SIGNATURE PAGE

for

RESEARCH NATURAL AREA ESTABLISHMENT RECORD

Devils Rock-Hosselkus Research Natural Area

Shasta-Trinity National Forests

Shasta County, California

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

Prepared by _____ Date _____
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Recommended by _____ Date _____
Irl Everest, Shasta Lake District Ranger
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and _____ Date _____
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Recommended by _____ Date _____
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Concurrence of _____ Date _____
JAMES C. SPACE, Station Director
Pacific Southwest Research Station

Established by _____ Date _____
G. LYNN SPRAGUE, Regional Forester
Pacific Southwest Region

TITLE PAGE

Establishment Record for
Devils Rock-Hosselkus Research Natural Area
within Shasta-Trinity National Forests
Shasta County, California

Devils Rock-Hosselkus Research Natural Area

MAPS

MAP 1: Devils Rock-Hosselkus RNA Location and Boundaries

MAP 2: Access to Devils Rock-Hosselkus RNA

MAP 3: Vegetation Types

A. INTRODUCTION

The Research Natural Area (RNA) system is a national network of ecological areas designated in perpetuity for research, education, and to maintain biological diversity on National Forest System and other federal ownerships lands. The selection of RNAs is by the identification of 'target elements', which are determined by vegetation associations within physiographic provinces. The RNA system is intended to include representative examples of common or widespread vegetation associations in each province, as well as any associations unusual or unique to that province. There are more than 300 RNAs already established in the Nation.

In California the identification of 'target elements' is based on plant communities described in various ecological reference works, such as Kuchler (1966), Eyre (1980), and Holland (1986), and unusual ecosystems, such as aquatic and geologically unique areas. Most RNAs contain a far greater diversity of vegetation types than just the designated target elements. The interactions between these types are of equal importance. For an overview of California's RNAs, please refer to Todd Keeler-Wolf (1990), "Ecological Surveys of Forest Service Research Natural Areas in California" (USDA Forest Service General Technical Report PSW-125).

The Devils Rock-Hosselkus RNA (DHRNA) was chosen because it contains a representative California black oak (Quercus kelloggii[1]) vegetation type (SAF [Society of American Foresters' Forest Cover Type] 246, Eyre 1980) for the Klamath Mountains Physiographic Province and a unique limestone ecosystem.

As early as 1966 the University of California sparked a proposal for a Natural Area in the Hosselkus Limestone area in the RNA. In 1971 the Shasta-Trinity National Forests designated the region as a special management unit. In 1974 the Region 5 RNA committee approved the RNA candidacy of the area. In 1975 a survey on the the scientific values of the area was conducted and in 1989 the Ecological Survey of the RNA was written (Keeler-Wolf and Keeler-Wolf 1975, Keeler-Wolf 1989b). In the same year Keeler-Wolf (1989a) also wrote a draft Establishment Record, on which this report is mainly based. However, proceeding to the DHRNA establishment stalled because of the unfinalized Forest Plan.

The DHRNA is entirely on land managed by the Shasta-Trinity National Forests. It is part of the Nosoni Management Area in Shasta Lake Ranger District, except the southern portion which is within the Whiskytown Shasta-Trinity National Recreation Area (Appendix A). The Shasta-Trinity National Forests is the sole administrator of this RNA.

(1) Land Management Planning

The Shasta-Trinity National Forests Final Land and Resource Management Plan (LRMP) (1995) recommends establishment of the DHRNA (Shasta-Trinity National Forests 1995a, Appendix A). The land allocation decision for the DHRNA was made with the signing of the Record of Decision for the LRMP by the Regional Forester (1995). The analysis for this decision was included in the Final Environmental Impact Statement for the LRMP (Shasta-Trinity National Forests 1995b, Appendix B). DHRNA

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

is one of the nine RNAs recommended by the Record of Decision for the Shasta-Trinity National Forests LRMP.

In earlier drafts of the Land and Resource Management Plan, the eastern portion of the RNA, selected as representative of the California black oak target element, was considered separately under the name of Devil's Rock candidate RNA (Keeler-Wolf 1989b). However, both adjacent areas are now considered as one.

B. OBJECTIVES

The DHRNA is established to represent: 1) the unique target element of limestone ecosystem and 2) the California black oak vegetation type for the Klamath Mountains Physiographic Province.

Initial interest in the area focused entirely on the limestone element. No other areas on Forest Service lands in Region 5 have been suggested for RNA candidacy to represent this special element. Marble Caves candidate RNA on the Klamath National Forest has been recommended to represent the unique element of limestone caves, however, that area was selected primarily for its geological significance. The unique biotic attributes of the DHRNA are multifarious. They include: a new shrub species discovered in 1992, a localized endemic plant discovered in 1958, wider-ranging plants endemic to limestone, localized endemic mollusks, a localized endemic salamander, a rich Triassic fossil assemblage (including ammonites, brachiopods, corals, and marine reptiles), and more recent Pleistocene vertebrate fossils in cave deposits. These combined values cannot be duplicated in any other area in the region or the world. The undisturbed nature of the area adds to its great value as a biological preserve.

The California black oak element for Region 5 is represented by several established or candidate RNAs in the Peninsular Range Province (Cahuilla Mountain RNA), the North Coast Range Province (Devil's Basin Candidate RNA), and the Southern Sierra Province (Big Grizzly Candidate RNA). However, the element is not represented by any other candidate or established RNA in the Klamath Mountains Province (Keeeler-Wolf 1990). The extensive California black oak (hereafter shortened to black oak when mentioned as a species) stands particularly in the eastern portion of the DHRNA cover a larger area on more varied slope exposures than the other black oak areas under current consideration for RNAs. This area includes a diversity of stocking densities and subtypes unequalled on other Pacific Southwest Region black oak areas. Thus, the area is a showpiece for this target element in California.

C. JUSTIFICATION

Scientific interest in the DHRNA area has been keen since before the turn of the century. In 1895 J.P. Smith of Stanford University collected ichthyosaur fossils from the area. Until ca. 1920 several paleontologists including J.C. Merriam and E.L. Furlong of the University of California visited the area and amassed the greatest collection of Late Triassic fossils in California. In all, over 210 species of fossil invertebrates (including ammonites, corals, brachiopods, and other mollusks) are known from the area (Hirschfeld 1975, Luft 1975). The ichthyosaurs of the area have provided virtually all that is known about this group during the late Triassic period in North America. When these were described by Merriam (1908) they included five new species of the genus Shastasaurus and three new genera (Leptocheirus, Toretocnemus,

and Delphinosaurus). In addition to the ichthyosaurs, the area has preserved the only known remains of the order Thalatosauria in the Western Hemisphere.

Following the flooding of the Squaw Creek and Pit River valleys by Lake Shasta, many of the landmarks used to locate the fossil quarries were obscured. To this day many of the old quarries of the pre-1920's have not been rediscovered, though most (if not all) are certainly within the boundaries of the DHRNA.

The Hosselkus Limestone is fossiliferous throughout much of its area. However, fossil preservation seems best at the southern end of the RNA, from the Gray Rocks area to the Brock Creek arm of Lake Shasta. The extremely fossiliferous nature of the southern end of the RNA makes it likely that the fossils taken by the early collectors could have been obtained virtually anywhere in this area (Susan Hirschfeld, pers. comm. September 1988).

Recent paleontological work shows continued interest in the Triassic fossils of the area. A Ph.D. thesis by Michael McCormick (1979) of U.C. Berkeley summarized the species assemblage and the paleoenvironment of the Hosselkus Limestone. Another paper by Stanley (1979) discusses the corals of the Hosselkus. Another paper (Silberling and Tozer 1982) points out that the Hosselkus Limestone is the type locality for two major biostratigraphic zones of the marine Triassic.

Paleontological research has also focused on the late Pleistocene fossil cave deposits. The limestone area between the Pit River and McCloud River arms of Lake Shasta is known as the most important site for Pleistocene vertebrate deposits in Northern California (Munthe and Hirschfeld 1971).

The Hosselkus limestone area is not as thoroughly explored as, for instance, Samwell and Potter's caves in the McCloud Limestone, but research in the early and mid-1970's by Jens and Kathy Munthe from U.C. Berkeley confirmed that caves in the Hosselkus Limestone contain fossil representatives of all vertebrate classes including at least one species each of fish and salamander, several snake species, many birds (including Gymnogyps, the California condor), and the following mammals: Sorex (shrew), Scapanus (mole), Sylvalagus (cottontail), Aplodontia (mountain beaver), Sciurus (tree squirrel), Thomomys (pocket gopher), Neotoma (woodrat), Peromyscus (deer mouse), Martes (Marten), Odocoileus (deer), Euceratherium (scrub ox), and at least one species each of Microtine mice, ground squirrels, and Vespertilionid bats (Hirschfeld 1975). Hirschfeld (1975) discovered a great many natural traps and fissures in the southern part of the limestone area (primarily in Section 9, T34N, R2W, see map 2).

The Shasta salamander (Hydromantes shastae)[2] is known from only five localities, all in the limestone country north of Lake Shasta. The type locality for this species is in Low Pass Creek Canyon within the DHRNA (Gorman 1954). This species is active throughout much of the year in the caves of the Low Pass and Gray Rocks areas, but may be seen above ground elsewhere in the area during the wet winter months (Ted Papenfuss pers. comm. 1975 and pers. observation). The Shasta salamander is a State of California listed threatened species, and is listed by the Forest as sensitive.

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[2]Authorities for animal names are Stebbins (1985) for reptiles and amphibians, Robbins et al. (1983) for birds, and Ingles (1965) for mammals.

The Shasta eupatory (Eupatorium shastense) is a shrubby composite endemic to the Hosselkus and McCloud Limestones north of Lake Shasta. It is listed by the California Native Plant Society (CNPS) (Skinner and Pavlik 1994) as a member of List 4 (a watch list). It is locally restricted to the shady north slopes of limestone outcrops in the Gray Rocks and Devils Rock area (photo 1). This species was discovered by G.L. Stebbins in 1958 in the Low Pass Creek area of the RNA (Taylor and Stebbins 1978).

In 1992 a new species of shrub in the rose family was discovered growing off Highway 299 on limestone. Seven occurrences of the new plant, Shasta snow-wreath (Neviusia cliftonii), has since been located. One occurrence is within the boundary of of DHRNA (Taylor et al. 1993, Long pers. comm. 1995). This species, whose closest relative occurs in the southeastern part of the United States, is thought to be a relic from the Arcto-Tertiary period. The complete story of the discovery of Shasta snow-wreath and its significance are reported in Fremontia (A journal of the CNPS) vol. 22, no. 3 (Taylor et al. 1993).

A large number of land snails coexists in the RNA. These include Monodenia troglodytes, an endemic to the Shasta County limestones, Monodenia churchii, a more widespread northern California species, Rilobopsis roperi, Versperocola shasta, and Haplotrema sp.; the last three being endemics to Shasta County. According to Barry Roth (pers. comm. 1975) the DHRNA is the only area where there are two sympatric species of the genus Monodenia. Monodenia troglodytes (Photo 2) is a common species of the limestone outcrops and caves.

Several species of plants including the ferns Cheilanthes cooperae (Photo 3), and Adiantum capillus-venerus, are widespread limestone endemics, which occur here. These species illustrate the unique chemical and physical environment of limestone. It is likely that, with further investigation, a number of other species of invertebrates, plants, lichens, etc. will be found to comprise an entire limestone ecosystem.

Apart from the unique physical environment of the limestone, the geographical location of the DHRNA near the juncture of the Klamath Mountains and the Sacramento Valley provinces creates some unique juxtapositions of various plants and animals. The coastal element of the Douglas-fir (Pseudotsuga menziesii) - dominated forests is prevalent in the shaded canyons of the RNA. Although approximately 105 miles (169 km) from the nearest point along the coast, many typical species of the mesic western Klamath Mountains occur here. These include Viola ocellata, Aruncus vulgaris, Acer circinatum, Taxus brevifolia, and Lomatium dissectum. Many of these species occur near their most inland localities at the DHRNA (Munz 1968). Animals such as the Pacific giant salamander (Dicamptodon ensatus), black salamander (Aneides flavipunctatus), tailed frog (Ascaphus truei), and Chestnut-backed chickadee (Parus rufescens) are also near their most inland localities in the vicinity of the RNA (Stebbins 1985, Grinnell and Miller 1944).

Conversely, the area is within 10 miles (16 km) of the northern end of California's Great Central Valley and the xeric south-facing slopes contain vegetation dominated by plants typical of the summer-dry foothills of California. Many plants such as Sonoma sage (Salvia sonomensis), Collinsia tinctoria, California buckeye (Aesculus californicus), bush poppy (Dendromecon rigida), flowering ash (Fraxinus dipetala), snowdrop bush (Styrax officinalis var. californica), and western spicebush (Calycanthus occidentalis) reach their northern limits within a few miles of the RNA. Along with them are animals typical of the California foothills such as the California newt (Taricha californica), striped racer (Masticophis lateralis), and Nuttall's woodpecker (Picoides nuttallii) (Stebbins 1985, Grinnell and Miller 1944).

The excellent representation of the California black oak element is another justification for establishment. California black oak forest is typically a fire-adapted vegetation which requires regular burning to stimulate resprouting of basal underground rootstalks and to open the understory for successful seedling germination (McDonald, in Eyre 1980). Much of the eastern portion of the area has undergone fires of sufficient frequency and intensity in the past to have promoted the widespread dominance of this type on not-only the hotter south-facing slopes, but on east-, west- and even occasionally north-facing slopes. The more sheltered exposures often show evidence of Douglas-fir succession, while the xeric exposures show colonization by conifers such as ponderosa pine (Pinus ponderosa), Pinus sabiniana, and to a lesser degree, Douglas-fir. The understories of the various exposures also differ, creating a variety of sub-types of this typically rather uniform vegetation type.

In addition to the paleontological and biological values, the DHRNA is adjacent to one of the most significant archaeological sites in northern California, Squaw Creek. Ancient multi-level village deposits dating back at least 6500 years have been excavated within 1/2 mile (0.8 km) of the RNA (see cultural section). Although no excavations or thorough search for artifacts has been conducted within the RNA, several Indian habitation sites in caves in the southern part of the area have been discovered (Hirschfeld 1975).

D. PRINCIPAL DISTINGUISHING FEATURES

The DHRNA occupies the upper Brock Mountain peninsula between the Squaw Creek and the Pit River arms of Lake Shasta. The area is bisected by a prominent ridge of rugged, resistant gray limestone that stretches in a N-S direction for approximately five miles (8 km) (Photos 4 and 5). This limestone rises above 3000 ft (914 m) in several locations, but is deeply cut by the canyon of Low Pass Creek in the northern portion of the area. The area to the east of the limestone is more gentle topography, underlain primarily by shale, and is dominated by the valleys of Flat and Ripgut creeks. The upper slopes above these small permanent streams are thickly vegetated with California black oak forest, canyon live oak (Quercus chrysolepis) forest and Brewer oak (Quercus garryana var. breweri) scrub, while the lower valleys are dominated by Douglas-fir and lush riparian thickets of dogwood (Cornus sessilis), white alder (Alnus rhombifolia) and other species.

The best area for the Triassic limestone fauna appears to be in the southern portion of the limestone outcrops, including Gray Rocks and outcrops to the southeast. The highest Pleistocene paleontological values are in the cave deposits of the Low Pass area and to the east and southeast of Gray Rocks. Other scientific values such as the Shasta salamander, the land snails, and the Shasta eupatory are more widespread throughout the limestone.

The California black oak vegetation occurs on both sides of the limestone outcrops. However, it is best represented on the more extensive eastern side. There vegetation dominated by black oak occurs on virtually all slope exposures and ranges from small-boled, even-aged stands to older monarchs intermixed with old growth Douglas-fir and ponderosa pine.

E. LOCATION

(1) National Forests Involved

The DHRNA is located entirely on the Shasta-Trinity National Forests.

(2) Latitude and Longitude

The approximate center of the RNA is located on 40°52'00"N latitude and 122°07'00"W longitude.

(3) Boundary Description

DHRNA's boundaries include all or portions of Sections 21, 22, 26, 27, 28, 32, 33, 34 of T35N, R2W and Sections 3, 4, 5, 8, 9, 16 of T34N, R2W (Goose Camp, Devils Rock, Minnesota Mtn. 7.5" quad.; Bolli Bokka Mtn. 15' quad.).

The following narrative boundary description is prepared by Mike Wines (Cadastral Engineer, Shasta-Trinity National Forests) and accompanies Map 1:

A. Beginning at the Northeast corner of Section 22 (T35N, R2W), Mount Diablo Base and Meridian (MDBM)(point A), southerly and along the Easterly boundary of Section 22 (also the borderline demarcation DHRNA and Mathews and Pappas Partnership's property), for approximately 1 mile (1.6 km) to the Southeast corner of Section 22 (point B);

B. easterly and along the Northerly boundary of Section 26, for approximately 0.1 mile (0.2 km), to a point 120 ft (37 m) easterly of the centerline of Ripgut Creek; said 120 ft (37 m) distance being measured at a right angle to the centerline of Ripgut Creek, point C);

C. southerly and along a line parallel with and 120 ft (37 m) easterly of the centerline of Ripgut Creek, for approximately 1.2 miles (1.9 km), to the Southerly boundary of Section 26 (T35N, R2W) (point D);

D. westerly and along the Southerly boundary of Section 26 and Section 27 (T35N, R2W) for approximately 1.1 miles (1.8 km), to a point 80 ft (24 m) westerly of the centerline of Flat Creek; said 80 ft (24 m) distance being measured at a right angle to the centerline of Flat Creek. (point E);

E. southerly and along a line parallel with and 80 ft (24 m) westerly of the cenerline of Flat Creek, for approximately 2.5 miles (4.1 km), and running through Section 34 (T35N, R2W) and Section 3 (T34N, R2W) to the Southerly boundary line of said Section 3 (point F);

F. westerly and along the Southerly boundary of Sections 3 and 4 (T34N, R2W) (also the Southerly boundary of the Whiskeytown Shasta-Trinity National Recreation Area), for approximately 1.4 miles (2.2 km) to a point 120 ft (37 m) easterly of the centerline of Brock Creek; said 120 ft (37 m) distance being measured at a right angle to the centerline of Brock Creek (point G);

G. southerly and along a line parallel with and 120 ft (37 m) easterly of the centerline of Brock Creek, for approximately 0.8 mile (1.3 km) to a point lying 20 ft (6 m) northerly of the

centerline of existing Trail 1W21; said 20 ft (6 m) distance being measured at a right angle to the centerline of Trail 1W21 (point H);

H. southwesterly and along a line parallel with and 20 ft (6 m) northwesterly of the centerline of said Trail 1W21, for approximately 0.9 mile (1.6 km), to a point on the centerline of a ridge in the northwest quarter of Section 16 (T34N, R2W) where the trail turns and runs northwesterly (point I);

I. northwesterly and continuing along a line parallel with and 20 ft (6 m) northeasterly of the centerline of said Trail 1W21, for approximately 1.5 miles (2.5 km), to a point where the trail enters a saddle and intersects Road 34N10 in the north half of Section 8 (point J);

J. westerly and along the centerline of Road 34N10, for approximately 100 ft (30 m), to a point directly above the centerline of a northwesterly tending swale; said swale being a southerly branch of Madison Canyon (point K);

K. northwesterly and along the centerline of said southerly branch of Madison Canyon, for approximately 0.7 miles (1.1 km) to its junction with the centerline of the main branch of Madison Canyon; said junction being in the Southwest quarter of Section 5 (T34N, R2W) and also being opposite a spur ridge dividing Madison Canyon drainage and Squaw Creek drainage (point L);

L. northerly and along the centerline of said spur ridge, for approximately 0.4 mile (0.6 km), to the high point of a peak; then northeasterly and along the centerline of the main ridge dividing Madison Canyon drainage and Squaw Creek drainage, for approximately 1.2 miles (2.0 km), to a point in a saddle; said point being the lowest point in the saddle and having an approximate elevation of 2750 ft (838 m) (point M);

M. northwesterly and along a contour, having the same elevation as said low point of the saddle, for approximately 0.15 mile (0.24 km) to the centerline of a swale known as Dinner Gulch (point N);

N. continuing along said contour, in a northwesterly and then a northeasterly direction, for approximately 0.9 mile (1.4 km), and around the northwest base of Devils Rock to the southern tip of a saddle, which is also the beginning of a ridge running northwest from Devils Rock in the Northwest quarter Section of Section 33 (T35N, R2W) (point O);

O. easterly and continuing along said contour, for approximately 100 yards (91 m), to the beginning of a northerly tending swale; said point being approximately north of Devils Rock (point P);

P. leaving said contour and running northerly and along the centerline of the said northerly swale, for approximately 0.7 miles (1.1 km), to its junction with the centerline of Low Pass Creek (point Q);

Q. northwesterly and upslope, for approximately 0.4 mile (0.6 km), to the top of the northern most peak, said peak being in the Northwest quarter of Section 28 (T35N, R2W) (point R);

R. northwesterly and along the centerline of a ridge for approximately 0.6 mile (0.2 km) to the centerline of a southwest and northeast tending swale; said swale being in the southwest 1/4 of Section 21 (T35N, R2W) (point S);

S. northeasterly and upslope, for approximately 0.1 mile (0.2 km), to the high point of a peak, said high point being in the southeast quarter of Section 20 (T35N, R2W) and having an approximate elevation of 1700 feet (510 m) (point T);

T. northeasterly along the centerline of the ridge for approximately 0.5 miles (0.8 km) to the high point of a peak near the center of Section 21 (T35N, R2W), said point having an approximate elevation of 2400 ft (730 m) (point U);

U. northwesterly in a direct line from said 2400 ft high point to the Northwest corner (a found section corner) of Section 21 (T35N, R2W); approximately 0.6 mile (1.0 km) (point V);

V. easterly and along the Northerly boundary of Section 21 and 22 (T35N, R2W) for approximately 2.0 miles (3.2 km), to the Northeast corner of Section 22, and the point of beginning (point A).

(4) Acreage

The total acreage of the area described above is approximate 5550 acres (approximately 2246 hectares).

(5) Elevations

Elevations in the DHRNA range from 1150 ft (350 m) near the south end of Brock Creek to a point approximately 0.5 mile (0.8 km) SW of Devils Rock at 3272 ft (997 m).

(6) Access

The DHRNA is accessible from its western side by several Forest Service roads. It is approximately 33 miles (53 km) from the Low Pass Creek area of the RNA to the junction with Interstate Highway 5. From this junction it is approximately 20 miles (32 km) to Redding, the location of the Shasta-Trinity National Forests Supervisor's Office. The distance between Redding and Low Pass Creek may be driven in about one and three-quarters hours.

The road 35N60 (also is County Road 7H009 and called Gilman Road on California Automobile Association road map) between Interstate 5 and the McCloud River Bridge (approximately 17 miles or 27 km) is asphalt. Beyond the McCloud Bridge the road is dirt (34N17, also is Primary Forest Route 27). After crossing the Squaw Creek Bridge near the Squaw Creek Forest Service Station one may turn south on road 35N02 for 1 mile to the Chirpchatter Campground, a logical staging area for entry into the RNA. This campground is not correctly indicated on the Bolli Bokka Mtn SE topo sheet or the Forest recreation map, being actually in the SE 1/4 of Section 20 and the adjacent NE 1/4 of Section 29, T35N, R2W.

The RNA is also accessible from the east via road 34N17. This road continues past the Squaw Creek Station, eventually crossing the Pit River and intersecting Highway 299. The route between the Squaw Creek Station and Highway 299 is 27 miles (43 km) long. From its junction with Highway 299 it is approximately 35 road miles (56 km) to Redding.

Road 35N02 continues southward from the Squaw Creek Bridge well beyond the Chirpchatter Campground and connects Road 34N21 at its southern end. Several low grade roads branching off of 35N02 and 34N21 provide good access routes to the RNA:

(a) The first route, taking off to the east just north of the Chirpchatter Campground, is an unnamed jeep road which is an extension of trail 2W21 (shows as a trail on the topo sheet). This road is passable by four-wheel drive vehicles up to the western edge of the RNA in the SW 1/4 of Section 21, T35N, R2W. At the road's end the trail 2W21 is hard to follow, but affords access to the limestone outcrops in the vicinity of Alder Spring.

(b) Continuing south on road 35N02 for about 1 mile (1.6 km) from the Chirpchatter Campground, the next access route is the Low Pass Creek jeep road. This road (listed as trail 1W21) travels eastward and, as of June 1988, was passable by small four-wheel drive vehicles to its terminus well into the interior of the RNA in the NE1/4 Section 28, T35N, R2W. Although this road will be blocked upon designation of the RNA, it will continue to afford walking access to the limestone outcrops along Low Pass Creek. It is also is the best access route to the eastern and northeastern portions of the area. From the end of the jeep track, trail 1W21 continues and meets with trail 2W21, which turns west and meets with the jeep road west of Alder Spring. Trail 1W21 also continues NE to Brock Butte at the northeastern end of the RNA. In the SE 1/4 of Section 28, T35N, R2W trail 2W22 branches off of the jeep road and drops down into the Flat Creek drainage. Trail 2W22 meets with trail 2W16 in the NW 1/4 Section 34 T35N, R2W, which does not ascend the valley slopes to the west of the Flat Creek as the map indicates, but follows the bank of Flat Creek south along the eastern boundary of the RNA to Lake Shasta. Trail 2W22 also joins with the Ripgut Creek trail (2W15), along the northeastern edge of the RNA, if followed upstream along the main branch of Flat Creek.

(c) Continuing south, road 35N02 winds along for approximately 6 miles (10 km) before road 34N10 branches off to the east. This road is the best access route to the Gray Rocks area. This road was passable with a good clearance two-wheel drive vehicle in June 1988. It is approximately 0.7 miles (1.1 km) long and ends at a saddle just south of a large complex of limestone outcrops. Driving time from the Chirpchatter Campground to the road end is approximately 45 minutes. Ostensibly, from this saddle trail 1W21 continues north along the limestone. However, in reality, the trail is undefinable only a few hundred yards north of the saddle. The trail does actually continue southeast from the saddle and eventually drops down into the Brock Creek drainage, reaching Lake Shasta in somewhat over 3 miles (4.8 km).

Access from the south via Lake Shasta is also possible, and is the best way of reaching the isolated fossiliferous limestone outcrops in the southern end of the RNA.

The extensive network of trails shown on the map (see Map 1, 2) gives a false sense of facility of access to much of the RNA. All of the foot trails mentioned above have not been brushed out or blazed for many years and in many places it is of no use to follow them. In some cases it is very unlikely a trail ever existed where one is indicated on the map. This is true for the segment of 1W21 between Gray Rocks and Low Pass Creek and is also true for the route of 2W16 from its junction with 2W22 to Shasta Lake. Large areas of the limestone country are extremely difficult to access and the abundance of poison oak (Rhus diversiloba) throughout much of the RNA is also a deterrent to cross-country travel.

F. AREA BY COVER TYPES

SAF TYPES (Eyre 1980)	Percent	Acres	Hectares
Pacific Ponderosa Pine - Douglas-fir(244)	20	1110	449
California Black Oak (246)	53	2942	1191
unclassified	27	1498	606
totals	100	5550	2246
KUCHLER TYPES (Kuchler 1966)			
Mixed Conifer Forest (K-5)	20	1110	449
Chaparral (K-29)	27	1498	606
unclassified	53	2942	1191
totals	100	5550	2246
HOLLAND TYPES (Holland 1986)			
Northern mixed chaparral (37110)	27	1498	606
White Alder Riparian Forest (61510)	unmappable		
Black Oak Forest (81340)	53	2942	1191
Coast Range Mixed Conifer Forest (84110)	20	1110	449
unclassified	0	0	0
totals	100	5550	2246

G. PHYSICAL AND CLIMATIC CONDITIONS

The DHRNA occupies a portion of the divide between Squaw Creek on the west and the Pit River on the east. This divide is now a peninsula, formed by the flooding of the two stream valleys following the construction of Shasta Dam in the 1940's. Although the elevations are low to moderate within the RNA, topography, particularly on the limestone, is generally rugged with numerous steep ravines and escarpments.

The DHRNA is in the extreme southeastern portion of the Klamath Mountains Province near its juncture with the Sacramento Valley. The former is typically an area of high precipitation and montane climate, the latter is typified by relatively low precipitation with high summer and moderate winter temperatures. Consequently, the DHRNA enjoys a blend of Klamath Mountains and Sacramento Valley climates. Temperatures, particularly in the summer are high, but precipitation is also high.

The area is underlain by two principal rock types, limestone and shale, both of upper Triassic age (ca. 200 million years old). The Hosselkus Limestone occurs in well-defined exposures in the west-central portion of the area, while the Brock Shale underlies much of the well-wooded remainder of the area. The interaction of the high precipitation with the water-soluble limestone has created numerous knife edge ridges, sinkholes, caves, and other landforms typical of karst topography (photos).

No weather recording stations exist in or adjacent to the RNA. The nearest station recording precipitation is the Pit River Powerhouse #5 at an elevation of 1458 ft (444 m). This site is located approximately 11 miles (18 km) northeast of the center of the RNA at a latitude and longitude of 40°59'N., 121°59'W. This station has been taking precipitation data since 1943. The 42-year average annual precipitation for this station is 77.02 inches (1956 mm). Approximately 18 miles (29 km) southwest of the center of the RNA is Shasta Dam (40°43'N, 122°25'W) at an elevation of 1075 ft (328 m). This site has been taking both precipitation and temperature data since 1941. Precipitation at Shasta Dam averaged 61.92 inches (1573 mm) between 1941 and 1985.

The following tables summarize the climatological data for a 12-year period from these two stations.

Table 1: Summary of temperature data (°F[°C]) for Shasta Dam from 1974 through 1985

year	x ann. temp.	highest temp. (w/date)	lowest temp. (w/date)	x Jan. temp.	x July temp.	#days between last spring & 1st fall frost
' 74	62.0	104 (8/5)	29 (1/6)	43.9	79.0	365+
[	16.7	40.0	-1.7	6.6	26.1]	
'75	---	109 (7/25)	30 (11/29)	47.4	79.6	238
[	---	42.8	-1.1	8.6	26.4]	
'76	62.6	115 (7/28)	31 (3/3)	48.4	83.1	365+
[	17.0	46.1	-0.6	9.1	28.4]	
'77	61.9	112 (8/1)	27 (1/17)	45.9	81.4	292
[	16.6	44.4	-2.8	7.7	27.4]	
'78	62.2	113 (8/10)	28 (12/29)	48.1	81.5	296
[	16.8	45.0	-2.2	8.9	27.5]	
'79	62.1	106 (9/16)	29 (1/30)	45.2	80.5	324
[	16.7	41.1	-1.7	7.3	26.9]	
'80	62.1	108 (7/28)	33 (12/31)	49.5	79.4	365+
[	16.7	42.2	0.6	9.7	26.3]	

'81	63.1	115 (8/8)	32 (2/26)	48.1	82.6	365+
[	17.3	46.1	0.0	8.9	28.1]	
'82	59.8	105 (8/23)	29 (4/4)	40.7	78.3	226
[	15.4	40.6	-1.7	4.8	25.7]	
'83	60.4	105 (8/7)	31 (12/23)	46.0	75.3	341
[	15.8	40.6	-0.6	7.8	24.1]	
'84	62.2	108 (7/5)	32 (12/31)	50.2	84.9	275
[	16.8	42.2	0.0	10.1	29.4]	
'85	---	109 (7/14)	---	46.7	85.3	---
[	---	42.8	---	8.2	29.6]	
a ver.	61.8	109	30	46.7	80.9	
[	16.6	42.8	-1.1	8.2	27.2]	

Table 2: Precipitation (inches [mm]) summary for a 12 year period for Pit River Powerhouse #5 and Shasta Dam.

Year	Pit River #5			Shasta Dam		
	Jan.	July	total	Jan.	July	total
'74	23.51	2.38	80.04	15.96	4.03	65.90
[	598.2	60.6	2036.6	406.1	102.5	1676.8]
'75	3.75	1.18	68.90	3.34	0.57	62.58
[	95.4	30.0	1753.2	85.0	14.5	1592.4]
'76	0.70	0.17	28.68	0.74	0.00	27.99
[	17.8	4.3	729.8	18.8	0.00	712.2]
'77	3.32	0.00	57.44	3.31	0.01	44.59
[	84.5	0.00	1461.6	84.2	0.3	1134.6]
'78	28.41	0.28	76.95	32.67	0.04	77.76
[	722.9	7.1	1958.0	831.3	1.0	1978.6]
'79	9.56	0.00	77.67	14.78	0.02	66.99
[	243.3	0.00	1976.3	376.1	0.5	1704.6]
'80	15.58	0.34	72.61	6.35	0.00	61.94
[	396.4	8.7	1847.6	161.6	0.00	1576.1]
'81	10.13	0.05	99.42	15.05	0.11	84.76
[	257.8	1.3	2529.8	383.0	2.8	2156.7]
'82	7.30	2.07	94.28	8.80	0.59	73.87
[	185.8	52.7	2399.0	223.9	15.0	1879.6]
'83	18.62	1.11	138.84	17.35	0.25	130.48
[	473.8	28.2	3532.8	441.5	6.4	3320.1]
'84	0.42	0.26	60.35	0.58	0.03	43.01
[	10.7	6.6	1535.6	14.8	0.8	1094.4]
'85	1.10	0.89	39.50	1.21	1.09	---
[	28.0	22.6	1005.1	30.8	27.7	---]
Average	10.20	0.72	74.56	10.01	0.56	61.66
[	259.5	18.3	1897.2	254.7	14.2	1569.0]

The temperatures at Shasta Dam are probably quite comparable to those at the lower elevations of the RNA. Table 1 indicates that the highest annual temperatures in the RNA average about 109°F (42.8^{o}C) while the lowest average about 30°F (-1.1^{o}C). Frost is a relatively rare event at the lowest elevations and probably in about 1 in 3 years there are no days below freezing. Assuming a lapse rate of 3°F/1000 ft in elevation (1.67^{o}C/305 m), 2000 feet (610 m) higher at the highest elevations in the RNA highest yearly temperatures would be approximately 103°F (39.4^{o}C), and lowest about 24°F (-4.4^{o}C).

Actual precipitation in the RNA is probably midway between the Shasta Dam and the Pit River Powerhouse #5 stations. Thus, the range between 60 and 70 inches (1524-1778 mm) indicated by the isohyets in Rantz (1972) for the vicinity of the RNA is probably accurate.

H. DESCRIPTION OF VALUES

(1) Flora

The flora of the DHRNA is reasonably well known, having been collected intensively during the field work for the Ecological Survey (Keeler-Wolf and Keeler-Wolf 1975) and again during the field reconnaissance for this report (June 1988). Appendix C1 lists all vascular plant taxa currently known from the area. The total number of vascular taxa listed in the appendix is 256.

The Shasta eupatory (photo 1) is considered a member of the California Native Plant Society's (CNPS) watch list (List 4) (Skinner and Pavlik 1994). The recently discovered new species, Shasta snow-wreath, is restricted and rare, endemic in the limestone area. It is currently a CNPS List 1B plant (plants rare, threatened, or endangered in California and elsewhere) (Skinner and Pavlik 1994). No other plants are currently listed as sensitive or endangered by the State, the Forest or the California Native Plant Society.

The flora of DHRNA is of biogeographical interest because of the relatively large number of taxa which reach either their northern-most or most inland distributions near it (see general discussion in Justification section). Nineteen taxa are near their northern limits and ten taxa are near their eastern limits. Two taxa characteristic of the Modoc Plateau which begins approximately 20 miles (32 km) to the east are at their western limits. All of these plants are indicated in Appendix C2.

The following is a brief account of the major vegetation types occurring at the DHRNA. These are depicted on the vegetation map (Map 3). The code numbers in parentheses following the names are keyed to the type description in Eyre (1980), Kuchler (1966), or Holland (1986).

(a) Limestone Scrub
Holland: Northern Mixed Chaparral (37110)
no SAF equivalent
Kuchler: Chaparral (29)

This vegetation is most similar to the classification of Northern Mixed Chaparral type (Holland code 37110). However, in composition, this type is a mixture of species from Northern Mixed

Chaparral and Montane Chaparral types, particularly Shin Oak[3] (Quercus garryana var. breweri) Brush type (Holland code 37541). It is a more open vegetation than typical chaparral because of the character of the substrate. The rugged limestone outcrops preclude colonization of woody plants except in crevices and in areas where erosion and disintegration of the rock has produced local pockets of soil. Thus, this vegetation typically exists in patches interspersed with areas of bare rock (photo 6). Because of the compositional and physiognomic differences from Northern Mixed Chaparral type, this community is given its own special name in this analysis.

Hardtack (Cercocarpus betuloides) tends to dominate on the most xeric rocky sites. Among the dominant species of woody plants on less rocky sites are Brewer oak, California mock orange (Philadelphus lewisii ssp. californica), California buckeye (Aesculus californica), Holly-leaf redberry (Rhamnus crocea ssp. ilicifolia), Fremont silktassel (Garrya fremontii), flowering ash (Fraxinus dipetela), redbud (Cercis occidentalis), snowdrop bush (Styrax officinalis var. californicus), ocean spray (Holodiscus discolor), poison oak (Rhus diversiloba), chaparral clematis (Clematis lasiantha), foothill[4] pine (Pinus sabiniana), Berberis dictyota, and chaparral honeysuckle (Lonicera interrupta). Numerous herbs also occur in the rock crevices. These include; Collinsia tinctoria, Lessingia nemaclada, Selaginella hanseni, Penstemon azureus, Arabis breweri, Erysimum capitatum, Phacelia heterophylla, and Galium nuttallii.

The shadier north-facing cliffs and slopes are dominated by scrubby canyon live oak (Quercus chrysolepis) and have such characteristic plants as Shasta eupatory, but because of the xeric nature of the substrate, slope aspect has less influence than in other local vegetation types. Although the open rocky nature of the substrate protects much of this vegetation from fire damage, this vegetation, by virture of its typical lower elevation or montane chaparral dominants, is fire-adapted. It is likely that because of the relatively long interval since the last fire that much of this vegetation would burn in the next major fire affecting the area.

Occasional patches of a similar type of vegetation exist on Brock Shale on south-facing rocky slopes off the limestone. Although the physiognomy is different than typical Northern Mixed Chaparral type, these patches and the more extensive stands on limestone represent some of the northernmost stands of several characteristic chaparral dominants in California.

(b) White Alder Riparian Forest (Holland 61510)
No SAF and Kuchler equivalent

This assemblage of species lines the deeper canyon bottoms, surrounds springs, and follows trickles up shady north slopes. It is best developed along Low Pass, Flat, and Ripgut creeks. It is typified by such species as white alder (Alnus rhombifolia), Oregon ash (Fraxinus latifolia), big-leaf maple (Acer macrophyllum), dogwood (Cornus sessilis), spicebush (Calycanthus occidentalis), and choke cherry (Prunus virginiana var. demissa). In sunny locations, California grape (Vitis californica), greenbriar (Smilax californica), California pipevine (Aristolochia californica), and blackberry (Rubus ursinus) sprawl and climb over the trees and shrubs. In shadier canyon bottoms, Pacific yew (Taxus brevifolia) and vine maple (Acer circinatum), may be locally common and dogwood tends to dominate (photo 7). Herbaceous understory species vary depending upon the amount of sun and water. Typical species are: chain fern (Woodwardia

[3]Also called Brewer oak.

[4]Formerly called digger pine.

fimbriata), California spikenard (Aralia californica), umbrella plant (Peltiphyllum peltatum), common monkeyflower (Mimulus guttatus), and woodrush (Luzula divaricata).

(c) Black Oak Forest (Holland 81340)
SAF: California Black Oak (246)
no Kuchler equivalent

Despite the fact that most of the local oak vegetation is dominated by black oak, it is difficult to distinguish at a distance between this species and two other common oaks, canyon live oak (Q. chrysolepis), and Brewer oak (Q. garryana var. breweri), which may also dominate locally. Thus, for the sake of accuracy on the vegetation map, all oak-dominated vegetation will be classified under this general heading. With further study parts of this type will probably be referred to as Canyon Live Oak Forest type (Holland 81320), and possibly to Shin Oak Brush type (Holland 37541).

Oak-dominated vegetation in the RNA is a result of past widespread fires. Typically the upper slopes of south, west and east exposures, with relatively deep soil and slope angles less than 45° (100%) are clothed in black oak. The majority of the upper slope oak forests appear to have stems no older than 100 years, with the average age at breast height being ca. 74 years (n=16). Growth rates and understory composition and development depend upon slope exposure. Several sub-types of oak forest may be discerned.

On west-facing slopes, a black oak type occurs with a grassy understory dominated by Elymus glaucus with poison oak, California hazelnut (Corylus cornuta var. californica), snowberry (Symphoricarpos mollis), bedstraw (Galium aparine), white-flowered hawkweed (Hieracium albiflorum), Trillium chloropetalum, sweet cicily (Osmorhiza chilensis), gambleweed (Sanicula crassicaulis), California pipe vine (Aristolochia californica), and star flower (Trientalis latifolia). There may also be saplings of ponderosa pine and Douglas-fir. Some of the larger trees of black oak occur in this sub-type with diameters of 2 ft (0.61 m) and heights of 70 ft (21 m), indicating optimum local growing conditions (photo 8).

On southeast-facing slopes, particularly on the west side of the RNA, black oak may dominate in a forest with a higher percentage of ponderosa pine and a relatively sparse understory, including Iris tenuissima, golden brodiaea (Brodiaea lutea var. analina), gold wire (Hypericum concinnium), Collomia heterophylla, Pedicularis semibarbata, Viola lobata, Aira caryophyllaea, Silene campanulata, S. lemmonii, and Brodiaea multiflora. The largest ponderosa pines are 2-2.5 ft (0.6-0.8 m) diameter at breast height (dbh). This type of forest is clearly successional and without fire will change to ponderosa pine dominance in a few decades.

On southwest-facing slopes, at higher elevations in the eastern part of the RNA, black oak dominates a woodland of trees from 6-20 inches (15-51 cm) dbh with an understory of snowdrop bush (Styrax officinalis var. californica), Melica californica, Carex multicaulis, poison oak, and reproduction dominated by Douglas-fir. This type has a sparser understory than the west-facing sub-type previously described.

On southeast-facing slopes, on the eastern portion of the RNA, black oak dominates in a forest with trees 12-18 inches (31-46 cm) dbh and 50-55 ft (15-17 m) tall with a shrubby understory of snowdrop bush, mock orange (Philadelphus lewisii), poison oak, redbud, and deerbrush

(Ceanothus integerrimus). The herb layer is variable with some grassy openings dominated by Melica californica and Elymus glaucus.

At highest elevations along gently sloping ridgetops, black oak dominates over a grassy understory with Festuca californica, Elymus glaucus, Microseris nutans, Senecio aronicoides, Silene lemmonii, Agoseris grandiflora, Daucus pusillus, Cynosurus echinatus, Hydrophyllum occidentale, gambleweed, Clarkia rhomboidea, and miner's lettuce (Claytonia perfoliata) (Photo 9).

On northwest-facing slopes, black oak may dominate under conditions of relatively gentle slopes and deep soil. Here big leaf maple and canyon live oak may occur as subdominants with a relatively dense shrubby understory of California hazelnut. Douglas-fir may occur as saplings, indicating a trend toward future dominance by this species.

On shallower soils, black oak tends to become more spindly. In such an area on a steep east-facing exposure the black oak stems were only ca. 6 inches (15 cm) dbh and about 30 ft (9 m) tall. In these situations the species typically co-dominates with canyon live oak.

At higher elevations with steep south exposures or on rocky slopes of shale or limestone, black oak gives way to spindly stands of Brewer oak. These stands are typically only slightly larger than shrubs with stems 2-5 inches (5-13 cm) dbh and approximately 8-12 ft (2.4-3.7 m) tall.

On very steep slopes, of virtually any exposure, canyon live oak tends to dominate, often in dense stands with little understory except scattered poison oak and hazelnut. The steep stands of canyon oak on sheltered locations (east- and north-facing exposures) may have been spared from the fires which affected the majority of the area, and consequently are sometimes large - up to 3 ft dbh and 70 ft tall (1 m dbh, 21 m tall).

The largest black oaks seen in the area were also in sheltered locations such as canyon bottoms or edges of ravines. These included some specimens up to 4 ft dbh (1.2 m) and 85 ft (26 m) tall. They usually occurred within mesic mixed coniferous forest.

(d) Coast Range Mixed Coniferous Forest (Holland 84110)
SAF: Pacific Ponderosa Pine-Douglas-Fir (244)
Kuchler: Mixed Conifer Forest (5)

This forest is the most mesic vegetation in the RNA, occupying ravine bottoms and sheltered exposures throughout the RNA. It was called the Low Elevation Mixed Conifer Forest in the Ecological Survey (Keeler-Wolf and Keeler-Wolf 1975). It is not completely analogous to the Holland type 84110 because it does not typically contain such trees as sugar pine (Pinus lambertiana) or incense-cedar (Libocedrus decurrens). It is divisible into two sub-types: One which bears a greater resemblance to the coastal mesic forests dominated by Douglas-fir; and one which is more similar to the xeric ponderosa pine-Douglas-fir type of the lower montane zone of the eastern Klamath Mountains (e.g. Sawyer and Thornburgh 1977).

The greatest dominance by Douglas-fir occurs in the canyon bottoms and lower north-facing slopes where, sheltered from crown fire for hundreds of years, the canopy has grown to heights of 150 ft (46 m) in some places and dominant Douglas-fir attain dbhs of between 5 and 6 ft (1.5-1.8 m). Typical dominant Douglas-firs are between 2 and 4 ft (0.6-1.2 m) dbh and have such

species as canyon live oak, big-leaf maple, and madrone (Arbutus menziesii) as sub-dominants. These sub-dominants may be 3 ft (1 m) dbh and over 80 ft (24 m) tall. Beneath the taller trees is a understory of woody species including mountain dogwood (Cornus nuttallii), California hazelnut, ocean spray (Holodiscus discolor), ninebark (Physocarpus capitatus), poison oak, wood rose (Rosa gymnocarpa), and red-flowering currant (Ribes sanguineum). These woody species overlay an herb layer including Viola ocellata, Trientalis latifolia, wild ginger (Asarum hartwegii), false solomon's seal (Smilacina racemosa var. amplexicaulis), California harebell (Campanula prenanthoides), wood fern (Dryopteris arguta), swordfern (Polystichum munitum), California maidenhair fern (Adiantum jordanii), and alumroot (Heuchera micrantha var. pacifica).

Higher up the north-facing slopes and on more sheltered west and east-facing exposures, Douglas-fir may give way to ponderosa pine as the dominant tree. In these situations black oak also becomes an important species and occasional individuals of sugar pine occur. In general, shrub and herb cover is sparser than in the canyon bottoms and changes in composition to reflect the more xeric environment. Such species as white-leaf manzanita (Arctostaphylos viscida), poison oak, mahala mats (Ceanothus prostratus), Ceanothus lemmonii, and Lupinus albifrons occur over a scattered low herbaceous cover of Balsamorhiza deltoidea, Hieracium albiflorum, Apocynum pumilum, Lotus stipularis ssp. balsamifera, Lupinus albicaulis, Psoralea physoides, Carex multicaulis, Agoseris grandiflora, Festuca californica, and Horkelia tridentata.

Both phases of the Coast Range Mixed Coniferous Forest have sufficient overlap so as not to be easily discernible for aerial mapping.

(2) Fauna

The fauna of the DHRNA as has been mentioned, includes some unique and in some cases sensitive or threatened species. These include the Shasta salamander (Hydromantes shastae) (State of California listed threatened species and Forest Service listed senstitive) as well as at least one of the land snails (Monodenia troglodytes) which is being considered for State threatened listing (Barry Roth, malacologist, California Academy of Sciences, pers. comm. 1975).

As with plants, the mixing of coastal and interior valley animal species is an important and interesting attribute. Several species are near their distribution limits in the vicinity of the RNA. These include both species typical of the chaparral and foothill woodlands of California which are near their northern limits (striped racer, California newt, Nuttall's woodpecker) and species of the coastal forests near their easternmost distribution (Pacific giant salamander, tailed frog, black salamander, and chestnut-backed chickadee).

Among other species of interest seen in the RNA are osprey, pileated woodpecker, spotted owl (Forest Sensitive), black bear, and Rocky Mountain elk (introduced). A complete list of all vertebrate species known from the RNA is given in Appendix D.

(3) Geology

The two principal rock types in the RNA, limestone and shale, were both deposited in the late Triassic. The Hosselkus Limestone ranges from thin to massively bedded exposures and is dark

gray when freshly exposed. J.P. Smith (1894) and other workers (McMath 1966) have divided the limestone into upper and lower units. The lower unit of the southern part of the RNA is the most fossiliferous. The Hosselkus Limestone was actually named from limestone supposedly equivalent to that occurring in the RNA along Hosselkus Creek in Plumas County east of Taylorsville (Durrell 1987).

The Brock Shale is closely related to the limestone and in some places in the Brock Creek drainage, intergradation of shale and limestone may be seen. The shale is a less fossiliferous formation and only occasionally, usually in close association with limestone, are fossils found. Brock Shale is dark, massive argillite interlayered with tuff or tuffaceous sandstone.

The Pit Formation is another dark shaly-siltstone with abundant lenses of metadacite and quartz-keratophyte tuffs. It is of local occurrence in the RNA. Some is found in the northwestern part of the RNA in the Squaw Creek drainage. It is thought that the small lenses of limestone found in this formation are distinct from the Hosselkus (McMath 1966).

All three of the formations in the RNA are conformable; the Brock Shale overlying the Hosselkus Limestone, which in turn overlies the Pit Formation (McMath 1966). These rocks are the only Triassic rocks in the Klamath Mountains Province and have analogs in the northern and central Sierra Nevada (McMath 1966, Durrell 1987).

(4) Soils

The soils within the RNA are relatively complex, having been divided into 12 mapping units in the soils survey of the area (USDA Forest Service et al. 1980). The following map unit descriptions are keyed to the accompanying soil map (Fig. 1) of the DHRNA indicated by the unit number following the unit name. Detailed descriptions are included in Appendix E.

(a) Deadwood family, 40-60% slopes (32)

This is a shallow soil. Deadwood family has the following characteristics: Surface soil; 0-3 inches (0-7.6 cm) dark brown very gravelly sandy loam, weak fine granular structure, 55% gravel, neutral. Subsoil; 3-15 inches (7.6-38.2 cm) yellowish brown and light brown very gravelly loam and extremely cobbly heavy loam, weak fine and medium subangular blocky structure, 55 to 65% gravel and cobbles, medium to slightly acid. Substratum; 15-17 inches (38.2-43.3 cm) metamorphosed shale, moderately fractured, slightly weathered.

(b) Deadwood family-Rock outcrop complex, 60-80% slopes (37):

This unit consists of 60% Deadwood family and 30% Rock outcrop, with 10% inclusions of Typic Xerothents, extremely gravelly rubble land.

The local Rock outcrop is made up primarily of metamorphic Brock Shale. It does not have a soil profile.

Black oak forest is the dominant vegetation on this soil type.

(c) Goulding-Neuns families association, 50-80% slopes (84):

This unit is composed of 50% Goulding family, 30% Neuns very gravelly loam (previously described), and 20% inclusions of metamorphic rock outcrop, Typic Xerothents, and moderately deep Hugo family soils.

Goulding family is defined by the following characteristics: Surface soil; 0-7 inches (0-18 cm) yellowish brown very gravelly loam, moderate medium subangular blocky structure, 40% gravel, medium neutral. Subsoil; 7-15 inches (18-38 cm) yellowish brown very gravelly loam, moderate medium subangular blocky structure, 55% gravel and cobbles, neutral. Substratum; 15-20 inches (38-51 cm) fractured metavolcanic rock.

Neuns soils are characterized in the following way: Surface soil; 0-11 inches (0-28 cm) brown to light brown very gravelly sandy loam with weak to moderate medium granular structure, 35-45% gravel, slightly acid. Subsoil; 11-23 inches (28-58 cm) light brown very gravelly sandy loam with moderate fine subangular blocky structure, 55% gravel and cobbles, slightly acid. Substratum; 23-34 inches (58-102 cm), highly fractured, slightly weathered metamorphic rock.

This unit occurs adjacent to limestone outcrops in the northern portion of the RNA.

Legend for Soil Mapping Units

Symbol	Description
32	Deadwood family, 40-60% slopes
37	Deadwood family-Rock outcrop complex 60-80% slopes
84	Goulding-Neuns families association, 50-80% slopes
120	Holland family, deep-Holland family complex, 40-60% slopes
179	Marpa-Goulding families association, 40-60% slopes
180	Marpa-Goulding families association, 60-80% slopes
183	Marpa-Holland, deep families complex, 40-60% slopes
188	Marpa-Neuns families, 60-80% slopes
214	Neuns-Holland, deep families complex, 40-80% slopes
219	Neuns-Marpa families complex, 60-80% slopes
222	Neuns family-Neuns family, deep complex, 60-80% slopes
250	Rock outcrop, limestone

Figure 1. Soils in Devils Rock-Hosselkus Research Natural Area
(from USDA Forest Service et al. 1980)

(d) Holland family, deep-Holland family complex, 40-60% slopes (120):

This mapping unit is composed of 50% Holland, deep gravelly loam, 30% Holland gravelly loam and 20% inclusions of Neuns deep, Marpa, Marpa deep, and Neuns soils.

Holland family, deep soil is defined by the following characteristics: Surface soil; 0-3 inches (0-8 cm) brown gravelly loam, strong medium granular structure, 20% gravel and cobbles, neutral. Subsoil; 3-46 inches (8-117 cm) light brown to reddish yellow gravelly clay loam and cobbly clay loam, moderate medium and coarse subangular blocky structure, 15-20% gravel and cobbles, slightly acid. Substratum; 46-50 inches (117-127 cm) reddish yellow extremely cobbly clay loam, strong medium subangular blocky structure, 65% gravel and cobbles, slightly acid.

This mapping unit occurs on the west-central side of the RNA.

(e) Marpa-Goulding families association, 40-60% slopes (179):

This unit consists of 60% Marpa very gravelly loam and 30% Goulding family with 10% inclusions of Neuns, metamorphic rock outcrop, and Deadwood soils.

Marpa soils are characterized by: Surface layer; 0-13 inches (0-33 cm) which is brown heavy loam and gravelly light clay loam, moderate and weak medium granular structure, 5-35% gravel, and is slightly acid. The subsoil ranges from 13 to 26 inches (33-66 cm) and is light brown very gravelly clay loam, massive, 40-50% gravel, and is strongly acid. The substratum is 26-32 inches (66-81 cm) and is fractured shale.

Goulding soil has been previously described in section (c).

This is the most extensive mapping unit in the RNA, covering large areas of the southeastern portion of the area.

(f) Marpa-Goulding families association, 60-80% slopes (180):

This unit consists of 60% Marpa very gravelly loam and 30% Goulding family with 10% inclusions of Neuns, metamorphic rock outcrop, rubble land, and Deadwood soils. It is essentially the same as the previous unit except it occurs on steeper slopes. Locally it is most prevalent in the upper Flat Creek drainage.

(g) Marpa-Holland, deep families complex, 40-60% slopes (183):

This unit consists of 60% Marpa very gravelly loam and 30% Holland gravelly loam with 10% inclusions of Holland, Neuns, Forbes, and Hugo soils. This unit occurs locally around the southern end of the Gray Rocks area.

Soils of Marpa family have been previously described and Holland, deep family soil has the following characteristics: Surface soil; 0-3 inches (0-8 cm) brown gravelly loam, strong medium granular structure, 20% gravel and cobbles, neutral. Subsoil; 3-46 inches (8-117 cm) light brown

to reddish yellow gravelly clay loam and cobbly clay loam, moderate medium and coarse subangular blocky structure, 15-20% gravel and cobbles, slightly acid. Substratum; 46-50 inches (117-127 cm) reddish yellow extremely cobbly clay loam, strong medium subangular blocky structure, 65% gravel and cobbles, slightly acid.

(h) Marpa-Neuns families, 60-80% slopes (188):

Only small area of this soil type is found east of the Ripgut Creek. It consists of 60% Marpa and 30% Neuns soils with 10% inclusions of Deadwood soil and rubbles. Descriptions of these soil families can be found in previous sections.

(i) Neuns-Holland, deep families complex, 40-80% (214):

This unit consists of 25% Holland, deep soil and 50% Neuns soil with 25% inclusions of Marpa deep, Neuns deep, Deadwood, and Dunsmuir soils. Both of the major soil types have been previously described.

(j) Neuns-Marpa families complex, 60-80% slopes (219):

This mapping unit is made up of 50% Neuns very gravelly sandy loam and 30% Marpa heavy loam and gravelly light clay loam with 20% inclusions of Deadwood family, moderately deep Hugo soils, and Typic Xerothents.

This mapping unit is found locally on steep slopes in the Ripgut Creek drainage.

(k) Neuns family-Neuns family, deep complex, 60-80% slopes (222):

This unit is composed of 50% Neuns family (previously described) and 30% Neuns family, deep soils with 20% inclusions of Marpa family, deep soils and Deadwood family.

Neuns family, deep soil is characterized by having the following characteristics: Surface soil; 0-9 inches (0-23 cm) brown gravelly loam and very gravelly loam, moderate fine and very fine granular structure, 30-50% gravel and cobbles, slightly acid to neutral. Subsoil; 9-61 inches (23-155 cm) light yellowish brown very gravelly loam to pale yellow very cobbly light clay loam, massive 50-55% gravel and cobbles, slightly to medium acid.

This mapping unit is found locally at the north-central portion of the RNA.

(l) Rock outcrop, limestone (250):

This mapping unit includes the outcrops of Hosselkus Limestone. It has 10% inclusions of Lithic calcareous soils formed from limestone. It forms moderately steep to extremely steep, complex linear, craggy ridges and slopes appearing as isolated islands in contrasting geologies. There is no surface or subsoil and the substratum is slightly to moderately metamorphosed limestone which is hard and resistant to weathering.

(5) Lands

All land within the boundaries of the DHRNA is under the management of the Shasta-Trinity National Forests. The private inholdings shown on the 1983 topo map have been acquired from Roseburg Forest Products in 1987.

Land surrounding the DHRNA is not all Forest Service land. To DHRNA's northeast, Mathews and Pappas Partnership owns sections 15 and 23, T35N, R2W, to which the boundary line is 2 miles (3.2 km) long. One individual (Smith) owns W1/2SW1/4, section 16, T35N, R2W, lying to the northwest of the RNA. This borderline is approximately 0.25 mile (0.4 km). Lands to the west of Smith's property is privately owned also, but it doesn't share boundary with the DHRNA (Map 2).

(6) Cultural

The Squaw Creek drainage is one of the most important archaeological sites in Northern California. Prehistoric village sites dating back at least 6500 years have been excavated within 1/2 mile (0.8 km) of the RNA. These excavations have been under the guidance of Ed Clewett of Shasta College (Clewett 1974). Multiple component archaeological sites are rare in northern California and no others have been found that have the depth or sophistication of artifacts found at Squaw Creek.

The multi-level deposits indicate shifting styles of habitation and cultural evolution. Three major cultural components have been indicated. The earliest period (5500-6500 B.P.) indicated a hunting gathering society with stone-tipped spears and processing wild grass seeds. The second period (5500-1200 B.P.) showed a big increase in the number of milling stones as well as other artifacts, thus indicating an intensification of seed-gathering and an increase in population. The last component is a late Wintu cultural adaptation. Bows and arrows were commonly found, millstones were dropped in favor of hopper mortars and pestles. In addition, the total number of artifacts dropped rapidly. Clewett (1974) feels this implies a shift away from the Squaw Creek drainage towards the larger river systems of the area (Sacramento, McCloud, and Pit) and may well illustrate the period when the economic dependence on salmon runs (LaPena 1978) became increasingly important.

According to LaPena (1978), the area to the east of Squaw Creek was a no-man's-land on which both the Wintu and the Achumawi peoples hunted and gathered food. Thus, the Indian occupation sites in caves in the Gray Rocks area (Hirschfeld 1975) and the obsidian flakes found in caves by Jens and Kathy Munthe (Munthe and Hirschfeld 1971) may have belonged to either the Wintu or Achumawi.

(7) Fire regime

There is widespread evidence that black oak forest and woodland are fire-dependent (McDonald in Eyre 1980, Holland 1986, Keeler-Wolf 1990). However, unlike many fire-dependent forest types, black oak requires periodic crown fire (not ground fire) to eliminate the coniferous competing species and also to stimulate resprouting and seedling establishment on unshaded soil.

At present it appears that the last major fires to sweep through the area occurred at least 75-80 years ago. Given the rate of colonization of conifers such as Douglas-fir and ponderosa pine even on the most favorable sites, the area should maintain its black oak dominance for at least another 30-40 years. At that time many of the more sheltered exposures will show some decrease in black oak dominance relative to the conifers. However, more exposed sites will take longer to show the successional effects.

Other vegetation types and important features in the RNA are not fire-dependent as the black oak type. The limestone outcrop will not affected by the fire regime. Limestone scrub is essentially a form of chaparral limited by the substrate; it will benefit from fire through resprouting and seedling establishment of the major plant species. Coast range mixed coniferous forest and white alder riparian forest are found on the most sheltered and mesic sites, which may continue to resist burning in the future.

I. IMPACTS AND POSSIBLE CONFLICTS

(1) Mineral Resources

The Hosselkus Limestone is of fine enough quality to be mined for both manufacture of cement and refining sugar (Emmett Ball, Shasta-Trinity Forest mining specialist, pers. comm. 1975). Because of the rugged terrain, relatively poor roads, and current adequate commercial supplies from the McCloud Limestone there is no conflict with the removal of mineral entry upon designation. No mention of mining potential is made in the discussion of resource conflicts for the DHRNA in the LRMP and accompanying Environmental Impact Statement (Appendix A, B). A mineral potential report made by Teixeira in 1990 is included in Appendix F.

(2) Grazing

The area is not used for livestock grazing, hence there will be no conflict when grazing is prohibited following designation.

(3) Timber

According to the resource conflicts section in the Forest's discussion of the DHRNA in the LRMP, approximately 47% of the area contains tentatively suitable timber land which could be managed intensively for timber without adverse impacts on the environment. Potential yields are about 120 mbf (thousand board feet) per year. However, about 1/3 of the suitable timberlands consist of hardwood stands. The conifer stands in the area are in small patches and would be costly to harvest and regenerate.

In summary, the feasibility of timber management of the area is very low and the removal of the area from the timber producing base will not adversely affect the Forest's timber production.

(4) Watershed Values

Numerous named and unnamed drainages exist in the area. The most important are Low Pass Creek, Dinner Gulch, and Madison Canyon (tributaries to Squaw Creek), Flat Creek, Brock Creek and Ripgut Creek. The majority of the Flat Creek and virtually all of the Brock Creek drainages are contained within the RNA.

Flat, Brock, Ripgut and Madison drainages have permanent stream flow within the RNA. The others are intermittent. Low Pass Creek typically disappears into the limestone at all but major runoff periods.

All of the above streams empty into the Pit River Arm of Lake Shasta and contribute to the volume of this very large and important reservoir.

(5) Recreation Values

The principal recreation values of the area are hunting and spelunking. The evidence of human presence in the area is slight. In June 1988 no litter was found along the jeep road up Low Pass Creek and no recent tire tracks were noticed. The end of road 34N10 just south of Gray Rocks had a few pieces of litter, but no well established campsites. Despite the fact that the four-unit Chirpchatter Campground is located just west of the RNA, virtually all recreational activity associated with it is concentrated along Squaw Creek. Visits even during major holidays, when the campground was fully occupied, failed to produce any evidence of overflow or visitation to the RNA.

Irresponsible spelunking has been a problem along Low Pass Creek. Several of the caves in that area have been vandalized. Recently broken cave formations are clearly evident at the most accessible of these caves. Spelunking is potentially the most threatening of recreational activities, because it is difficult to regulate and could cause the most damage to geological, paleontological, and biological values (e.g. cave insects and shasta salamander). Although it is clear that the area is only lightly visited by spelunkers, the potential and long-lasting damage that can affect is cause for concern.

In order to control cave visitation, the Low Pass Creek jeep road will be blocked outside of the RNA and signs will be posted indicating the illegality of disturbing cave features and the prohibition of cave entry without a valid written consent from proper authorities, based on research needs.

(6) Wildlife and Plant Values

The relatively large and varied DHRNA will be eminently suitable for representation of the unique limestone and the California black oak elements. Barring any appreciable human disturbance, all limestone-related values should remain at high quality without any particular management requirements, other than protection from plant, animal, or fossil collectors and cave vandalism. The California black oak element will require periodic crown fire to rejuvenate the black oaks and reduce competition and succession from Douglas-fir and ponderosa pine. The latter will be discussed in the vegetation management section.

(7) Special Management Area Values

The portions of sections 8, 9, and 14, T34N, R2W (MDBM) within the RNA boundaries lie within the federally designated Whiskeytown Shasta-Trinity National Recreation Area. According to Jerry Anderson, Shasta-Trinity Forest Supervisor's Office (pers. comm. August 1988) there will be no conflict with the values of RNA designation and National Recreation Area designation in these three sections. The remainder of the area was inventoried in the RARE II process, but was released from potential wilderness status.

(8) Transportation Plans

There are no plans to construct roads within or nearby the area.

J. MANAGEMENT PRESCRIPTION

Appendix A2 contains the management prescription for the RNA as stated in the Shasta-Trinity National Forests LRMP (Shasta-Trinity National Forests 1995a). Within it standards and guidelines are provided.

1) RNA Management strategy

> The Shasta-Trinity National Forests will develop a specific management strategy to maintain the target element and other resource values in the best possible condition after the establishment of DHRNA.
>
> While forming the management strategy for the DHRNA expert(s) in fire ecology/prescribed fire should be consulted, for the target element - black oak forest type is fire-dependent.

K. ADMINISTRATION RECORDS AND PROTECTION

The official responsibility for administration and protection of the Devils Rock-Hosselkus Limestone RNA is with the District Ranger, Shasta Lake Ranger District, 6543 Holiday Road, Redding, CA 96003. Attention will be given to the effective barring of vehicle entry along the Low Pass Creek road, the regular patrolling of access routes, and the maintenance of posted signs designating the restrictions associated with the RNA; all of these tasks leading to the general protection and preservation of unique values associated with the limestone areas.

The research coordinator is the Director of Pacific Southwest Forest and Range Experiment Station, 800 Buchanan Street, Albany, CA 94710. This person is responsible for approving and coordinating observational or nonmanipulative applied research in the area, and maintaining research data files.

L. ARCHIVING

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

M. REFERENCES

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Appendices

A: Information excerpted from Shasta-Trinity National Forests Land and Resource Management Plan, 1995

A1: Location of the Devils Rock-Hosselkus RNA
A2: Management descriptions for Special Areas - Research Natural Area
A3: Management descriptions for the Shasta Unit of the Whiskeytown-Shasta-Trinity National Recreation Area
A4: Management descriptions for Nosoni Management Area

B: Information excerpted from Shasta-Trinity National Forests Final Environmental Impact Statement, 1995

C: Devils Rock-Hosselkus RNA plant lists

C1: List of plants identified from the Hosselkus RNA (Aug. 31 to Nov. 1, 1975) & Devil's Rock annex (June 7-10,1988) by Keeler-Wolf & Keeler-Wolf)
C2: Vascular plant species with known distributional limits near Devils Rock-Hosselkus RNA

D: List of fauna species in Devils Rock-Hosselkus RNA

E: Descriptions of soils types in Devils Rock-Hosselkus RNA (from U.S.D.A. Forest Service et al. 1980)

F: Mineral Potential Report for Lands Proposed for Mineral Withdrawal in the Devils Rock-Hosselkus Research Natural Area (R.W. Teixeira 1990)

APPENDIX A

INFORMATION EXCERPTED FROM
SHASTA-TRINITY NATIONAL FORESTS
LAND AND RESOURCE MANAGEMENT PLAN, 1995

A1: Location of Devils Rock-Hosselkus RNA

A2: Management descriptions for Special Areas - Research Natural Area

A3: Management descriptions for the Shast Unit of the Whiskeytown-Shasta-Trinity National Recreation Area

A4: Management descriptions for Nosoni Management Area

APPENDIX A1: Location of Devils Rock-Hosselkus RNA

APPENDIX A2: Management descriptions for Special Areas - Research Natural Area

APPENDIX A3: Management descriptions for the Shast Unit of The Whiskeytown-Shasta-Trinity National Recreation Area

APPENDIX A4: Management descriptions for Nosoni Management Area

APPENDIX B

INFORMATION EXCERPTED FROM
SHASTA-TRINITY NATIONAL FORESTS
FINAL ENVIRONMENTAL IMPACT STATEMENT, 1995

APPENDIX C

DEVILS ROCK-HOSSELKUS RNA

PLANT LISTS

Appendix C1: List of plants identified from the Hosselkus RNA (Aug. 31 to Nov. 1, 1975) & Devil's Rock annex (June 7-10, 1988) by Keeler-Wolf & Keeler-Wolf

Appendix C2: Vascular plant species with known distributional limits near Devils Rock-Hosselkus RNA

Appendix C1: Plant list excerpted from the Ecological Survey
(Keeler-Wolf and Keeler-Wolf 1975)

This list is excerpted from the Ecological Survey (Keeler-Wolf and Keeler-Wolf 1975). The vegetation units defined in the list from the Ecological Survey are roughly equivalent to the ones used in this report except that the type listed in the survey as Low Elevation Mixed Conifer Forest is now termed Coast Range Mixed Coniferous Forest, and the Canyon Riparian of the Survey is now termed White Alder Riparian Forest.
Taxonomy for follows Munz (1968).

Appendix C2: Additional plant species identified by Keeler-Wolf in 1988

During the field work for the draft establishment record and survey of the Devil's Rock annex (June 7-10, 1988) an additional group of species was found by Keeler-Wolf. These are listed below. Taxonomy follows Munz (1968).

Cynosurus echinatus; common in oak woods
Nemophila heterophylla; oak woods
Hydrophyllum occidentale; shady oak woods
Clarkia rhomboidea; openings in oak woods
Allium campanulatum; limestone scrub
Brodiaea multiflora; oak woods
Ranunculus occidentalis var. eisenii; grassy understory in oak woods
Erodium cicutarium; occasional openings in oak woods
Delphinium nudicaule; oak woods
Vulpia (Festuca) myuros; open scrub
Collinsia tinctoria; limestone scrub
Lomatium leptocarpum; limestone scrub
Madia elegans; openings in oak woods and limestone scrub
Clarkia purpurea; limestone scrub
Sedum spathulatum; limestone scrub
Mimulus sp.; annual yellow-flowered species, uncommon on limestone, taxonomic status being determined
Cheilanthes cooperae; limestone scrub
Trillium chloropetalum; oak woods
Galium aparine; oak woods
Brodiaea leutea var. analina; oak woods and drier mixed conifer forest
Hypericum concinuum; occasional drier mixed conifer and oak woods
Agropyron trachycaulum; occasional drier mixed conifer and oak woods
Mimulus kelloggii; occasional scrub and drier oak woods
Silene campanulata var. orbiculata; occasional oak woods
Pedicularis multipedunculata; occasional drier mixed conifer forest
Tellima grandiflora; occasional riparian and mesic mixed conifer forest
Lithophragma sp.; uncommon mesic mixed conifer
Lathurus sulphureus; occasional oak woods and sunnier riparian
Poa pratensis; uncommon along road in Low Pass canyon
Lingusticum apiifolium; occasional in semi-shade of mixed conifer
Cynoglossum grande; occasional oak woods and mesic mixed conifer
Actaea rubra ssp. occidentalis; uncommon, mesic mixed conifer
Polystichum munitum; occasional mesic mixed conifer
Erythronium californicum; occasional mesic mixed conifer
Goodyera oblongifolia; uncommon mesic mixed conifer
Corallorhiza maculata; rare mesic mixed conifer
Senecio triangularis; rare, riparian along Flat Creek
Aruncus vulgaris; occasional riparian along Flat Creek
Prunella vulgaris ssp. lanceolata; occasional riparian
Draperia systyla; occasional mesic mixed conifer
Pyrola picta forma aphylla; uncommon in mesic mixed conifer

Habenaria elegans; rare, mesic mixed conifer
Salix lasiolepis; occasional sunny riparian
Fritillaria lanceolata; occasional shady oak woods and mixed conifer
Sanicula bipinnatifida; occasional openings in oak woods
Madia exigua; scrub and openings in oak woods
Euphorbia crenulata; rare, oak woods
Quercus garryana var. breweri X chrysolepis; one patch seen in sheltered oak woods.
Cacalopsis nardosmia; uncommon oak woods
Claytonia perfoliata; uncommon oak woods
Bromus diandrus; uncommon dry grassy openings in scrub and oak woods
Bromus tectorum; upper elevation scrub near Brock Butte
Lotus stipularis; occasional sunny openigs in oak woods
Poa scabrella; uncommon, rocky understory of upper elevation oak woods
Arenaria douglasii; uncommon, dry openings in scrub and oak woods
Lupinus andersoni; occasional, oak woods
Galium trifidum var. subbiflorum; occasional riparian and mesic mixed conifer.
Microseris nutans; common in grassy oak woods
Melica torreyana; occasional mesic mixed conifer
Festuca elmeri; oak woods
Trisetum cernuum; oak woods
Trifolium ciliolatum; open oak woods and scrub
Cryptantha torreyana; occasional openings in oak woods
Delphinium depauperatum; common in oak woods
Trifolium microcephalum; occasional limestone scrub
Trifolium varigatum; limestone scrub
Symphoricarpos mollis; common in oak woods

APPENDIX C2

VASCULAR PLANT SPECIES
WITH KNOWN DISTRIBUTIONAL LIMITS
NEAR DEVILS ROCK-HOSSELKUS RNA

Plants thought to reach their northern distribution near the RNA:

Collinsia tinctoria
Hypericum concinuum
Cheilanthes cooperae
Draperia systyla
Melica torreyana
Melica californica
Calycanthus occidentalis
Dendromecon rigida
Styrax officinalis var. californica
Fraxinus dipetela
Salvia sonomensis
Dudleya cymosa
Aristolochia californica
Ceanothus lemmonii
Aesculus californica
Lonicera interrupta
Erythronium californicum
Clematis lasiantha
Selaginella hansenii

Plants thought to reach their inland distribution near the RNA

Ligusticum californicum
Trisetum cernuum
Festuca elmeri
Viola ocellata
Whipplea modesta
Acer circinatum
Lomatium dissectum
Symphoricarpos mollis
Cacaliopsis nardosmia
Aruncus vulgaris

Plants thought to reach their westernmost distribution near the RNA:

Chrysothamnus parryi ssp. latior
Lomatium leptocarpum

APPENDIX D

VERTEBRATES KNOWN FROM OR SUSPECTED IN
THE DEVILS ROCK-HOSSELKUS RNA

The following pages are taken from the appendix of Keeler-Wolf and Keeler-Wolf (1975). The list immediately below is an addendum to that list based on observations made during the field work for this establishment record from June 7 through 10, 1988. Authorities for the names are Stebbins (1985) for reptiles and amphibians, Robbins et al. (1983) for birds, and Ingles (1965) for mammals.

AMPHIBIANS:
California Newt Taricha torosa: Definitely known from the RNA in the Flat Creek drainage

REPTILES
Western Pond Turtle Clemmys marmorata: seen in puddle along road just west of RNA in Squaw Creek drainage.
Southern Alligator Lizard Gerrhonotus multicarinatus: definitely known from oak woodland in Flat Creek drainage.
Racer Coluber constrictor: definitely known from upper Ripgut Creek drainage within the RNA edge of scrub and oak woodland.
Western Aquatic Garter Snake Thamnophus couchii: definitely known from streamside forest along Flat Creek.

BIRDS:
Osprey: soaring over Gray Rocks, a regular breeder at Shasta Lake.
Pileated Woodpecker: heard in Madison Canyon.
Violet-green Swallow: common over Gray Rocks
Purple Martin: flock of 5 over Gray Rocks
Ash-throated Flycatcher: common in scrub and more open oak woods.
Olive-sided Flycatcher: coniferous forest Low Pass Canyon.
Orange-crowned warbler: fairly common in limestone scrub and oak woods.
Song Sparrow: along Squaw Creek just outside RNA
Yellow Warbler: willow thicket along Low Pass Creek
Northern Oriole: occasional in black oak woods
Brown-headed cowbird: heard at Chirpchatter camp just outside RNA
Anna's Hummingbird: Low Pass canyon and other areas of scrub and oak woods
Rufous? Hummingbird: probably this species (possibly Allen's hummingbird) along Flat Creek.
Winter Wren: several singing in shady canyons of Flat Creek drainage.
Black-headed Grosbeak: fairly common in black oak forest and scrub.
Downy Woodpecker: oak woods in NE portion of RNA
Nuttall's Woodpecker: black oak woods NE portion of RNA

MAMMALS
Black Bear Ursus americanus: two individuals seen in RNA, both brown color phase. Seen in coniferous forest and scrub on limestone.
Elk Cervus canadensis: an adult male with large rack seen in Brewer oak scrub in Gray Rocks area. Scat seen several places throughout the eastern part of RNA.

APPENDIX E: Descriptions of soils types in Devils Rock-Hosselkus RNA
(from U.S.D.A. Forest Service et al. 1980)

APPENDIX F: Mineral Potential Report for Lands Proposed for Mineral Withdrawal in the Devils Rock-Hosselkus Research Natural Area (R.W. Teixeira 1990)

Legend for Vegetation Type Map (Map 3)

Symbol	Description	Holland Type Equivalent	Kuchler Type Equivalent	SAF Type Equivalent
S	Limestone Scrub	37110	29	none
P	Douglas-fir-dominated forest	84110	5	244
O	Black oak forest	81340	none	246

???? 1994???
DESIGNATION ORDER

By virtue of the authority vested in me by the Secretary of Agriculture under regulations 7CFR 2.42 and 36 CFR 251.23, I hereby establish the Hosselkus Limestone Research Natural Area. The Hosselkus Limestone Research Natural Area shall be comprised of the following lands:

Beginning at the point of juncture of the two forks of Flat Creek intersected by the trail 2W22 in the NW 1/4 Section 34 T35N, R2W Mount Diablo Base and Meridian (MDBM), the boundary runs along the east bank of Flat Creek southward through Sections 34 (T35N, R2W MDBM) and 3 (T34N, R2W MDBM). At the point along Flat Creek where it meets the boundary between sections 3 and 10 T34N, R2W (also the boundary of the Whiskeytown Shasta-Trinity National Recreation Area) the RNA boundary turns west along said line to the corner common to sections 3, 4, 9, and 10 T 34N, R2W MDBM. At this corner the boundary runs south along the line between sections 9 and 10 T34N, R2W MDBM until the point is reached 100 ft (30 m) above the high water mark of Lake Shasta. The contour 100 ft (30 m) above the high water line is then followed westward and southward skirting the Brock Creek inlet of the lake until the boundary between sections 9 and 16 T34N R2W MDBM is met. At this point the boundary follows said section line west to a point approximately 0.5 mile (0.8 km) east of the common corners of sections 8, 9, 16, and 17 T34N, R2W MDBM. At this point the boundary runs south for approximately 0.25 mile (402 m) and then runs west for approximately 0.5 mile (0.8 km), whence it runs north along the boundary between sections 16 and 17 T34N, R2W MDBM to the common corner of sections 8, 9, 16, and 17 T34N, R2W MDBM. From said corner the boundary runs west along the boundary between sections 8 and 17 T34N, R2W MDBM until the bed of a intermittant tributary of Susanville Canyon is reached, approximately 0.25 mile (402 m) west of said corner. The boundary then turns northward, following said streambed to the saddle in the NW 1/4 Section 8 T34N, R2W MDBM which corresponds to the end of road 34N10. The boundary continues over the saddle and follows the bed of the south branch of Madison Canyon to the junction of the two main branches of Madison Canyon in the SW 1/4 Section 5 T34N, R2W MDBM. At this point the boundary turns northward following the ridge dividing the Madison Canyon drainage from the Squaw Creek drainage to the junction of this ridgeline with the boundary line between sections 32 T35N, R2W and 5 T34N, R2W MDBM. At this point the boundary turns west for approximately 400 ft (122 m) until reaching a point midway along the section boundary between the common corners of sections 31 and 32 T35N, R2W and 32 and 33 T35N, R2W. At this point the boundary runs north for approximately 1 mile (1.6 km) to the border between sections 29 and 32, thence east for approximately 1/2 mile (0.8 km) to the common corner of sections 28, 29, 32, and 33 T35N, R2W MDBM. From this point the boundary runs north for approximately 2 miles (3.3 km) to the comon corner of sections 16, 17, 20, and 21 T35N, R2W MDBM. Here the boundary turns east and runs for approximately two miles (3.3 km) to the common corner of sections 14, 15, 22, and 23 T35N, R2W MDBM. From this point near the head of the Ripgut Creek drainage the boundary descends the Ripgut Creek drainage along the boundary between sections 22 and 23 T35N, R2W MDBM approximately 300 ft (91 m) to a ravine bottom, following it for about 500 ft (152 m) until it joins with the main branch of Ripgut Creek. The boundary thence follows the eastern bank of Ripgut Creek in a southerly direction for approximately 1.5 miles (2.4 km) to a point along the creek in the SW 1/4 Section 26 T35N, R2W. This point, at an elevation of approximately 1500 ft (457 m), is also the point where trail 2W22 crosses Ripgut Creek. Here the boundary follows the ridgeline uphill to the west closely paralleled by the trail 2W22, to a saddle between the Flat and the Ripgut Creek drainages (NE 1/4 Section 27 T35N, R2W MDBM). From this saddle the boundary follows the ridge forming the divide between these two streams southward over point 2489

(reference U.S.G.S. Bolli Bokka Mtn. SE 7.5 Minute series 1983 edition). Thence southwestward along a descending spur of the main dividing ridge into the Flat Creek Drainage for approximately 0.9 miles (1.5 km) to the point of juncture of the two forks of Flat Creek intersected by the trail 2W22 in the NW 1/4 Section 34 T35N, R2W, the point of beginning.

Regional Forester Paul F. Barker recommended the establishment of the Hosselkus Limestone Research Natural Area in the Shasta-Trinity National Forests 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. The results of the Regional Forester's analysis are documented in the Final Environmental Impact Statement for the National Forest Land and Resource Management Plan and the Establishment Record which are available to the public.

The Hosselkus Limestone Research Natural Area will be managed in compliance with all relevant laws, regulations, and manual direction regarding Research Natural Areas. The Hosselkus Limestone Research Natural Area will be administered in accordance with the management direction identified in the Establishment Record. The Shasta-Trinity National Forests Land and Resource Management Plan is hereby amended to be consistent with the management direction identified in the Establishment Record and this Designation Order. Directions on pages F-10 and IV-49 of the Shasta-Trinity National Forests Land and Resource Management Plan are replaced by the direction on pages 30 and 31 of the Establishment Record. This direction will remain in effect unless amended pursuant to 36 CFR 219.10. This is a non-significant amendment to the Shasta-Trinity National Forests Land and Resource Management Plan.

The Forest Supervisor of the Shasta-Trinity National Forests shall notify the public of this amendment and will mail a copy of the Designation Order and amended direction to all persons on the Shasta-Trinity National Forests Land and Resource Management Plan mailing list.

Based on the environmental analysis documented in the National Forest Land and Resource Management Plan and the Establishment Record I find that the designation of the Hosselkus Limestone Research Natural Area is not a major federal action significantly affecting the quality of the human environment.

This decision is subject to appeal pursuant to 36 CFR 211.18. A Notice of Appeal must be in writing and submitted to:

Chief
USDA Forest Service
P.O. Box 96090
Washington, D.C. 20013-6090

The Notice of Appeal must be submitted within 45 days from the date of this decision. Within five days of receipt, the Chief will transmit the Notice of Appeal and a copy of the Designation Order to the Secretary of Agriculture for review at the Secretary's discretion. The appeal will be deemed denied if the Secretary takes no action within ten days of receiving the appeal.

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Chief date

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?? PHOTO CAPTIONS FOR
HOSSELKUS LIMESTONE RNA
ESTABLISHMENT RECORD

Photo 1: Typical habit of the Shasta County limestone endemic, Shasta eupatory, on north-facing vertical cliffs in Gray Rocks area (NE 1/4 Sect. 8)

Photo 2: Two individuals of Monodenia troglodytes, the land snail endemic to limestone outcrops of Shasta County. Gray Rocks area (NE 1/4 Sect 8).

Photo 3: The fern Cheilanthes cooperae, a relatively widespread endemic to limestone, at its northernmost range limits near Gray Rocks (SE 1/4 Sect. 5).

Photo 4: Looking north from near the summit (3032 ft) of Gray Rocks (SE 1/5 Sect. 5) along the prominent ridge of Hosselkus Limestone.

Photo 5: The summit pinnacle of Gray Rocks showing the precipitous topography of the main limestone ridge.

Photo 6: Limestone scrub dominated by hardtack (Cercocarpus betuloides) with the herb Arabis breweri in foreground. View looking southeast (NE 1/4 Sect. 8) from Gray Rocks area to Pit River Arm of Lake Shasta.

Photo 7: Shady tributary canyon to Flat Creek (NW 1/4 Sect 34) showing well developed riparian thicket dominated by Cornus sessilis. Note mesic Douglas-fir-dominated forest with Pacific madrone in background.

Photo 8: California black oak forest on moderate west-facing slope (SE 1/4 Sect. 5). Grassy understory dominated by Elymus glaucus. Oak stems average about 2 ft (61 cm) dbh.

Photo 9: Ridgetop forest of California black oak (SW 1/4 Sect 22) showing open herb-dominated understory.