

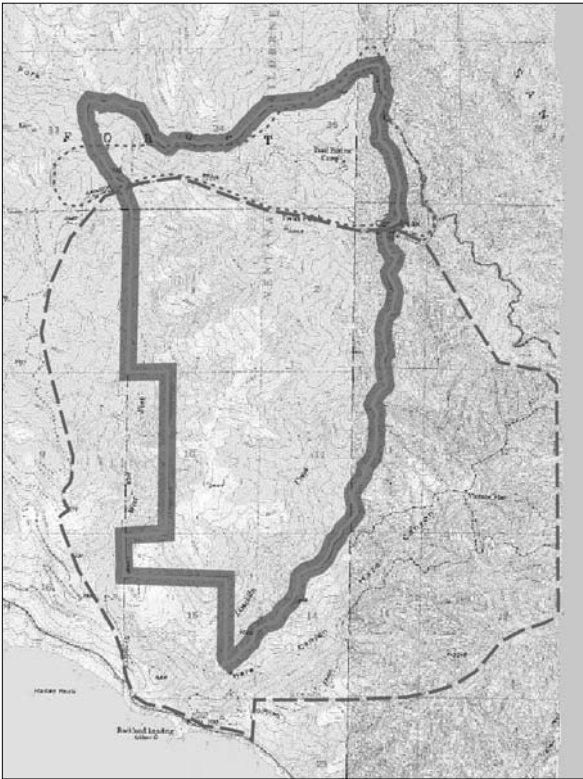
## 19. Cone Peak Gradient (Limekiln Creek, South Fork of Devil's Canyon)

### Location

This established RNA is on the Los Padres National Forest, near Lucia about 23 miles (37 km) SE. of the town of Big Sur, in Monterey County. It incorporates two ecological surveys, Limekiln Creek and South Fork of Devil's Canyon. The RNA includes portions of sects. 33, 34, and 35 T21S, R4E and all or portions of sects. 1, 2, 3, 10, 11, 12, 13, 14, 15, 22, and 23 T22S, R4E MDBM (36°01'N., 121°29'W.), USGS Cone Peak and Lopez Point quads (fig. 38). Ecological subsection – North Coastal Santa Lucia Range (261Aj).

### Target Elements

This area falls in part under the category of unique ecosystem, resulting from the juxtaposition of many biogeographic elements. Santa Lucia fir (*Abies bracteata*) and disjunct stands of sugar pine (*Pinus lambertiana*) are perhaps the most significant special elements along with a set of isolated and endemic herbaceous species. The area also has been selected to represent the canyon live oak (*Quercus chrysolepis*) woodland, mixed evergreen forest, California coast live oak (*Quercus agrifolia*) woodland, redwood (*Sequoia sempervirens*), and chaparral target elements for the Central California Coast Ranges ecological section.



**Figure 38—Cone Peak Gradient RNA**

Dashed line =  
Limekiln Creek  
ecological study area  
Solid gray line = RNA  
Boundary  
Dotted line = South  
Fork of Devil's  
Canyon ecological  
study area

### A. Limekiln Creek (Keeler-Wolf and Keeler-Wolf 1977, Borchert 1987)

#### Distinctive Features

**Highly Varied Ecological Structure:** A high number of plant associations exist in this small drainage. North coastal scrub, coastal sage scrub, redwood forest, coast live oak woodland, mixed evergreen forest, valley grassland, and several types of chaparral are well represented. The mixtures of such communities as coastal scrub and chaparral, valley grassland and coastal prairie, and north coastal scrub and south coastal scrub provide for some unique mixing of species. The unusual elevation cline of related associations such as mixed evergreen forest, coast live oak, and canyon live oak woodlands may provide answers to questions concerning the tolerance and requirements of the individual species comprising these associations.

Several closely related species that are typically segregated geographically such as *Eriophyllum confertiflorum* and *E. staechadifolium*, *Mimulus aurantiacus* and *M. bifidus* ssp. *fasciculatus*, and *Eriogonum parvifolium* and *E. fasciculatum* ssp. *foliolosum* co-occur here and may provide useful information on species relationships and environmental tolerances.

The area's complex group of plant associations has much to do with its varied climate, geology, and topography. The elevational difference of nearly one mile within a 3-mile (5-km) distance, a variety of slope exposures and rock types, the influence of the cool marine layer at the lower elevations, and the very steep gradient of precipitation from low to high elevations all combine to create a great diversity of environments within this relatively small area.

**Biogeographical Significance:** This area contains several biogeographically significant taxa, either reaching their distributional terminus in the area or representing isolated populations. The largest of these groups represents whole associations. For example, the local coast redwood forest contains several characteristic plants such as *Oxalis oregana*, *Viola sempervirens*, *Whipplea modesta*, and *Hierochloa occidentalis*, among others, which all reach their S. limits within a few miles of the RNA. The north coastal scrub reaches its S. limits in the vicinity of the RNA. The south coastal sage scrub reaches its N. limits within the vicinity of the RNA with certain of its species such as *Salvia leucophylla* reaching its N. limits very near the RNA.

A group of species at the upper elevations of the RNA is characteristic montane California plants and may be more than 100 miles (161 km) from the nearest known populations. These include such species as sugar pine (*Pinus lambertiana*), *Cycladenia humilis* var. *venusta*, *Cheilanthes gracillima*, and *Lotus argophyllus* var. *fremontii*.

Another group of plants has a relatively continuous distribution but reaches its range limits within or near the RNA. Species at or near their N. limits include *Yucca whipplei* ssp. *percursa*, *Monardella villosa* var. *subglabra*, *Penstemon heterophyllus* ssp. *australis*, *Collinsia childii*, and *Mimulus subsecundus*. Species at or near their S. limits include *Arabis breweri*, *Calochortus albus* var. *rubellus*, *Penstemon corymbosus*, *Nemophylla parvifolia*, *Streptanthus tortuosus*, and *Erigeron petrophilus*.

The fauna of the region also has some biogeographical significance. Two species of slender salamanders (*Batrachoseps*) inhabit the Big Sur coast; the RNA is a meeting ground for the northern *Batrachoseps pacificus* and the southern *B. nigriventris*. The area may harbor a hybrid swarm and thus be of interest to evolutionary zoologists. Such species as the sagebrush lizard (*Sceloporus graciosus*) and mountain chickadee (*Parus gambeli*) have isolated occurrences near the summits of Cone and Twin peaks. A recent record of a night snake (*Hypsiglena torquata*) is the most coastward record for the species in central California.

**Geological Significance:** The geologic terrane (rock groups) within the RNA is varied, with outcrops of sedimentary, metamorphic (including marble and gneiss), and crystalline basement rocks. The area is geologically unique, containing the oldest (Pre-Cambrian) rocks known between the Transverse Ranges and the N. Cascades, a major thrust fault (the Sur-Nacimiento Fault), and the only charnockitic terrain described W. of the Continental Divide.

**Rare Plants:** Several rare species occur at the upper elevations. These are species shared with the Devil's Canyon portion of this RNA. They include Santa Lucia fir (*Abies bracteata*, CNPS List 4), *Galium californicum* ssp. *luciense* (CNPS List 1B), and *Galium clementis* (CNPS List 4).

**Figure 39—Cone Peak Gradient / Limekiln Creek, *Adiantum pedatum*, *Oxalis oregana*, and *Vaccinium ovatum* of the redwood riparian forest along W. Fork Limekiln Creek. (1976)**



## Physical Characteristics

The area covered by the ecological survey includes the entire Limekiln Creek drainage (5478 acres, 2217 ha). The actual size of the established RNA is 2787 acres (1128 ha). The topography of the area is extremely rugged. The summit of Cone Peak is 5154 ft (1571 m); the mouth of Limekiln Creek, at sea level, is about 3.25 miles (5.2 km) from Cone Peak (the lowest point of the established RNA is 540 ft, 165 m). The drainage is oriented to the S. with the two highest points at its N. end. The deep canyons of the W. and main branches of Limekiln Creek divide the area. In general, the slopes are steepest at the upper reaches of canyons and at the foot of ridges. Numerous limestone outcrops add to the rugged nature at the upper elevations.

Rocks include the Pre-Cretaceous metamorphic Sur Series, Jurassic-Cretaceous Franciscan metasediments, and Mesozoic granitic rocks. The Sur Series covers more than 75 percent of the area. These rocks include limestone, quartzite, granofelses, and gneisses with many layers of amphibolites, schists, calcite marbles, and metadolomites (the latter two being broadly classified as limestone). Soils include Cieneba-Rock outcrop, Cieneba-Sur-Rock Outcrop, Gamboa-Sur, Los Osos Clay loam, Pfeiffer-Rock outcrop, Rock outcrop, and Sur-Junipero complexes.

Climate is highly varied, with annual precipitation at the lower elevations about 28 inches (711 mm) to amounts in excess of 90 inches (2286 mm) on the lee side of Cone Peak. Less than 2 percent of the average annual precipitation falls between June and September. Snow is common in winter at the highest elevations, whereas the lower elevations rarely freeze. Temperature inversions resulting from the strong summer marine layer are very stable between May and October. Summer fog is common below about 2000 ft (610 m). Average winter temperatures vary as much as 19 °F (7.2 °C) between the highest and lowest elevations.

## Association Types

Many of the plant associations in this area are complex and not easily separated into distinct types. No quantitative vegetation sampling was conducted for the ecological survey. Description and acreages of the types were based on the ecological survey.

**Mixed Evergreen Forest (81100, 81400):** 1200 acres (486 ha). This is the most diverse of the three sclerophyllous forests or woodlands present. It is dominated by varying mixtures of tanoak (*Lithocarpus densiflorus*), madrone (*Arbutus menziesii*), California bay (*Umbellularia californica*), bigleaf maple (*Acer macrophyllum*), coast live oak, interior live oak (*Quercus wislizenii*), canyon live oak (*Quercus chrysolepis*), and Coulter pine (*Pinus coulteri*).

Mesic lower N.-facing-slope stands have diverse understories of *Trientalis latifolia*, *Smilacina racemosa* var. *amplexicaulis*, *Osmorhiza chilensis*, *Dryopteris arguta*, *Symphoricarpos mollis*, *Adiantum jordanii*, *Rhamnus californicus*, and *Rosa gymnocarpa*, among others (28 typical understory species listed). The density of native grasses, including *Festuca californica*, *Melica hartfordii*, *M. imperfecta*, *Elymus glaucus*, *Calamagrostis rubescens*, and *Bromus grandis*, is frequently high.

**Redwood Forest (82320, 82310, 61210):** 800 acres (324 ha). This forest is restricted to mesic valley bottoms; it is difficult to separate from a true riparian element containing such trees as California sycamore (*Platanus racemosa*), white alder (*Alnus rhombifolia*), and the willow *Salix coulteri*. A number of other riparian or semi-riparian species are closely associated with redwood (*Sequoia sempervirens*), including big-leaf maple, California wax myrtle (*Myrica californica*), *Petasites palmatus*, *Boykinia elata*, *Aralia californica*, *Adiantum pedatum* var. *aleuticum*, and *Woodwardia fimbriata* (fig. 39).

The most well-developed redwood forests occur in the lower drainages and include characteristic understory species such as *Oxalis oregana*, *Viola semper-virens*, *Vaccinium ovatum*, and *Hierochloa occidentalis*. In the upper canyons redwood forest is patchier, nondiverse, and very closely tied to canyon bottoms. Redwood is generally the only dominant tree, but in some areas tanoak, California bay, and Douglas-fir (*Pseudotsuga menziesii*) may be subdominants. Occasionally, Santa Lucia fir (*Abies bracteata*) occurs in redwood groves in the upper drainages. Most redwood forest in the RNA tends to form a mosaic with mixed evergreen forest.

**Grassland (41100, 42110, 42200):** 750 acres (304 ha). There is a gradual transition between coastal prairie grassland below the typical summer inversion layer to the more interior valley grassland at higher elevations. The coastal prairie type is not particularly well developed, with few species characteristic of the true coastal prairie of more N. locations. Such species as *Ranunculus californicus*, *Pteridium aquilinum*, *Zigadenus fremontii*, and *Dichelostemma* (*Brodiaea*) *pulchella* occur with the introduced annual *Bromus*, *Avena*, *Vulpia* (*Festuca*), and *Erodium* species.

Upslope from this coastal grassland, *Stipa pulchra* becomes locally common, signifying the grassland of more interior affinities. Also in this more extensive upland grassland are such species as *Paeonia californica*, *Chlorogalum pomeridianum*, *Eremocarpus setigerus*, *Trichostema lanceolatum*, *Plagiobothrys nothofulvus*, *Phacelia imbricata*, *Linanthus ciliatus*, *L. androsaceus*, *L. linifolius*, *Lagophylla ramosissima*, *Poa howellii*, *P. scabrella*, *Sitanion jubatum*, *Festuca megalura*, and several annual species of the following genera: *Chorizanthe*, *Lotus*, *Trifolium*, and *Bromus*. These higher elevation grasslands have a more open habit than the lower-elevation coastal prairie type, with herbs often just as important as grasses.

Some areas of grassland are being replaced by transitional scrub, and much of this association may be maintained only by periodic fire. However, atop the central ridges on the clay-rich Los Osos soils, grassland exists in a relatively stable state. These areas are bordered by coast live oak woodland and contain a number of perennial grasses and native herbs characteristic of well-developed valley grassland.

**Chaparral (37110, 37200):** 690 acres (279 ha). This association is easily broken down into two subtypes, which are often treated as separate associations. The first is the chamise (*Adenostoma fasciculatum*) chaparral (450 acres, 182 ha). It dominates on xeric S.- or W.-facing steep slopes at mid- to upper elevations. Typically, chamise occurs as almost pure, dense stands with little understory cover and few associated herbs or shrubs. In some cases, such species as *Heteromeles arbutifolia*, *Ceanothus papillosus* var. *roweanus*, and *Arctostaphylos glandulosa* occur as important members.

The other subtype is mixed chaparral (240 acres, 97 ha). It occurs in various forms from about 1500 to 4800 ft (457-1463 m) elevation. Overall dominants are *Arctostaphylos glandulosa*, *Heteromeles arbutifolia*, *Adenostoma fasciculatum*, *Mimulus bifidus* ssp. *fasciculatus*, *Ceanothus integerrimus*, and *Yucca whipplei* ssp. *percursa*. This association occurs on all major rock types and is on S.-, W.-, or E.-facing exposures of more moderate steepness than most chamise stands. In rocky stands with low shrub density, numerous herbs may be present including *Selaginella bigelovii*, *Clarkia rhomboidea*, *Cordylanthus rigidus*, *Monardella villosa* var. *subserata*, *Stephanomeria chicoriacea*, *Galium californicum*, *G. nuttallii*, and *Zauschneria californica*. Scrubby forms of canyon live oak, interior live oak, and tanoak also may occur as important members.

**Sage Scrub (32300, 37G00):** 550 acres (223 ha). This association occurs on S.-facing slopes away from the immediate coast between 200 and 2500 ft (61-762 m). Stands are generally lower with less crown overlap of shrubs than in the

coastal scrub association. Dominants include *Artemisia californica*, *Salvia mellifera*, *Mimulus aurantiacus* (lower elevations), *M. bifidus* ssp. *fasciculatus* (upper elevations), *Eriogonum fasciculatum*, *Rhamnus crocea* ssp. *ilicifolia*, *Toxicodendron diversilobum*, *Lupinus albifrons*, and *Lotus scoparius*. This association is more xeric than the coastal scrub and intergrades with chaparral at higher elevations.

This association reaches its peak diversity on open, rocky, E.-facing exposures where numerous grasses and herbs occur with the shrubs. These additional species include *Castilleja affinis*, *Gnaphalium bicolor*, *G. microcephalum*, *Sitanion jubatum*, *Galium angustifolium*, *G. californicum*, *Clarkia rhomboidea*, *C. speciosa*, *Stephanomeria virgata*, *Lupinus hirsutissima*, *Chorizanthe douglasii*, *C. membranacea*, *Eriogonum elongatum*, and *Stipa pulchra*. In contrast, xeric S.-facing stands frequently may be strongly dominated by *Artemisia californica* or *Salvia mellifera* with few associated species.

A subtype of this association, the transitional scrub, occurs in scattered, largely successional patches associated with sage scrub, chaparral, and grassland. This low scrub may develop into sage scrub, chaparral, or coast live oak woodland depending on site locations. The dominants are *Eriogonum fasciculatum*, *Lotus scoparius*, *Chrysopsis villosa* var. *sessiliflora*, *Penstemon breviflorus*, *Haplopappus squarrosus*, *Lupinus albifrons*, and *Yucca whipplei* ssp. *percursa*. At most of the sites where it occurs, this subtype is replacing grassland which was maintained by burning before the 1950s. This subtype is an important indicator of relatively rapid vegetational change in the drainage.

**Coast Live Oak Woodland (71160, 81310, 81200):** 520 acres (210 ha). This association occupies slopes and knolls of the main ridges. It normally is adjacent to and interdigitates with mixed evergreen forest, but it occurs on somewhat drier exposures. It is usually a more open association than the mixed evergreen forest with a more poorly developed understory. It is strongly dominated by coast live oak. *Rhamnus californica*, *Toxicodendron diversilobum*, and *Rubus vitifolius*, among other shrubs, are widely spaced with a sparse herb cover of *Collinsia heterophylla*, *Gnaphalium californicum*, *Madia elegans*, and *Sanicula crassicaulis*. A number of herbs and shrubs from chaparral, grassland, and sage scrub associations may occur where coast live oak woodland borders on those associations.

A California Bay subtype (Holland 81200) of this association often occurs around rock outcrops adjacent to grassland. These are generally small clonal stands interspersed within more extensive stands of coast live oak.

**Canyon Live Oak Woodland (81320):** 510 acres (206 ha). This association covers very steep upper slopes of the drainage on all major exposures. On the upper S. and W. slopes of Cone Peak it is typically composed of low, scrubby trees. The small size and high frequency of multiple stems of this association indicate past fire. This association is transitional between lower elevation, broad-leaved sclerophyll forests and the higher, more mesic conifer forests. A taller forest with scattered Coulter or ponderosa pine (*Pinus ponderosa*) occurs on gentler and less exposed slopes. On the ridgetops, this association may merge with mixed chaparral. The understory is sparse, but contains some interesting taxa including the three rare taxa, and several of the disjunct species listed under distinctive features.

**Santa Lucia Mixed Conifer Forest (84120, 84131, 84140):** 320 acres (130 ha). This association is best represented in the S. Fork of Devil's Canyon. Locally, this forest is divisible into three types. These include a mixed phase containing Santa Lucia fir, Coulter pine, canyon live oak, and occasional madrone and tanoak on NW.- or E.-facing slopes well protected from fire (90 acres, 36 ha); a ponderosa pine phase, occurring as an open woodland of coast live oak, madrone, and canyon live oak with a broken canopy of ponderosa pine (140 acres, 57 ha); and

a Coulter pine phase (90 acres, 36 ha) that occurs in small stands on higher, xeric ridgetops and S.-facing slopes and has a sparse understory related to adjacent xeric, mixed evergreen and canyon live oak forests.

**Bluebush Scrub (37820):** 180 acres (73 ha). Closely associated with the coastal scrub and sage scrub, this scrub association is dominated by bluebush (*Ceanothus thyrsiflorus*) or the similar *Ceanothus griseus* (at lower elevations) or *C. soledadensis* (at higher elevations). This type of scrub is taller than coastal scrub and generally found on steeper, rockier slopes than the two related scrub associations. Holland considers it a form of chaparral.

**Coastal Scrub (32200):** 170 acres (69 ha). This association occurs along steep to moderate SW.- or E.-facing slopes directly above the ocean. Dominants include the shrubs *Artemisia californica*, *Toxicodendron diversilobum*, *Baccharis pilularis* var. *consanguinea*, *Eriophyllum staechadifolium*, *Rhamnus crocea*, and *Mimulus aurantiacus*. Herbs include *Achillea millefolium*, *Agrostis diegoensis*, *Astragalus nuttallii*, *Galium nuttallii*, *Eriogonum parvifolium*, *Phacelia malvifolia* var. *loasaeifolia*, *Eucrypta chrysanthemifolia*, *Calystegia cyclostegia*, *Gnaphalium bicolor*, *G. californicum*, *G. ramosissimum*, and *Castilleja foliolosa*. Dominants vary from stand to stand, and a number of species more typical of the upper elevation scrub associations, such as *Salvia mellifera*, *Haplopappus squarrosus*, *Lotus scoparius*, *Yucca whipplei* var. *percursa*, may occur.



## B. South Fork of Devil's Canyon

(Griffin 1976, Borchert 1987)

### Distinctive Features

**Disjunct and Unusual Vegetation:** The Devil's Canyon vegetation encompasses a combination of plants in an unusual topographic setting including extensive groves of the Santa Lucia Mountains' endemic bristlecone fir, impressive disjunct old-growth sugar pine stands (fig. 40), interesting S. and N. montane disjuncts, three restricted endemic vascular plant species, and several types of mixed hardwood forest. The value of the area is not in its representation of typical or exemplary types of vegetation but in its unique plant communities.

**Rare Flora:** The following Devil's Canyon taxa are listed by CNPS: Santa Lucia fir (List 4), *Galium californicum* ssp. *luciense* (List 1B), *Galium clementis* (List 4), *Arctostaphylos hooveri* (List 4), and *Lupinus cervinus* (List 4).

**Disjunct Taxa:** Several plant species including *Allium burlewii*, *Carex multicaulis*, *Chimaphila menziesii*, *Chrysothamnus nausiosus* ssp. *albicaulis*, *Cycladenia humilis* var. *venusta*, *Holodiscus microphyllus*, *Lotus argophyllus* var. *fremontii*, sugar pine, *Pleuricospora fimbriolata*, and *Streptanthus tortuosus* are disjunct for their main population centers in the higher, mountainous parts of California. The mountain chickadee (*Parus gambeli*) is also a disjunct bird (known from the Santa Lucia Range) in this area only.

**Botanical Collecting History:** A number of noted collectors including David Douglas, Thomas Coulter, Theodor Hartweg, Willis Jepson, and Alice Eastwood, among others, have collected in the area.

**Figure 40—Cone Peak Gradient, South Fork of Devil's Canyon,** the sugar pine dominated pine/oak woodland on the north slope of Twin Peak in South Fork of Devil's Canyon. (J. R. Griffin 1976)

## Physical Characteristics

The survey area covers 542 acres (219 ha). Elevations range from about 2800 ft (853 m) in the lower canyon bottom to 5155 ft (1571 m) atop Cone Peak. Topography is steep to extremely steep throughout, with N.- and S.-facing slope aspects predominating, but all aspects are represented.

The geology is predominantly pre-Cretaceous metasediments of the Sur series (primarily crystalline schist with local marble outcrops at the upper elevations of Twin and Cone peaks). Three soil units are known from the area. These are rock outcrops-xerothents, Cieneba-Sur-rock outcrops complex, and Sur-Junipero complex. The best-developed forest vegetation occurs on Junipero sandy loam, whereas the most open hardwood forest occurs on Cieneba fine gravelly sandy loam.

Climate is varied, with occasional summer maritime influence at the lower elevations (temperature inversions relating to the cool maritime layer and associated fog generally occur below the lowest elevations in this area) and warm, dry interior climate in the summer above the inversion layer. Winter snows are common at the upper elevations. Annual average precipitation is estimated to range from 70 inches (1778 mm) across most of the area to 90 inches (2286 mm) on the E. flank of Cone Peak.

## Association Types

Twelve 300-m<sup>2</sup> plots were sampled in the sugar pine/tanoak-canyon live oak/*Toxicodendron* forest. Twelve 250-m<sup>2</sup> plots were sampled in the sugar pine/tanoak-canyon live oak-madrone/*Toxicodendron* forest. Twelve 500-m<sup>2</sup> plots were sampled in pine/oak woodland. Descriptions and acreages are based on the ecological survey.

**Pine/Mixed Hardwood Forest (84110):** 260 acres (105 ha). This association has been broken into two phases.

The first is the sugar pine/tanoak-canyon live oak/*Toxicodendron* phase. This phase covers 92 acres (37 ha). Compared to the pine/oak woodland (see last association type on following page) tree cover is substantially greater (73 percent average). There is a pronounced increase (>10-fold) in tanoak density and cover relative to pine/oak woodland. Pacific madrone (*Arbutus menziesii*) is rare.

Sugar pine reaches its best development in the area in the first phase. Heights and dbh of sugar pine are significantly greater than in the pine/oak woodland (averaging 149 ft [45 m] tall and up to 70 inches [1.8 m] dbh). Most sugar pines (86 percent) have basal fire scars. Sugar pine reproduction is abundant in tree fall gaps and good elsewhere. Almost all hardwoods in this phase are sprouts with no old growth. Maximum canyon live oak dbh is 8 inches (20 cm), and 12 inches (31 cm) for tanoak. Both species of hardwoods are well represented in the reproduction layers. Average densities (trees/ha) and basal area (m<sup>2</sup>/ha), respectively, are given after the species in the following list: sugar pine (121, 64.5), canyon live oak (210, 1.8), tanoak (403, 7.3), Santa Lucia fir (5, trace), and total trees (741, 73.7).

*Toxicodendron diversilobum* is a conspicuous shrub (up to 25 percent cover). The rare or disjunct species *Allium burlewii*, *Cycladenia humilis* var. *venusta*, *Chimaphila menziesii*, and *Lupinus cervinus* occur as scattered individuals.

The second phase of this forest type is described as the sugar pine/tanoak-canyon live oak-Pacific madrone/*Toxicodendron* phase (168 acres, 68 ha). This phase occurs at lower elevations than the previous phase; it is characterized by a higher density and cover of hardwoods. Tanoak is ubiquitous, Pacific madrone is locally common, California bay (*Umbellularia californica*) is a minor component, and canyon live oak may be locally absent. Fire history is similar to that of the first phase with few older hardwood stems.

Maximum dbh for tanoak and madrone sprouts is about 14 inches (36 cm). Sugar pine tends to be smaller than in the previous phase, with a maximum recorded dbh of 61 inches (1.6 m). Trees also may be younger and shorter on average than sugar pines in previous stands. Only 29 percent of the mature trees have fire scars. Density of pines is similar to that of the woodland plots whereas basal area is intermediate between that of the woodland and the previous phase. Pine seedlings and saplings are considerably less common than at the previous phase. Average densities (trees/ha) and basal area (m<sup>2</sup>/ha), respectively, are given after the following species: sugar pine (59, 46.8), *Quercus chrysolepis* (408, 7.3), Santa Lucia fir (7.4, trace), Pacific madrone (126, 3.4), California bay (54, trace), and total trees (1184, 67.3). Herbs are rare and mostly in rocky openings.

*Toxicodendron* is the most widespread and conspicuous understory plant. *Pleuricospora fimbriolata* was noted for the first time in the Santa Lucia Mountains in this phase.

**Mixed Hardwood Forest (81100, 81320):** 117 acres (47 ha). This forest also is broken into two phases.

The first is the tanoak-oak-Pacific madrone/*Toxicodendron* phase (66 acres, 27 ha). This is a typical mixed hardwood forest without significant presence of sugar pine. Tanoak is the most important species, with canyon live oak and Pacific madrone locally dominant. Interior live oaks (*Quercus wislizenii*) are scattered, but unimportant. A few Coulter pine and ponderosa pine (*Pinus ponderosa*) are present. *Toxicodendron diversilobum* remains the dominant understory plant. This phase is better represented in the adjacent Limekiln Creek drainage.

The second phase is dominated by canyon live oak (51 acres, 21 ha). It occurs on S. aspects. Compared to the previous type it has a low diversity with only widely scattered sugar or Coulter pine rising above the closed canyon-live-oak canopy. Fire history varies in this phase with some canyon live oak ranging up to 3 ft (1 m) dbh; other stands may be much smaller as a result of recent and frequent burns.

**Santa Lucia Fir-Pine-Oak Woodland-Rock Land (84120):** 92 acres (37 ha). This vegetation complex is divided into three landscape classes based on Talley (1974).

The first of these is the summit phase (65 acres, 26 ha). It is characterized by very steep (average 96 percent) rocky slopes with tree and shrub cover less than 25 percent. This phase is the best represented. Here scrubby sugar and Coulter pines are scattered with the firs. Stunted canyon live oaks are the principal hardwoods. Some colonies of *Arctostaphylos glandulosa* occur, but these are not extensive. Landscape features of this type almost preclude serious fires, thus the firs may be large and relatively old.

The cliff-outcrop-talus mosaic between the conifers and oaks has a rich flora including healthy populations of *Arabis breweri*, *Cheilanthes gracillima*, *Cheilanthes intertexta*, *Erigeron petrophilus*, *Eriogonum saxatile*, *Galium californicum* ssp. *lucianense*, *G. clementis*, *Holodiscus microphyllus*, *Lotus argophyllus* var. *fremontii*, *Penstemon corymbosus*, *Stipa coronata*, and *Streptanthus tortuosus*.

The other two types are the transition phase, which occurs below the summits. One type is the steep (average 84 percent) rocky slopes without cliffs or sudden breaks in slope, with average tree cover of 40 percent and shrub cover of 25 percent. The other type is the ravine phase, with an average slope of 70 percent and tree cover of greater than 50 percent. These types are mapped together and are estimated to cover about 27 acres (11 ha).

**Pine/Oak Woodland (no Holland equivalent):** 51 acres (21 ha). Between the ridge crest at Twin Peak (4843 ft, 1476 m) and about 4400 ft (1341 m) on N.-facing slopes, a woodland with average tree cover of 45 percent occurs. It is

dominated by widely spaced sugar pine up to 58 inches (1.5 m) dbh and 125 ft (38 m) tall. Sixty percent of these dominants have basal fire scars. Beneath the pines is a broken subcanopy of canyon live oak, many of which have been spared from fire for many years and have large boles. Average densities (trees/ha) and basal area (m<sup>2</sup>/ha), respectively, are given after the species name in the following list: sugar pine (59, 27), Coulter pine (*Pinus coulteri*) (47, 2), canyon live oak (136, 5), tanoak (40, 0.4), Santa Lucia fir (2, trace), and total trees (284, 33.5).

The shrub stratum is primarily composed of saplings of the oaks and pines. Herbs have a low cover-abundance value. Among the most conspicuous are *Galium californicum* ssp. *flacidum*, *Galium clementis*, *Lupinus cervinus*, and *Polystichum munitum* var. *curtum*.

### **Plant Diversity**

More than 380 taxa of vascular plants have been identified from the RNA (Borchert 1987). The number listed in Limkiln Creek is 288; in South Fork of Devil's Canyon, 107.

### **Conflicting Impacts**

The greatest recent influence in the area has been the 1985 Rat Fire, which burned virtually the entire RNA. Certainly much of the information on the structure and extent of a number of the associations described in this survey have changed dramatically after the fire. The prior amount of vegetation sampling will provide important baseline information for the monitoring of succession over the ensuing decades.

The area lies within the Federally-designated Ventana Wilderness. However, recreational use has traditionally been light.

Grazing, browsing (deer and cattle), and cattle wallowing within the coast live oak woodland appear to have affected the relatively poor seedling reproduction in this association. Seedlings are becoming established primarily in sheltered locations within transitional and other scrubs. Reproduction of coast live oaks within the grassland is virtually nil. Some areas of heavy disturbance from cattle congregation were noted in the lower grassland.