	SAP 246	Quercus kelloggii		X				X		X	X		
Bristlecone Pine	SAP 209	Pinus aristata (P.longaeva)					X						
Douglas-Fir - Western hemlock	SAP 230	Pseudotsuga menziesii, Tsuga heterophylla	X					X					
Interior Ponderosa Pine	SAP 237	Pinus ponderosa, Artemisia tridentata, Purshia tridentata			X					X			
Jeffrey Pine	SAP 247	Pinus jeffreyi			X		X			X	X		
Knobcone Pine	SAP 248	Pinus attenuata	X	X				X	X				
Limber Pine	SAP 219	Pinus flexilis					X						
Lodgepole Pine	SAP 218	Pinus contortat spp. murrayanna					X						
Sierra Nevada Mixed Conifer	SAP 243	Pinus ponderosa, P. lambertiana, Abies concolor, Calocedrus decurrens Pseudotsuga menziesii	X	X						X			
Douglas-fir - Tanoak - Pacific Madrone	SAP 234	Lithocarpus densiflorus, Arbutus menziesii	X					X	X				
Mountain Hemlock	-	Tsuga mertensiana								X			
Pacific Douglas-fir	SAP 229	Pseudotsuga menziesii	X					X					
Pacific Ponderosa Pine	SAP 245	Pinus ponderosa, Quercus kelloggii, Chamaebatia foliolosa, Arctostapylos spp.								X	X		
Ponderosa Pine - Douglas-Fir	SAP 244	Pinus ponderosa, Pseudotsuga menziesii	X	X						X			
Port Orford-cedar	SAP 231	Chamaecyparis lawsoniana	X										
Red fir	SAP 207	Abies magnifica (including var. shastensis)	X	X						X	X		
Redwood	SAP 232	Sequoia sempervirens						X	X				
Sugar Pine-White Fir	-	Pinus lambertiana, Abies concolor								X			
White Fir	SAP 211	Abies concolor	X	X					X	X	X	X	
Woodland Elements													
Black Cottonwood-Willow	SAP 222	Populus trichocarpa, Salix spp.	X					X					
Blue Oak-Digger Pine	SAP 250	Quercus douglasii, Pinus sabiniana		X						X	X		
California Coast Live Oak	SAP 255	Quercus agrifolia										X	
Engelmann Oak	-	Quercus engelmannii											X
Foothill Woodland	K-26	Quercus spp., annual grass spp.		X				X	X	X	X		
Oregon White Oak	SAP 233	Quercus garryana						X					
Pinyon-Juniper	SAP 239	Pinus monophylla, Juniperus osteosperma					X					X	
Western Juniper	SAP 238	Juniperus occidentalis			X								

MAJOR ELEMENTS	NOTES	CHARACTERISTIC SPECIES	PHYSIOGRAPHIC PROVINCES									
			1	2	3	4a	4b	5a	5b	7a	7b	8a	10
Scrub and Chaparral Elements													
Chamise Chaparral	K-29	Adenostema fasciculatum, Arctostaphylos spp., Ceanothus spp.						X			X	X	X
Coastal Sage	K-30	Artemisia californica, Salvia spp., Eriogonum fasciculatum							X			X	X
Coulter Pine-Chaparral		Pinus coulteri, Quercus spp., chaparral species							X			X	X
Montane Chaparral	K-31	Quercus, Ceanothus, Arctostaphylos, Castanopsis	X							X	X		
Mountain Mahogany		Cercocarpus spp.										X	
Serpentine Chaparral		Quercus durata, Ceanothus jepsonii, Arctostaphylos viscida, viscida, Heteromeles arbutifolia						X					
Grassland and Meadow Elements													
Alpine Meadow		Carex spp., Centiana spp.									X		
Fescue-Oatgrass	K-40	Festuca idahoensis, Danthonia californica						X	X				
Montane Wet Meadow		Carex spp., Juncus spp., Camassia sp., Veratrum sp.									X		
Subalpine Wet Meadow		Carex spp., Centiana spp., Deschampsia spp.									X		
Marsh and Bog Elements													
Darlington Bog		Darlingtonia californica	X							X			
Moss Bog		Sphagnum spp.	X					X		X			
(Special Elements)													
Alpine Fellfields		Cushion plants, forbs, and dwarf shrubs	X				X				X		
Bigcone Douglas-Fir		Pseudotsuga macrocarpa							X			X	X
Brewer Spruce		Picea breweriana	X										
Cuyamaca Cypress		Cupressus arizonica var. stephensonii											X
Enriched Conifer		Numerous coniferous species in association	X										
Foxtail Pine		Pinus balfouriana	X								X		
MacNab Cypress		Cupressus macnabiana		X				X		X			
Modoc Cypress		Cupressus bakeri	X	X	X					X			
Parry Pinyon		Pinus quadrifolia											X
Piute Cypress		Cupressus arizonica var. nevadensis									X		
Santa Lucia Fir		Abies bracteata							X				
Sargent Cypress		Cupressus sargentii								X			
Sierra Redwood (Giant Sequoia)		Sequoiadendron gigantea								X	X		
Tecate Cypress		Cupressus guadalupensis (Syn. C. forbesii)											X
Washoe Pine		Pinus washoensis								X			
Other Unique Ecosystems		Determined case by case	X	X	X	X	X	X	X	X	X	X	X

Moses FPA is approximately a four-hour drive from Los Angeles and two hours from Bakersfield.

The Moses FPA was recommended for further planning by the RARE II Final EIS. This FPA has not appeared in any proposed California Wilderness Bills since 1980.

A majority of public responses during the RARE II process favored non-wilderness (52 percent) over wilderness (48 percent) designation. The Tulare County Board of Supervisors filed a resolution opposing further wilderness in Tulare County. Those supporting wilderness designation feel that it would be a good addition to the Golden Trout Wilderness. However, this FPA does not add to the integrity of the Golden Trout Wilderness since it extends into another river drainage system and the southern portion would be especially unmanageable. Opposition to wilderness status centers in the southern portion. Timber industry sees an unnecessary loss of volume, and range interests may not be able to maintain investments in improvements and treating the chaparral to increase or maintain current AUM's.

During the creation of the Golden Trout Wilderness in 1978, Congress considered placing the Moses area in with the Golden Trout, but rejected it.

All ecosystems in the Moses FPA are represented in the National Forest Wilderness System.

ENVIRONMENTAL CONSEQUENCES

1. Designation: Non-wilderness
   Prescription: Wildlife & Dispersed Recreation (BO5, OW5, MC5, CF5)
   Alternatives: See Table C.9.

Wilderness attributes of solitude, natural integrity and appearance would be little affected, except for short-term impacts on appearance during wildlife habitat projects. There would be no appreciable increase in use of the area because of the difficulty of terrain and limited access. Therein, solitude opportunities will remain high. Improvement and/or expansion of trails to access the area is limited by steep slopes. Cultural resources would remain reasonably protected, although project areas would require inventory, evaluation, and protection of cultural resources.

Wildlife habitat would be improved primarily via prescribed fire, therein, increasing both vegetative and animal diversity. Associated benefits to grazing could occur, although grazing would be subservient to wildlife needs. Air quality would be impacted during periods of burning, except in the lower portions of the FPA which are more affected by the San Joaquin Valley air quality and its associated pollutants.

Limited opportunities exist for timber management and would be available if done in conjunction with other timber harvests. Some fuelwood could be removed. Without this, opportunities would be foregone because of high

APPENDIX 4
TARGET ELEMENTS FOR THE PACIFIC SOUTHWEST REGION