

4.4	Biological Resources	4.4-1
4.4.1	Environmental Setting	4.4-1
4.4.2	Impacts and Mitigation Measures	4.4-36
4.4.3	References.....	4.4-70

TABLES

Table 4.4-1	Special-Status Plants Occurring or Potentially Occurring On Campus
Table 4.4-2	Special-Status Wildlife Species Occurring or Potentially Occurring in the Study Area
Table 4.4-3	Mitigation Ratios for Impacts to Santa Cruz Manzanita
Table 4.4-4	Potential Impacts to Santa Cruz Manzanita on the Campus from Proposed Development under the 2005 LRDP

FIGURES

Figure 4.4-1	Vegetation Communities and Sensitive Habitats
Figure 4.4-2	Distribution of Santa Cruz Manzanita in the North Campus
Figure 4.4-3	Special-Status Wildlife Species: California Red-Legged Frog and Ohlone Tiger Beetle
Figure 4.4-4	Special-Status Bat Habitat
Figure 4.4-5	Vegetation Communities and Sensitive Habitats within Proposed Developed Areas

Biological Resources

This section describes the potential for development under the 2005 LRDP to affect biological resources. The section is based on a review of existing literature and data sources, recent and extensive biological resource surveys and assessments conducted on campus between 2000 and 2005 (EcoSystems West 2000, 2004a; Entomological Consulting Services 2002; Jones & Stokes 2002, 2004, 2005) and site visits in February and June 2005 by Jones & Stokes biologists. This section includes the following components:

- Description of the existing biological setting, including natural communities, vegetation and animal life characteristic of those communities, natural communities unique to the area, special-status plants and animals, common wildlife on campus, and potential wildlife corridors
- Assessment of potential impacts to these biological resources and of their significance under CEQA
- Proposed mitigation measures to reduce significant impacts.

Letters and public comments regarding the scope of the biological analysis were received in response to the Notice of Preparation. These letters and comments addressed the general topics of concern listed below.

- Habitat protection and potential impacts to special-status species, namely the foothill yellow-legged frog, California red-legged frog, Ohlone tiger beetle, and San Francisco dusky-footed woodrat
- Potential impacts of the proposed LRDP to natural communities, vegetation and animal life characteristic of those communities, natural communities unique to the area, special-status plants and animals, and common wildlife on campus
- Potential effects to species outside of the campus boundaries, including hydrologic effects to communities downstream of the campus.

This section specifically addresses the potential for impacts to all special-status species potentially affected by the proposed 2005 LRDP, including those cited in public comments. It also addresses all other scoping comments related to biological resources.

4.4.1 Environmental Setting

4.4.1.1 Study Area

The study area for biological resource impacts includes all of the main campus, 2300 Delaware Avenue, and areas adjacent to and downgradient of the campus where biological resources could potentially be indirectly affected by changes at the campus (i.e., Moore Creek drainage, Cave Gulch, and San Lorenzo watershed). For the purposes of this section, the UC Santa Cruz campus is divided into the following areas (see Figure 3-2 in Section 3.0 of Volume I of this EIR):

Main Campus¹

The main campus is divided into the following four areas:

- Central Campus. This area, also referred to as the campus core, is the primary developed center of the campus. It generally lies between the West and East Remote parking lots in the south (excluding areas of the Great Meadow), extends to just north of McLaughlin Drive, and includes areas to the west of the Heller/McLaughlin intersection up to Kresge College.
- Lower Campus. This area consists of campus lands from the Bay Street entrance (at the southern end of the campus) extending northward to the East and West Remote Collector parking lots.
- North Campus. This area extends northward from just north of McLaughlin Drive to the Seven Springs area of the campus, and westward from Kresge College to the western boundary of the University. This is the area where new colleges, academic facilities, and employee housing would be developed under the proposed 2005 LRDP.
- Upper Campus. This area consists of all University-owned lands to the north of the narrowest portion of the campus (Seven Springs area), extending to the northern boundary of the campus. No portions of the upper campus are proposed for development under the 2005 LRDP, except that a water tank may be located in this area.

2300 Delaware Avenue

This property is an 18-acre parcel in the west side of the city of Santa Cruz that is developed with structures, landscaping and parking. No native habitats are present on the site, although there are adjacent natural areas. This property is included in growth proposed under the 2005 LRDP.

4.4.1.2 Regional Setting

The UC Santa Cruz campus is situated on the coastal terraces at the western base of the Santa Cruz Mountains; campus elevations range from approximately 300 to 1,200 feet above sea level. This ecological subregion is classified as the Santa Cruz Mountains Subsection of the California Central Coast Section (Miles and Goudy 1997). The area is characterized by a Mediterranean climate moderated by proximity to the Pacific Ocean. Temperatures generally range between 45°F and 60°F, and summer fog is common. Rainfall averages about 30 to 45 inches annually; most of the rainfall occurs between November and April. Summer fog is common and provides moisture to soil and vegetation through fog drip, which is produced when moisture condenses on trees and other plants.

The Santa Cruz Mountains are located within the Central Western California region and San Francisco Bay subregion of the California Floristic Province (Hickman 1993). The province, which is the portion of the state west of the Sierra Nevada crest, is known to be particularly rich in endemic or native plant species (Hickman 1993; Stein et al. 2000) relative to the rest of California. The province is considered to

¹ Because no biological resources are present on the 2300 Delaware Avenue property that could be affected, the analysis in this section focuses on the main campus. The term “campus” hereinafter in this section refers to the main campus.

have a high level of biological diversity, where species diversity and endemism² are high and threats to this diversity of species are also high (Myers et al. 2000; Stein et al. 2000). The Santa Cruz Mountains region's exceptionally high levels of biodiversity and endemism (nearly 1,800 species of plants and 400 species of vertebrates) can be attributed to a combination of topographic diversity and numerous microclimates, which create an unusually diverse array of habitats. The major plant communities in the region are grassland, redwood forest, mixed evergreen forest, and chaparral. All are represented on the Santa Cruz campus.

4.4.1.3 Campus Setting

The campus is located in the central part of California's Coast Ranges geomorphic province (Norris and Webb 1990). The coastal terraces on which the campus is situated are geomorphic remnants of the former shoreline, which have been elevated above sea level by active uplift associated with the growth of the Coast Ranges. UC Santa Cruz has a generally south-southwest aspect. With the exception of steep slopes associated with stream drainages, the campus is largely dominated by gentle to moderately sloped undulating topography.

The UC Santa Cruz campus is located on the southeastern end of the Ben Lomond Mountain, a major ridge in the Santa Cruz Mountains. Ben Lomond Mountain is a large granitic massif that has been uplifted and tilted to the southwest along the Ben Lomond fault. The mountain's underlying bedrock is mostly a mix of granite, marble, and schist. In general, the bedrock underlying the campus is composed of two major types: a marble/schist substrate and a granite substrate. Granitic rock underlies most of the upper campus and forms intrusions into marble/schist bedrock in several north-central and southern campus locations. Marble and schist bedrock underlies the rest of the campus, including the central campus. Karst³ conditions have developed in some areas underlain by marble bedrock.

Most surface streams on the campus flow only during storms, with the exception of Cave Gulch and Moore Creek, which may flow during the summer months depending on rainfall amounts. Surface flows commonly flow into sinkholes or other karst features on campus. Water from the karst aquifer feeds springs at lower elevations. Springs and seeps are found in the north campus, but most subsurface water resurfaces off-campus to the south.

4.4.1.4 Regulatory Setting

The following provides an overview of the regulations relevant to biological resources.

Federal Laws and Regulations

Federal Endangered Species Act. Section 9 of the federal Endangered Species Act (ESA) prohibits the "take" of federally listed threatened and endangered species. The ESA defines "take" as any action that would harass, harm, pursue, hunt, shoot, wound, kill, injure, trap, capture, or collect any listed

² Endemism refers to species that are native to and restricted to a particular area.

³ Karst features are distinctive surficial and subterranean features developed by solution of carbonate and other rocks and characterized by closed depressions, sinking streams, and cavern openings. "Karst" is a German derivation of the geographical name *Kras*, a limestone plateau in Slovenia.

species. “Harm” includes significant habitat modification that could result in injury or death to a species. Federal projects, federally funded projects, or projects requiring a federal permit must comply with the ESA through a consultation with the U.S. Fish and Wildlife Service or the National Oceanic and Atmospheric Administration-National Marine Fisheries Service (NOAA-Fisheries) under Section 7 of ESA, or both. If a proposed nonfederal project may result in take of a listed species, and there is no nexus with any federal agency, an Incidental Take Permit under Section 10(a)(1)(B) of the ESA is required; a Habitat Conservation Plan (HCP) must accompany this permit application.

Clean Water Act (Section 404). Areas meeting the regulatory definition of *waters of the United States* (jurisdictional waters) are subject to the jurisdiction of the U.S. Army Corps of Engineers (ACOE). These waters may include all waters “used, or potentially used, for interstate commerce, including all waters subject to the ebb and flow of the tide, all interstate waters, all other waters (intrastate lakes, rivers, streams, mudflats, sandflats, playa lakes, natural ponds, etc.), all impoundments of waters otherwise defined as waters of the United States, tributaries of waters otherwise defined as waters of the United States, the territorial seas, and wetlands adjacent to waters of the United States” (33 CFR, Part 328, Section 328.3). ACOE, under provisions of Section 404 of the Clean Water Act (1972) (CWA) and Section 10 of the Rivers and Harbors Act (1899), has jurisdiction over waters of the United States. Waters thus regulated are termed “jurisdictional waters.” Impacts to jurisdictional waters, including wetlands (a special category of water of the United States), require a permit from ACOE and typically require mitigation. Impacts to wetlands often require compensation in kind to ensure no net loss of extent and function of wetlands.

Migratory Bird Treaty Act. The federal Migratory Bird Treaty Act (16 USC §703, Supp. I, 1989) prohibits killing, possessing, or trading in migratory birds except in accordance with regulations prescribed by the Secretary of the Interior. This act encompasses whole birds, parts of birds, bird nests, and eggs. Disturbance during the breeding season could result in the incidental loss of fertile eggs or nestlings, or otherwise lead to nest abandonment, and this could be a violation of the Migratory Bird Treaty Act.

Bald Eagle and Golden Eagle Protection Act. The Bald Eagle and Golden Eagle Protection Act prohibits the taking or possession of and commerce in bald and golden eagles, with limited exceptions. Under the Act, it is a violation to “...take, possess, sell, purchase, barter, offer to sell, transport, export or import, at any time or in any manner, any bald eagle commonly known as the American eagle, or golden eagle, alive or dead, or any part, nest, or egg, thereof...” *Take* is defined to include pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, and disturb.

State Laws and Regulations

California Endangered Species Act. Section 2080 of the California Endangered Species Act (CESA) prohibits the “take” of state-listed threatened and endangered species. The CESA defines take as any action or attempt to hunt, pursue, catch, capture, or kill any listed species. If a proposed project may result in “take” of a listed species, a permit pursuant to Section 2080 of CESA is required from the California Department of Fish and Game (CDFG). Take of state-listed species is authorized through

Section 2081 through a permit process. Take can also be authorized through Section 2835 with an approved Natural Community Conservation Plan.

Porter-Cologne Water Quality Control Act. Areas meeting the regulatory definition of *waters of the state* are subject to the jurisdiction of the California Regional Water Quality Control Board. *Waters of the state* means any surface water or groundwater, including saline waters, within the boundaries of the state [California Water Code, Chapter 2, 13050(e)]. Any person discharging waste, or proposing to discharge waste, within any region that could affect the quality of the waters of the state, other than into a community sewer system, must file a report of waste discharge with the appropriate regional board [California Water Code, Article 4, 13260(a)(1)]. The Central Coast Regional Water Quality Control Board administers this Act in Santa Cruz County.

California Fully Protected Species. In the 1960s, before CESA was enacted, the California Legislature identified species for specific protection under the California Fish and Game Code. These *fully protected* species may not be taken or possessed at any time, and no licenses or permits may be issued for their take except for collecting these species for necessary scientific research, and relocation of the bird species for the protection of livestock. Fully protected species are described in Sections 3511 (birds), 4700 (mammals), 5050 (reptiles and amphibians), and 5515 (fish) of the California Fish and Game Code. These protections state that "...no provision of this code or any other law shall be construed to authorize the issuance of permits or licenses to take any fully protected [bird], [mammal], [reptile or amphibian], or [fish]."

California Fish and Game Code Section 1602. Activities that result in the diversion or obstruction of the natural flow of a stream, substantially change its bed, channel or bank, or utilize any materials (including vegetation) from the streambed, require that the project applicant enter into a Streambed Alteration Agreement with CDFG pursuant to Sections 1602 of the California Fish and Game Code (CDFG 2003). The definition of streams includes "intermittent and ephemeral streams, rivers, creeks, dry washes, sloughs, blue-line streams, and watercourses with subsurface flows." Canals, aqueducts, irrigation ditches, and other means of water conveyance can also be considered streams if they support aquatic life, riparian vegetation, or stream-dependent terrestrial wildlife.

California Fish and Game Code Section 3503 (Bird Nests and Birds of Prey). Bird nests are protected in California under Section 3503 of the California Fish and Game Code (CDFG 2003). Section 3503 states that it is "unlawful to take, possess, or needlessly destroy the nest or eggs of any bird, except as otherwise provided by this code or any regulation made pursuant thereto." Disturbance during the breeding season can result in the incidental loss of fertile eggs or nestlings, or otherwise lead to nest abandonment. Disturbance that causes nest abandonment and/or loss of reproductive effort is considered take by CDFG. CDFG may issue permits authorizing take.

Section 3503.5 of the Code specifies that "It is unlawful to take, possess, or destroy any birds in the orders Falconiformes or Strigiformes (birds-of-prey) or to take, possess, or destroy the nest or eggs of any such bird except as otherwise provided by this code or any regulation adopted pursuant thereto."

Z'Berg-Nejedly Forest Practice Act

The Z'berg-Nejedly Forest Practice Act (PRC 4511-4628) was enacted in 1973 to “encourage prudent and responsible forest resource management calculated to serve the public’s need for timber and other forest products, while giving consideration to the public’s need for watershed protection, fisheries and wildlife, and recreational opportunities.” The California Forest Practice Rules (14 CCR 895-1110) implement the Z'berg-Nejedly Forest Practice Act and are enforced by the California Department of Forestry and Fire Protection (CDF). The California Forest Practice Rules require that an owner of timberland obtain a Timberland Conversion Permit (TCP) from CDF before removing trees or other forest products during the conversion of timberlands to land uses other than the growing of timber. In addition, a Timber Harvesting Plan (THP) must be filed and must be approved by CDF before timber operations may begin.

4.4.1.5 Natural Communities

[Figure 4.4-1](#), *Vegetation Communities and Sensitive Habitats*, presents the natural communities that are found on the campus. Brief descriptions of the natural communities occurring on the UC Santa Cruz campus are provided below. More detailed descriptions are provided by Dashe (1982) and Buck (1986).

Grassland

Grassland covers approximately 462 acres of UC Santa Cruz and represents about 23 percent of the total area of the campus. Much of the vegetation south of the central campus consists of grassland habitat ([Figure 4.4-1](#)). The grasslands are dominated by nonnative annual grasses, including wild oats (*Avena barbata*), brome grasses (*Bromus* spp.), and rattlesnake grass (*Briza maxima*). Nonnative forbs, such as English plantain (*Plantago lanceolata*) and bristly ox-tongue (*Picris echioides*), are also common in these areas. The largest grassland areas are located between Moore Creek and Jordan Gulch (the Great Meadow) and between Hagar Drive, Glenn Coolidge Drive (the East Meadow), and to the west of Empire Grade Road in the southwestern corner of campus. Several large stands of purple needlegrass (*Nassella pulchra*), a California native, are present south of the Music Center and north of the Arboretum. Native herbaceous perennials associated with these needlegrass stands include harvest brodiaea (*Brodiaea elegans*), golden brodiaea (*Tritelia ixioides*), yellow mariposa lily (*Calochortus luteus*), California acaena (*Acaena pinnatifida* var. *californica*), and California aster (*Corethrogyne filaginifolia* ssp. *californica*), as well as the native perennial grasses California oat grass (*Danthonia californica*) and California melic (*Melica californica*). Portions of the meadows in lower campus are infested with invasive exotic plants such as bull thistle (*Cirsium vulgare*). The native purple needlegrass is common and widespread in the grassland east of Jordan Gulch, although this grassland area appears to be drier and lacks the diverse assemblage of native perennials found in the Great Meadow. Grassland occurs on the west side of Moore Creek north of Family Student Housing (Porter Meadow) and grassland adjacent to the West Remote parking lot extends south to the Arboretum and west of Heller Drive. Grassland “meadows” (relatively small grassland patches within forested areas) also exist at several locations including Marshall Field and West Marshall Field along Empire Grade Road in the northwestern corner of the campus. There is a small meadow, known as Crown Meadow, north of the Crown/Merrill Apartments. Small patches of non-native

annual grasslands, such as Kerr Meadow south of Steinhart Way, are found adjacent to developed areas in various parts of the campus.

Annual grasslands provide foraging habitat and cover for many common wildlife species. Meadows that are grazed or mowed, such as the meadow west of Empire Grade Road and the East Meadow, are especially beneficial to wildlife because the low stature of the grasses and herbs provides open or bare areas in which small mammals and other wildlife can burrow and forage. Moreover, carefully managed grazing and/or mowing can result in an increase in native grasses and other vegetation with a concomitant decrease in nonnative invasive weedy species. Native vegetation provides much higher quality habitat for wildlife than does nonnative vegetation. Wildlife species observed in grassland habitats during previous campus surveys (Jones & Stokes 2004) included Western meadowlark (*Sturnella neglecta*), cliff swallow (*Petrochelidon pyrrhonata*), red-tailed hawk (*Buteo jamaicensis*), American kestrel (*Falco sparverius*), common raven (*Corvus corax*), meadow vole (*Microtus pennsylvanicus*), California ground squirrel (*Spermophilus beecheyi*), black-tailed hare (*Lepus californicus*), brush rabbit (*Sylvilagus bachmani*), and mule deer (*Odocoileus hemionus*).

Coastal prairie, which refers to grasslands largely dominated by native perennial bunchgrasses and having a higher proportion of native herb species, is also present on the campus. Coastal prairie areas are discussed in Section 4.4.1.6, *Sensitive Natural Communities*.⁴

Redwood Forest

Redwood forest covers approximately 457 acres of UC Santa Cruz and represents about 22.5 percent of the total campus area. Redwood forest occurs along the north and east margins of the upper campus area, on the central campus, and in much of the north campus (Figure 4.4-1). In the central campus and north campus, redwood forest is found on steep slopes and in canyon bottoms, while in the upper campus redwood forests are found on gentler slopes as well. Redwood forests tend to occur on sites that are moister than mixed evergreen forests. The dominant species in the redwood forest is coast redwood (*Sequoia sempervirens*). Redwood forest on UC Santa Cruz intergrades with mixed evergreen forest; other tree species occur in the canopy in some areas, including Douglas fir (*Pseudotsuga menziesii*), madrone (*Arbutus menziesii*), California bay (*Umbellularia californica*), and tan oak (*Lithocarpus densiflorus*). The understory is generally sparse, consisting of scattered shade-tolerant ferns and herbaceous perennials. All of the redwood forest on the campus, including dwarf redwood forest, is second-growth, having been logged at least once between 1860 and 1960.

Redwood forest habitat provides shade, moisture, food, cover, and special habitat elements for many wildlife species. Almost all the redwood forests on campus were logged toward the end of the 19th century (Warrick 1982), and the quality of the resulting second-growth habitat on campus varies immensely. Some forest groves exhibit a complex understory (e.g., north and west of Marshall Field) while others lack vegetation at ground level (e.g., redwood forest in central campus). Forest habitats with understory species support many more wildlife species than habitats lacking understory communities because they provide additional cover and food sources. Common wildlife species observed in the redwood forests on

⁴ *Sensitive natural communities* are natural communities that are recognized by the California Department of Fish and Game as rare, unique, or threatened in California (CNDDDB 2003). See Section 4.4.1.6.

campus included American robin (*Turdus migratorius*), Pacific slope flycatcher (*Empidonax difficilis*), violet-green swallow (*Tachycineta thalassina*), dark-eyed junco (*Junco hyemalis*), downy woodpecker (*Picoides pubescens*), and Douglas' squirrel (*Tamiasciurus douglasii*).

Dwarf Redwoods. Dashe (1982) noted several stands of redwoods on campus that exhibit unusual dwarf stature. Redwoods in these dwarf stands may be extremely short in stature (10 to 15 feet tall), or only moderately dwarfed (15 to 50 feet tall). By comparison, the height of typical adult redwoods ranges from 100 to 340 feet tall. In some areas, the dwarf redwood stands are dense and monotypic.⁵ In other areas, they are intermixed with chaparral, normal-stature redwoods, and Douglas fir. Dwarf redwood trees in these areas are shorter than in normal redwood stands and have denser foliage. The difference in growth form is probably due to the effects on the shallow-rooted redwoods of the sandy or thin, rocky soils where these stands occur (Dashe 1982; EcoSystems West 2004a). In 2002, biologists mapped a variety of dwarf redwood stands in the southeastern portion of the north campus, where they are interspersed with stands of normal redwoods (EcoSystems West 2004a). Monotypic stands of the dwarf redwood community occupy approximately 23 acres on campus. Dwarf redwoods also occur intermixed with other trees and with chaparral on an additional 34 acres.

The most unusual dwarf redwood stands on UC Santa Cruz occur where stands are dense, monotypic, and of short stature (10 to 15 feet tall; EcoSystems West 2004a) (Figure 4.4-2, *Distribution of Santa Cruz Manzanita in the North Campus*). Short-stature dwarf redwoods occupy approximately 9.9 acres on campus. Redwoods in these stands have trunks that are only a few inches in diameter. These stands lack an understory due to their density. Dashe (1982) notes that trunk cores have revealed these individuals to be similar in age to typical redwoods on campus (up to 80 years old). These stands of dwarf redwood are referred to as “short-stature dwarf redwoods.”

Dwarf redwoods are not currently tracked by the California Natural Diversity Database (CNDDDB 2005) or recognized as a distinct natural community or vegetation association. However, the 1988 UC Santa Cruz LRDP EIR considered them to be sufficiently rare to be recognized as a sensitive natural community (UCSC 1989). Short-stature dwarf redwood stands on campus were thought to represent the southernmost extent of this stand type's distribution (UCSC 1989) and possibly to harbor genotypes not found in other redwood stands (Buck 1986). Contrary to the previous findings of UC Santa Cruz (1989), it appears that dwarf redwood stands are found throughout the range of coast redwoods where soil nutrients are lacking, or where other extreme conditions, such as salt spray near the coast, stunt growth (McBride 2005; Borchert et al. 1988). Buck (1986) describes other occurrences in the Santa Cruz Mountains north of the UC Santa Cruz campus on Ben Lomond Mountain, along Empire Grade Road in the “chalks” area of northern Santa Cruz and southern San Mateo Counties, and small patches in Henry Cowell Redwoods State Park, and elsewhere in the Ben Lomond Sand Hills of Santa Cruz County. Dwarf redwood stands are reported from Alameda and Marin Counties (McBride 2005). In southern Monterey County, dense, monotypic stands of dwarf redwoods, as short as 3 feet in height, are described as occurring on the steep slopes of coastal entrances to drainages, where they are “widespread, but patchily distributed” (Borchert

⁵ *Monotypic* is defined as including only a single representative (i.e., the stand of vegetation is composed of a single species versus many species).

et al. 1988). In light of this information on the distribution of dwarf redwoods, these stands are not considered sufficiently rare or threatened to qualify as a sensitive natural community under CEQA.

Mixed Evergreen Forest

Mixed evergreen forest covers approximately 427 acres of UC Santa Cruz and represents 21 percent of the total campus area. Mixed evergreen forest is present along the southern and western edges of the north and upper campus area and in the central campus (Figure 4.4-1). Although coast redwood is present in this community, the dominant tree species are coast live oak (*Quercus agrifolia*), interior live oak (*Q. wislizenii*), California bay, madrone, and Douglas fir. In the north and upper campus area, scattered ponderosa pine (*Pinus ponderosa*) and knobcone pine (*P. attenuata*) trees are present in the canopy. The understory is often dense, with small trees, such as California hazelnut (*Corylus cornuta*), poison oak (*Toxicodendron diversilobum*), and shrubs more typical of chaparral stands. Douglas fir and madrone are more abundant in mixed evergreen forest in the north campus than in the central and south campus, while coast live oak and California bay are less abundant in the north campus (EcoSystems West 2004a; Buck 1986). Coast redwood and tanoak (*Lithocarpus densiflora*) individuals are also present in this community type. Density of the mixed evergreen forest is variable, with greater density more typical of stands in the north campus.

Wildlife species observed in the mixed evergreen forest included many of the species observed in the redwood forest. However, the structural heterogeneity in the mixed evergreen forests supports many more wildlife species than the more monospecific redwood forests on campus. Additional species identified in the mixed evergreen forest included Western scrub-jay (*Aphelocoma insularis*), Wilson's warbler (*Wilsonia pusilla*), and Townsend's warbler (*Dendroica townsendi*).

Coyote Brush Scrub

Coyote brush scrub covers approximately 1.4 acres of UC Santa Cruz and represents a very small percentage of the total campus area. Coyote brush scrub on the campus is located in three small patches, one of which is in the central campus area, and two of which are located between 500 and 1,000 feet northwest of the campus's main entrance in the lower campus area. These patches of scrub are dominated by coyote brush (*Baccharis pilularis*). Other species of shrubs found in these patches include sticky monkey-flower (*Mimulus aurantiacus*), poison oak, and blue blossom (*Ceanothus thyrsiflous*) (Dashe 1982). Coyote brush scrub on UC Santa Cruz is typically found in grasslands that do not experience periodic disturbances such as fire or grazing. Without these disturbances, coyote brush scrub is likely to continue to expand. Coyote brush scrub, with its fairly open canopy and low, dense cover, offers a complex mix of niches for many different species. California towhee (*Pipilo crissalis*), California quail (*Callipepla californica*), house finch (*Carpodacus mexicanus*), Western scrub-jay, black-tailed hare, and brush rabbit have been observed in this habitat.

4.4.1.6 Sensitive Natural Communities

In the Environmental Checklist Form presented in Appendix G of the CEQA Guidelines, sensitive natural communities are identified as “any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the CDFG or USFWS” (Section [IV (b)]). In this context,

“sensitive” indicates that a natural community would be adversely affected if subjected to development, and that its loss or degradation would result in negative impacts to valuable biological resources, such as occurrences of special-status species,⁶ concentrations of biodiversity, or a rare or regionally restricted natural community type.

Natural communities considered sensitive include, but are not necessarily limited to, those listed on the California Natural Diversity Data Base (CNDDDB) working list of “high priority” habitats (i.e., those habitats that are considered rare or endangered within California) (Holland 1986; CNDDDB 2005). The CNDDDB is a program administered by CDFG that inventories the status and locations of rare plants, animals, and natural communities in California.

Wetlands that meet the criteria, under Section 404 of the federal CWA or the Porter-Cologne Act, as jurisdictional wetlands of the state or federal government are also considered sensitive.

The following sensitive natural communities are found on campus and described in detail below: northern maritime chaparral, coastal prairie, and riparian woodland and scrub. Wetlands are discussed in Section 4.4.1.8, *Wetlands*, below.

Northern Maritime Chaparral

Northern maritime chaparral (NMC) (Holland 1986) covers approximately 48 acres of the UC Santa Cruz campus and represents about two percent of the total campus area (Figure 4.4-1). Additional NMC is present intermixed with mixed forest on about 42 acres of the campus. Most of the NMC on the UC Santa Cruz is located in the north campus (EcoSystems West 2004a). A small stand of NMC also occurs in the upper campus area along Seven Springs Trail. Maritime chaparral differs from typical chaparral because it is found in cooler and moister climates located nearer to the coast (Griffin 1978). CDFG considers NMC to be a sensitive natural community (CNDDDB 2005).

NMC within the north campus mostly occurs on the level to gently sloping uplands and is largely associated with outcrops of Santa Margarita sandstone, although it also occurs on schist and possibly on quartz diorite (EcoSystems West 2004a). At UC Santa Cruz, NMC is typically extremely dense and tall (8 to 10 feet), although it may be more open in some areas, such as areas in transition from chaparral to mixed evergreen forest. The dominant shrub in NMC stands is brittleleaf manzanita. Santa Cruz (heartleaf) manzanita (*Arctostaphylos andersonii*), a special-status species, is locally dominant in some patches of chaparral (Figures 4.4-1 and 4.4-2). Other shrubs occurring in the NMC include wartleaf ceanothus (*Ceanothus papillosus*), blue blossom, a shrubby form of interior live oak (*Quercus parvula* var. *shrevei*), chaparral pea (*Pickeringia montana*), and yerba santa (*Eriodictyon californicum*). One tree species, knobcone pine (*Pinus attenuata*), occurs at varying abundance throughout much of the NMC, as well as in mixed evergreen forest. Herbaceous vegetation is generally sparse in the NMC, except where disturbance has occurred.

⁶ *Special-status species* are species listed as rare, threatened, or endangered or proposed for this status by the federal or state government, wildlife species listed as *species of special concern* by the state or *species of concern* by USFWS, and plants on the California Native Plant Society List 1B or 2 (CNPS 2005). Additional criteria are listed under *Riparian Woodland and Scrub*.

NMC on campus is further differentiated from other maritime chaparral because it occurs on relatively level ground, much of which is poorly drained and supports wetland species such as sneezeweed (*Helenium puberulum*) and bog rush (*Juncus effusus* var. *brunneus*) (EcoSystems West 2004a).

NMC requires periodic fires, to be maintained as a community. Historically, chaparral in the Monterey Bay area burned every 10 to 30 years as the result of lightning strikes or aboriginal burning (Greenlee and Langenheim 1990). Fire suppression in the region has led to fire frequencies in chaparral at intervals in excess of 150 years (Greenlee and Langenheim 1990). Without fire, NMC tends to transition to other vegetation types, such as oak woodland (Van Dyke et al. 2002) or mixed hardwood forest. In addition to fire frequency, succession to mixed evergreen forest may be governed by soil depth and humus accumulation sufficient enough to support trees (EcoSystems West 2004a). Forests and NMC on the UC Santa Cruz campus have not burned since the early 1900s (Greenlee 1978), and according to the campus fire marshal, there has been only one fire in the north campus in the last 11 years (Hernandez 2005). Furthermore, the Campus does not manage NMC through other means (e.g., vegetation clearing). In the absence of fire or intentional management, NMC on deeper soils has been undergoing a transition to mixed evergreen forest communities, as evidenced by sparsely distributed Douglas firs and madrones amongst the shrubs in these areas. Comparing recent vegetation maps with the vegetation map from the 1988 LRDP EIR (UCSC 1988) shows that all of the areas mapped as NMC-forest transition in 2002 were mapped as NMC in 1988. This provides further evidence of the gradual succession of NMC to forest communities on campus, on suitable soils and in the absence of management. Without fire or management, NMC on shallow soils (e.g., on either side of Empire Grade Road) will mature into very old stands that may die and not replace themselves.

Chaparral provides low but dense cover for wildlife and a complex mix of niches for many different species. Species observed in the NMC habitat included western fence lizard (*Sceloporus occidentalis*), Allen's hummingbird (*Selasphorus sasin*), California quail, western scrub-jay, wrenit (*Chamaea fasciata*), California thrasher (*Toxostoma redivivum*), California towhee (*Pipilo crissalis*), and brush rabbit.

Coastal Prairie

Coastal prairie, a unique and sensitive grassland type, is found on campus in three locations: in Marshall Field, in the mima mound area at the southwestern edge of the campus southwest of Empire Grade Road, and in Crown Meadow in the southeastern portion of the north campus (Figure 4.4-1). These areas together comprise approximately 111 acres of campus lands. The areas of coastal prairie are much more mesic (requiring more moisture) than other grasslands on campus and support a diverse assemblage of native perennials, including coyote thistle (*Eryngium armatum*), white hyacinth (*Triteleia hyacinthina*), dwarf brodiaea (*Brodiaea terrestris*), Kellogg's yampah (*Perideridia kelloggii*), coast trefoil (*Lotus formosissimus*), and Olney's sedge (*Carex gynodynama*). Before the invasion of exotic herbs and grasses from the Mediterranean region of Europe, coastal prairie occupied larger areas than at present and supported a high diversity of both annual and perennial native herbs and grasses. Over 80 percent of the historic extent of coastal prairie statewide has been lost, and only 10 percent of the remaining statewide extent is currently protected (Wild 2002). Loss and degradation of coastal prairie has occurred as a result of development and grazing (Huenneke and Mooney 1989; Bartolome 1989). Today, coastal prairie is

restricted to small remnant stands. These stands are important habitats for native species. Populations of at least 30 endangered plant and animal species are found primarily in coastal prairie (Elkhorn Slough Coastal Training Program 2004). Within Santa Cruz County, losses of coastal prairie have been extensive. It is thought that nearly the entire first coastal terrace was probably prairie before European settlement, and prairie was also found on the second, third, and fourth coastal terraces (Santa Cruz CNPS 2005). Much of the Pajaro Valley, Watsonville, the City of Scotts Valley, and large areas of the north coast of Santa Cruz were once coastal prairie, that has now been developed for agriculture and housing (Santa Cruz CNPS 2005). Prairie is currently protected by the County of Santa Cruz and the Coastal Commission who recognize the rarity of the habitat.

On campus, native perennial grasses, especially California oat grass, are prominent in coastal prairie, and although nonnative annual grasses are still present, they are in lower abundance than in other areas of grassland. At Marshall Field, Pacific panic grass (*Panicum acuminatum*) and other native perennial grasses are abundant. Occurrences of San Francisco popcornflower (*Plagiobothrys diffusus*) and Point Reyes horkelia (*Horkelia marinensis*), both special status plant species, have been documented in coastal prairie in Marshall Field. Marsh microseris (*Microseris paludosa*), a special status plant species, has been reported from mima mound/coastal prairie habitat in the lower campus. Velvet grass (*Holcus lanatus*), a nonnative grass, is invading both coastal prairie areas in the north campus and could displace California oatgrass over time if not controlled.

The general vegetation structure of coastal prairie habitat is comparable to that of annual grassland habitat; however, the greater incidence of native species in coastal prairie increases its value to wildlife. Consequently, the wildlife species composition, particularly among insect species such as noctuid moths (*Schinia* sp.) and solitary bees (families Andrenidae and Anthophoridae), observed in coastal prairie habitat is more diverse than that described for typical grassland habitat. Species that tend to occur in these areas include the Ohlone tiger beetle (*Cicindela ohlone*), Buckeye butterfly (*Precis coenia*), Western racer (*Coluber mormon*), gopher snake (*Pituophis melanoleucus*), Western meadowlark, cliff swallow, golden eagle (*Aquila chrysaetos*), ferruginous hawk (*Buteo regalis*), red-tailed hawk, American Kestrel, common raven, meadow vole, California ground squirrel, black-tailed hare, brush rabbit, and mule deer.

Riparian Woodland and Scrub

Approximately 4 acres of riparian woodland and scrub occurs along Moore Creek between Oakes College and the Arboretum and in a small drainage southwest of the West Remote parking lot downstream of the College Eight detention basin (Figure 4.4-1). The characteristic trees are willows (*Salix* spp.) and black cottonwood (*Populus balsamifera* ssp. *trichocarpa*). Central Coast Arroyo Willow Riparian Forest is recognized by CDFG as a sensitive community (CNDDDB 2005). Black Cottonwood Riparian Forests and other willow riparian forests are identified as communities that are high priority for inventory in the CNDDDB (CDFG 2003) due to their rarity and the level of threat facing them. Although redwood forest and mixed evergreen forest also occur in riparian areas (i.e., along creeks and streams), they also occur in other settings, such as the upland terrace in the north campus. Habitat dominated by exclusively riparian plants such as willows and cottonwoods is restricted on campus to the two areas noted above. In addition, Dashe (1982) describes riparian woodland consisting of bigleaf maples (*Acer macrophyllum*) and California hazelnut (*Corylus cornuta*) as occurring in some reaches of Cave and Jordan Gulch. Jones &

Stokes biologists conducted surveys of Jordan Gulch in June 2005 and found that the channel and adjacent areas support numerous small patches (< 1 acre) of riparian woodland beneath an overstory of mixed evergreen or redwood forest. These patches are dominated by California hazelnut, California blackberry (*Rubus ursinus*), and snowberry (*Symphoricarpos alba*), which are species typical of riparian forest. Fern species that occur in these riparian areas include giant chain fern (*Woodwardia fimbriata*), coastal wood-fern (*Dryopteris arguta*), and western swordfern (*Polystichum munitum*). Due to the small size of these patches of riparian vegetation, these riparian woodland areas are not differentiated from adjacent mixed evergreen and redwood forest on Figure 4.4-1. Similar patches of riparian woodland understory species are expected to occur in Cave Gulch and have been reported by others (Warrick 1982). Redwood forests occurring along streambanks with a component of chain fern or bracken fern are recognized as a community that is high priority for inventory by the CNDDDB, due its rarity, ecological importance, and the level of threat it faces (CDFG 2003). Buck (1986) reports occurrences of California bottlebrush grass (*Elymus californicus*), a special-status plant species, from riparian woodland on campus, but specific locations of this special-status plant are not known.

Riparian woodland and scrub provides food, water, migration and dispersal corridors, and escape, nesting, and thermal cover for many wildlife species (Mayer and Laudenslayer 1988). Wildlife species observed in riparian woodland and scrub included western toad (*Bufo boreas*), rubber boa (*Charina bottae*), black phoebe (*Sayornis nigricans*), Anna's hummingbird (*Calypte anna*), northern mockingbird (*Mimus polyglottos*), mourning dove (*Zenaida macroura*), house finch (*Carpodacus mexicanus*), raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), and Virginia opossum (*Didelphis virginiana*).

4.4.1.7 Wetlands

Wetlands are defined as areas regularly saturated by surface water or groundwater and therefore dominated by vegetation that is adapted for saturated-soil conditions. In general, wetlands on campus are uncommon because of the sloping or steep topography, the permeable soils, and dense forest or grassland cover. However, three wetland types occur in small patches on campus: ponds, springs, and depressional wetlands. These three wetland types may qualify as jurisdictional wetlands under the Clean Water Act or the Porter-Cologne Water Quality Act. Any wetland that meets the definition of jurisdictional by the state or federal government (ACOE 1987) is considered a sensitive natural community.

Ponds

The only pond on campus is located in the Arboretum, in the south-central portion of campus within Moore Creek. This pond, known as the Arboretum Pond, occupies approximately 0.9 acre and is a potential jurisdictional water of the U.S. The pond is actually a seasonal man-made reservoir that was formed after the construction of a dam for water storage for the Cowell Ranch in the late 1800s. The Arboretum Pond contains dense emergent and woody vegetation such as willows, cottonwoods, and bamboo. The pond dries near the end of the summer. The Arboretum Pond provides the only known breeding habitat for California red-legged frog on campus, and is also foraging habitat for special-status bats.

Springs

Seeps and springs are common in the north campus, both in the “seep zone” along Spring Road and near the boundary of West Road and Fuel Break Road and elsewhere in the north campus. In addition, two seeps are located in grassland habitat in the Campus Habitat Reserve located near the campus entrance (between High Street and the Ranch View Terrace Housing). These two seeps and their associated hydrophytic⁷ vegetation occupy approximately 1.3 acres (Jones and Stokes 2005). These springs and seeps appear to result from the intersection of the water table with the ground surface (EcoSystems West 2004a).

Springs and seeps and their associated wet areas in the north campus tend to occur in small patches (less than 500 square feet). Drainages associated with seeps and springs occur as narrow linear features in forest or along road margins. Springs and seeps and associated drainages located in forest support a hydrophytic plant community with herbaceous and shrub layers. This plant association always consists of hydrophytic species such as western azalea (*Rhododendron occidentale*) and wax myrtle (*Myrica californica*) in the shrub layer, and slough sedge (*Carex obnupta*), sedge (*Carex* sp.), chain fern (*Woodwardia fimbriata*), lady fern (*Athyrium filix-femina* var. *cyclosum*), sneezeweed, Douglas’ baccharis (*Baccharis douglasii*), bog rush, common rush, paniced bulrush (*Scirpus microcarpus*), musk flower (*Mimulus moschatus*), tinker’s penny (*Hypericum anagalloides*), and water smartweed (*Polygonum punctatum*) in the herbaceous layer. Changes in hydrologic regime due to increased runoff or reduced groundwater supplies may result in the degradation of seeps and springs, as flows would increase or decrease away from natural flow ranges. Natural vegetation associated with these features would be expected to shift as a result of hydrologic changes.

Depressional Wetlands

The mixed evergreen forest in the north campus contains depressional areas underlain by a subsurface clay layer (EcoSystems West 2004a). These depressional areas contain variable densities of hydrophytic species, such as sedges, bog rush, common rush (*Juncus patens*), sneezeweed, Douglas’ baccharis, western bent-grass (*Agrostis exarata*), loosestrife (*Lythrum hyssopifolia*), and California water starwort (*Callitriche marginata*) (EcoSystems West 2004a). Local variations in topography and hydrology appear to create variations in the frequency and duration of inundation of these areas, such that some of them may meet the regulatory definition of waters of the United States and/or waters of the state, while others probably do not.

4.4.1.8 Identification of Special-Status Species

Special-status species are defined as plants and animals that are protected under the California or federal Endangered Species Acts or other regulations, and species that are considered sufficiently rare by the scientific community to qualify for such listing. Special-status plants, animals, and fish are species in the following categories:

⁷ *Hydrophytic* defines plants that thrive in areas that are inundated or have saturated soils for long or very long durations.

- Species listed or proposed for listing as threatened or endangered under the federal ESA (50 CFR 17.12 [listed plants], 50 CFR 17.11 [listed animals]), and various notices in the Federal Register ([FR] [proposed species])
- Species that are candidates for possible future listing as threatened or endangered under the ESA, including federal species of concern⁸ (61 FR 40 7596–7613, February 28, 1996)
- Species listed or proposed for listing by the State of California as threatened or endangered under the California Endangered Species Act (14 CCR 670.5)
- Species that meet the definitions of rare or endangered under CEQA (State CEQA Guidelines, Section 15380)
- Plants listed as rare or endangered under the California Native Plant Protection Act (California Fish and Game Code, Sections 1900 et seq.)
- Plants considered by the California Native Plant Society (CNPS) to be “rare, threatened, or endangered in California” (Lists 1B and 2 in CNPS 2001a)
- Animal species of special concern⁹ to the CDFG as identified in CDFG’s Special Animals List (CDFG 2005)
- Bird species that are CDFG first- and second-category species of special concern. Third-priority species are not included because, as stated in the CDFG list, they, “are not in any present danger of extirpation and their populations within most of their range do not appear to be declining seriously; however, simply by virtue of their small populations in California, they are vulnerable to extirpation should a threat materialize”
- Animals fully protected in California (California Fish and Game Code, Sections 3511 [birds], 4700 [mammals], and 5050 [reptiles and amphibians])
- Bat species designated as high or medium priority by the Western Bat Working Group (WBWG). The WBWG is a partner in the Coalition of North American Bat Working Groups. The WBWG is comprised of bat experts from agencies, organizations and research groups interested in bat research, management, and conservation from 13 western states and the provinces of British Columbia and Alberta. High-priority bat species are those species that, based on available information on distribution, status, ecology, and known threats, should be considered the highest priority for funding, planning, and conservation actions. These species are imperiled or are at high risk of imperilment. Medium-priority species are those species that are considered to warrant closer evaluation, both of the species and of possible threats; more research; and conservation actions.

⁸ *Species of concern* is an informal term used by the USFWS that refers to those species believed by each field office of USFWS to be in decline or in need of concentrated conservation actions to prevent decline. "Species of concern" receive no federal legal protection.

⁹ Species of Special Concern: A California Department of Fish and Game administrative designation given to vertebrate species that appear to be vulnerable to extinction because of declining populations, limited ranges, and/or continuing threats. Some species may be just starting to decline, while others may have already reached the point where they meet the criteria for listing as a threatened or endangered species.

4.4.1.9 Special-Status Plant Species

Dashe (1982) reported that the first campus surveys identified more than 500 species of vascular plants occurring on or near UC Santa Cruz. Dashe and Sellers (1982) provided a checklist of 376 plant taxa occurring on the campus. Jones & Stokes botanists encountered 306 taxa during surveys in 2002 (Jones & Stokes 2004). The results of Jones & Stokes surveys and the results of previous surveys were used to prepare a checklist of 521 plant taxa (species, subspecies, and varieties) on the present UC Santa Cruz campus (Jones & Stokes 2004). The checklist contains species that are native to campus or have become naturalized at UC Santa Cruz. It does not include landscaping plants or arboretum plantings, but does include a few species that have escaped from cultivation, such as English ivy (*Hedera helix*) and rosemary grevillea (*Grevillea rosmarinifolia*).

The UC Santa Cruz flora is fairly species rich. Dashe (1982) attributed this high local species richness to the diverse soil types, topography, and plant communities present on the campus, as well as to the favorable climate in the Santa Cruz area and to historic and recent disturbance. About 30 percent of the checklist taxa are nonnative. This approximates the percentage Thomas (1961) gave for the flora of the Santa Cruz Mountains (30.7 percent) but is substantially higher than the percentage of nonnative plants for the California flora (17.4 percent) (Hickman 1993). The greater percentage of non-natives on campus and in the Santa Cruz Mountains flora may be due to the fact that these areas are less remote than much of California. The campus and Santa Cruz mountains receive a greater influx of invasive species associated with vehicles and people traversing this area, as well as with intensive land uses in and adjacent to these areas. The Santa Cruz Mountains are also better studied than many areas of California, so the proportion of non-natives may be better documented in the Santa Cruz Mountains than in other parts of the state.

Special-status plants that are known to occur or have the potential to occur on the campus are listed in Table 4.4-1 (located at the end of this section). This list is based, in part, on an evaluation conducted by Jones & Stokes of plants considered of “special interest” in the 1988 LRDP EIR (UCSC 1989) (see Appendix C).

Four special-status plants are known or suspected to occur on campus: Santa Cruz manzanita, Point Reyes horkleia, marsh microseris, and San Francisco popcorn flower (Buck 1986; EcoSystems West 2004a; Jones & Stokes 2004). In addition, an undescribed sedge which may merit protection, but whose taxonomic status is currently undetermined, is present on campus. All five species are described below.

Santa Cruz Manzanita

Santa Cruz manzanita (*Arctostaphylos andersonii*) has no state or federal listing status, but CNPS includes it on List 1B, indicating that it is sufficiently rare to be considered a special-status species under CEQA (CNPS 2005). It is endemic to the Santa Cruz Mountains, where it occurs at 15 to 20 locations (CalFlora 2000; CNDDDB 2005; Jones & Stokes file information). Santa Cruz manzanita occurs in chaparral, where it may be the dominant species, and in redwood forest and mixed evergreen forest, where it occurs as solitary shrubs or groups of a few shrubs in openings or at the forest margins.

Santa Cruz manzanita is an obligate seeding plant (Hickman 1993). That is, it cannot reproduce vegetatively from underground burls (“stump sprout”) following fires that consume aboveground plant

material. However, periodic wildfires are probably necessary for the continued existence of Santa Cruz manzanita because fire likely stimulates germination of manzanita seeds (Keeley 1987; Tyler 1996) and clears vegetation to allow seedlings to grow. Wildfires are also important to reduce encroachment by trees and larger shrubs, which is occurring with greater frequency in the north campus in the absence of fires (EcoSystems West 2004a; Jones & Stokes 2004).

On the campus, Santa Cruz manzanita occurs primarily in the chaparral of the north campus (EcoSystems West 2004a; Figure 4.4-2). The species is also found in a patch of chaparral in the upper campus located along Seven Springs Trail. A detailed description of the distribution of this species in the north campus is excerpted from EcoSystems West (2004a) below:

Santa Cruz manzanita is abundant and widespread, although somewhat locally concentrated, over much of the north campus. It is most abundant, although unevenly distributed, in the chaparral community. In some chaparral areas, it is locally quite dense and constitutes one of the dominant shrubs. It occurs only as widely-scattered individuals in some chaparral areas, and is absent from some areas of chaparral. Santa Cruz manzanita also occurs more locally, sometimes only as scattered individuals, in open, often disturbed, areas in mixed evergreen forest and dwarf redwood forest communities.

Santa Cruz manzanita is frequently associated with past clearing or other disturbance where it occurs in the mixed evergreen forest or dwarf redwood forest; sometimes in chaparral areas as well. Santa Cruz manzanita does not produce a basal burl and reproduces only from seed. In general, seed of chaparral shrubs is stimulated to germinate by fire, and fire is necessary for abundant reproduction of chaparral shrubs in otherwise undisturbed chaparral (Hanes 1977). The current uneven distribution of this species in the chaparral of the survey area may be related, in part, to the past fire history of the chaparral. Fire or other periodic disturbance may be necessary to maintain viable long-term populations of Santa Cruz manzanita on the UC Santa Cruz.

Fifteen other occurrences of Santa Cruz manzanita are documented in Santa Cruz County (CNDDDB 2005). All of these occurrences are presumed extant by the CNDDDB, but only five have been seen in the last 10 years. This may be due to lack of survey effort. Nine of the Santa Cruz manzanita occurrences in Santa Cruz County have been seen since 1960, while an additional six occurrences were last seen between 1936 and 1950. Nine additional occurrences of these species have been documented in San Mateo and Santa Clara counties. Of these nine occurrences, four were last seen between 1974 and 2001, while the other five occurrences were last seen between 1895 and 1936. Population estimates are only available for three of the documented occurrences of Santa Cruz manzanita; thus it is difficult to assess the overall number of individuals. Two of the documented occurrences together comprise approximately 1,300 individuals on 28 acres (CNDDDB 2005) and a third documents a single individual. Based on the two substantial occurrences, it seems reasonable to presume that the overall number of individuals in documented occurrences of this species is on the order of tens of thousands of individuals. Because counts are lacking for almost all occurrences, the size of the campus population is unclear.

The status of most of the documented occurrences of Santa Cruz manzanita, and whether these occurrences are currently under protection, is unknown. However, three documented occurrences of the species occur in state parks (Forest of Nisene Marks and Big Basin Redwoods State Parks) and are therefore protected from development. The three state parks occurrences are mapped as occupying a relatively large area, totaling over 500 acres, although the precise distribution and abundance are unknown.

Point Reyes Horkelia

Point Reyes horkelia (*Horkelia marinensis*) has no state or federal listing status, but CNPS includes it on List 1B. The species is endemic to the California central coast, ranging from Mendocino to Santa Cruz counties. It was once believed to be restricted to the north coast, until specimens from the Santa Cruz Mountains, previously treated as *H. bolanderi* ssp. *parryi* (Thomas 1961), were subsequently identified as *H. marinensis* (Ertter 1993). The CNDDDB has no records of this species from Santa Cruz County, although it has been collected at least three times along the Empire Grade Road north of Santa Cruz, including at Marshall Field on the campus (CalFlora 2000). Point Reyes horkelia grows in sandy areas in coastal dunes, coastal scrub, and coastal prairie (CNPS 2001b). At Marshall Field, it occurs in scattered patches throughout the areas of coastal prairie.

Marsh Microseris

Marsh microseris (*Microseris paludosa*) has no state or federal listing status, but CNPS includes it on List 1B. It occurs along coastal California from Humboldt to San Luis Obispo counties. In Santa Cruz County, it is reported to occur on wet grassy slopes near the coast (Thomas 1961). It has been collected in the city of Santa Cruz near Graham Hill Road and west of the city of Santa Cruz near Swanton (CalFlora 2000). Buck (1986) observed it in coastal prairie/mima mound habitat at the south end of the campus. It was not encountered during the surveys conducted on the campus in 2002 (Jones & Stokes 2004). Furthermore, the area where the species was reported on campus would not be developed under the 2005 LRDP; thus, additional analysis was deemed unnecessary.

San Francisco Popcornflower

San Francisco popcornflower (*Plagiobothrys diffusus*) is a state-listed endangered species that is also on CNPS List 1B. *Plagiobothrys diffusus* was subsumed within the more common *Plagiobothrys reticulatus* var. *rossianorum* in *The Jepson Manual* (Hickman 1993), although CNPS and CDFG continue to recognize *P. diffusus* as a distinct species. *P. reticulatus* var. *rossianorum* is common and is found in the San Francisco Bay Area and all counties in northwestern California (Hickman 1993); this subspecies does not have special status.

P. diffusus is known to occur at less than 10 sites in Santa Cruz County in wet meadows and prairies. The species was formerly known from the Presidio in San Francisco and may be present in one location in Alameda County (CNPS 2001b). Two occurrences of *P. diffusus* are reported from coastal prairie within Marshall Field (CNDDDB 2005) but neither was observed during the 2002 surveys. Locations of occurrences near UC Santa Cruz on public land include Pogonip City Park and the City of Santa Cruz Moore Creek Uplands Preserve.

Undescribed Sedge

A local botanist recently documented occurrences of a sedge in the north campus that may be an undescribed taxon (EcoSystems West 2004a). The taxonomic status of this plant remains unresolved at this time (Buck 2005). The following description of the plant and its occurrence in the north campus are excerpted from EcoSystems West (2004a):

It grows in shady to partly shady areas where some seepage is present or the water table is relatively high. The largest population in the north campus study area is located just south of Fuel Break Road west of Red Hill Road, in a shady forest understory area along the drainage way from a large forest spring (campus sectors 41 and 42). Four smaller populations occur east of Cave Gulch and south of Fuel Break Road (campus sectors 40, 41, and 42).

This sedge somewhat resembles two species previously known to occur in the Santa Cruz Mountains (Thomas 1960)...

*Based on the above [anatomical] considerations, it is unlikely that this sedge is either *C. hassei* or *C. saliniformis*. The possibility cannot be ruled out that it is either an introduced species or represents a range extension of a species not previously known to occur in the Santa Cruz Mountains region. If it is native, it is certainly very rare in the region.*

Because this taxon remains undescribed, its status cannot be determined at this time. Therefore, it will not be considered further in this EIR. If it is determined after publication of the 2005 LRDP to be a distinct and unique taxon, and this taxon is determined to have special status (e.g., by CNPS), then the taxon would be considered in project-specific CEQA evaluations.

4.4.1.10 Special-Status Wildlife Species

Forty special-status wildlife species were identified as having the potential to occur in northern Santa Cruz County; 31 of these species were identified as occurring on the campus or as having a moderate to high potential to occur on the campus (Table 4.4-2, located at the end of this section). Species observed at UC Santa Cruz during the recent survey efforts (i.e., after 2001) include golden eagle (*Aquila chrysaetos*), white-tailed kite (*Elanus caerules*), and northern harrier (*Circus cyaneus*). Previous studies have recorded western burrowing owl (*Athene cunicularia hypugea*) east of Hagar Drive and in the Great Meadow (Alley 1988; Beyer 2001; Biosystems Analysis 1989; Pelc 1995; CNDDDB 2005), (although none was seen in 2002 or 2005), and woodrat (*Neotoma* spp.) nests have been surveyed throughout the north campus (Bankie 2005).

Special-status wildlife species observed or determined to have a moderate to high potential of occurring on the campus are discussed briefly below.

Invertebrates

Ohlone Tiger Beetle. The Ohlone tiger beetle (*Cicindela ohlone*) is known to occur at 15 locations in central and western Santa Cruz County and appears to be restricted to coastal terraces under 1,200 feet in

elevation. This species inhabits coastal terrace prairies that support remnant stands of native bunchgrasses. At all known Ohlone tiger beetle sites, the beetle co-occurs with California oatgrass and purple needlegrass (Entomological Consulting Services, Ltd. 2002; Jones & Stokes 2004). Within remnant native grasslands, the beetle utilizes barren or sparsely vegetated ground, including hiking and biking trails, on level ground and less frequently on gentle slopes. The substrate at each known beetle location consists of shallow, poorly drained clay or sandy clay soils that have accumulated over a layer of Santa Cruz Mudstone bedrock (Freitag et al. 1993). As previously mapped by the U.S. Soil Conservation Service (1980), the soils at all known Ohlone tiger beetle sites belong to the Watsonville loam series. More recent soil mapping indicates that other, similar soils occur at many of the locations known to support Ohlone tiger beetle (Natural Resources Conservation Service 2002).

Collection records indicate that most adult Ohlone tiger beetles are active from mid-January through mid-May, although the duration and timing of the adult activity period can vary from year to year and between places within a particular year. Specific dates when beetles have been observed range from January 17 through May 11 (Freitag et al. 1993). Reproduction, foraging, and dispersal activities occur during this time. If disturbed, Ohlone tiger beetle have been observed flying to densely vegetated areas (Freitag et al. 1993; USFWS 2001).

Ohlone tiger beetles are known to occur at Marshall Field and in the southwestern corner of the campus. Known locations of these species are shown in [Figure 4.4-3](#), *Special-Status Wildlife Species*. Watsonville loam soils are patchily distributed around the campus, mostly in north campus under forest vegetation that is not suitable for the species. Watsonville loam soils that support grassland and that are not already occupied by Ohlone tiger beetles occur in two areas: south of the approved Ranch View Terrace Housing Project and in the Porter Meadow. Surveys conducted in 2001, 2002, and 2003 found no beetles near Ranch View Terrace (Entomological Consulting Services 2002, 2003b, 2003c). UC Santa Cruz has set aside 12.5 acres south of the development site as Campus Habitat Reserve (Jones & Stokes 2005). A portion of this reserve will be managed to reduce vegetation cover and density to encourage colonization and use by Ohlone tiger beetles. It is unknown whether beetles would colonize this site even if vegetation were suitable, due to the distance of this site from known populations. No beetles have been found in Porter Meadow (Entomological Consulting Services 2002), and it is not known whether the site historically supported them. There are no plans to manage this site to encourage beetle use.

Ohlone tiger beetles are known to occur in Pogonip City Park, immediately off campus to the east. The closest campus population to Pogonip City Park is the population in the Campus Habitat Reserve west of Empire Grade Road, approximately 2 miles away. Although no one has studied the movement patterns of Ohlone tiger beetles, individuals may move between these two populations through the Great Meadow and other open sites (Arnold 2002). Research on another endangered tiger beetle (*Cicindela dorsalis dorsalis*) in the eastern United States showed they can readily disperse over unsuitable habitat for distances of 5 to 11 miles (Knisley and Hill 1989). Other tiger beetle species have been known to disperse long distances with the aid of wind or storms (Knisley and Hill 1989).

San Francisco Lacewing. The San Francisco lacewing (*Nothochrysa californica*) is a member of the insect order Neuroptera, which includes ant lions, dobsonflies, and alderflies in addition to the lacewings.

This lacewing was described as a new species in 1892 (Banks 1892), using material collected in the Los Angeles area. It is the only known species of this genus occurring in North America.

The San Francisco lacewing has been found throughout much of the Coast Ranges of California (Adams 1967; Banks 1892; BUGGY Data Base 2003a); in Oregon, Washington, and Idaho (Adams 1967); and in British Columbia in Canada (Garland 1985; Smith 1932). In California, the lacewing has historically been known from coastal locations between Mendocino and Los Angeles counties. The only known record from near UC Santa Cruz is a collection in 1965 of a specimen associated with knobcone pine at a location 7 miles northwest of Santa Cruz on Empire Grade Road (BUGGY Data Base 2003a). Due to a recent decline in observations of this lacewing in the Coast Ranges of California, the U.S. Fish and Wildlife Service (USFWS) treats it as a species of concern, and the lacewing satisfies the definition of a rare species pursuant to CEQA.

Adult San Francisco lacewings are typically about 0.4 inch long with a wingspan of 0.5 inch (Entomological Consulting Services 2003). Larval stages of *N. californica* prey on other insects and have been collected from coast live oak and California bay laurel (Toschi 1966). Adults, who are pollen feeders, exhibit an affinity for oak, pine, and bay trees. Most adult observations occur between March and May. The preferred habitat is probably moist forest areas near the coast.

Despite the presence of suitable habitat on the UC Santa Cruz campus, no life stages of San Francisco lacewing were observed during surveys conducted in 2003 (Entomological Consulting Services 2003).

Cave Species. The Santa Cruz telemid spider (*Telemid* sp.), Dolloff Cave spider (*Meta dolloff*), Empire Cave pseudoscorpion (*Microcraegris imperialis*), and MacKenzie's cave amphipod (*Stygobromus mackenziei*) are special-status insects that are known to occur in Empire Cave, which is located in central campus. The Dolloff Cave spider is also known to occur in the nearby Dolloff Cave on the west side of Empire Grade Road, off campus. All of these species are listed as federal species of special concern. Special caving surveys have been conducted for these species in six caves within Cave Gulch (Briggs and Ubick 1988; Muchmore and Cokendolpher 1995; Muchmore 1996; Ubick 2001).

Suitable habitat for special-status cave species may also be present in central and lower campuses where small cave entrances and sinkholes connect to larger subterranean cavities. These caves are formed through years of water run-off that has dissolved pockets of limestone and created an underground network of small and large caverns. Large well-explored caves, like Empire and Dolloff, share subterranean connections with small, inaccessible cavities that are poorly documented. Small subterranean cavities likely provide the same suitable habitat conditions for the special-status cave species as larger cavities more navigable to humans but documentation is absent because of inaccessibility. The four special-status cave species addressed here are capable of completing their entire life cycle below ground. These species are therefore capable of moving throughout the uncharted networks of caves and colonizing all suitable habitat, regardless of their proximity to a surface entrance. Literature suggests that the species likely do not inhabit small fractures or features that are within 4.9 feet of the surface where the heating and cooling during the summers and winters may be too variable (Veni and Reddell 2002). There have been no surveys of most of the caves and sinkholes on campus so the network of underground connections is unknown. Although the special-status cave species have only been observed in Cave Gulch, they could occur in other open limestone caves in the study area. The special-status species would

tend to live in deeper voids where temperatures and humidity are more stable, and in spaces out of the reach of native or non-native species that may compete with or prey upon the cave invertebrates. Researchers in central Texas determined that caves or voids that were less than 4.9 feet below ground surface, less than 6.6 feet wide and 3.3 feet high, or highly dissimilar in morphology to occupied caves were unlikely to contain suitable habitat for special-status invertebrate species (Veni and Reddell 2002). These factors have been adopted by the USFWS as guidelines for identification of potential central Texas karst invertebrate habitat (USFWS 2004), and may also be applicable to the karst system at UC Santa Cruz.

Amphibians

California Red-Legged Frog. California red-legged frog (CRLF) is federally listed as threatened and is a California species of special concern. CRLF is found throughout the Coast Ranges from Humboldt to San Diego counties, and isolated populations occur in the Sierra Nevada from Butte to Fresno counties.

CRLF habitat is characterized by permanent and ephemeral streams or ponds with emergent and submergent vegetation and riparian vegetation along the banks. During the dry summer and fall months, adults aestivate in rodent burrows in upland habitats (Jennings and Hayes 1994).

Extensive surveys for CRLF on campus have documented the species only within the lower campus and in the Moore Creek drainage (EcoSystems West 2000; Jones & Stokes 2002) (Figure 4.4-3). EcoSystems West (2000) conducted a campus wide assessment of habitat for CRLF that was subsequently refined by Jones & Stokes (2002). These studies mapped four zones on campus that corresponded to the likelihood of occurrence of CRLF based on the presence and quality of suitable habitat, barriers, or hazards to dispersal, and distance from known occurrence and the Arboretum Pond. For details on the ecology of this species, its occurrence on and near campus, and the presence of suitable habitat, [see Jones & Stokes (2002, 2003, 2005) and EcoSystems West (2000, 2004)]. The Arboretum Pond is the only location on campus where CRLF are known to breed. The size of the breeding population is unknown because of the dense vegetation in and around the pond and the difficulty in surveying the site. The Arboretum Pond likely provides high quality breeding habitat for the species because it dries out every summer, preventing predators of CRLF such as non-native bullfrogs or non-native fish from establishing in the pond. The only other suitable breeding habitat on campus is the College Eight detention basin at the head of the west branch of Moore Creek. No CRLF have been found breeding at this site (EcoSystems West 2004b). Adult and subadult CRLF have been found in east and west forks of Moore Creek (Figure 4.4-3), which provide suitable movement, foraging, and aestivation habitat but are not suitable for breeding. The individuals found in Moore Creek likely dispersed from the Arboretum Pond. A 13-acre site is dedicated in the southwestern corner of the campus as a permanent preserve to protect potential movement habitat for CRLF and because this site has a known occurrence of Ohlone tiger beetle (Jones & Stokes 2004). A Habitat Conservation Plan for the preserve is presently under consideration for approval by the USFWS.

The nearest observation of CRLF off campus was approximately 0.4 mile northwest of the north campus, west of Empire Grade Road along Adams Creek, a tributary of Wilder Creek (EcoSystems West 2000; Jones & Stokes 2002, 2005). All other occurrences of CRLF are south or southwest of the campus (see Jones & Stokes 2004 for these off-campus locations). The closest observations of breeding CRLF off

campus are 1 to 1.8 miles away in Wilder Ranch State Park and ponds near Highway 1. The closest observations of non-breeding CRLF are 1.3 to 2 miles from campus in the Moore Creek and Wilder Creek drainages. Because CRLF occurs in Wilder Creek, CRLF may migrate between the Wilder Creek and Moore Creek drainages in the southwestern part of campus over the grassland and prairie habitat in that area.

Paedomorphic Pacific Giant Salamander. The Pacific giant salamander (*Dicamptodon ensatus*) is a large, heavy-bodied animal (about 13 to 14 inches long) that inhabits the coastal redwood and pine forests of California, Oregon, Washington, and British Columbia. Dependent upon varying ecological conditions, this salamander exhibits several different life history strategies. At the end of the larval period, Pacific giant salamanders either transform into terrestrial salamanders or remain in their natal habitat and retain juvenile/larval characteristics. This phenomenon is called neoteny, and when in this stage individuals are called neotenes or paedomorphs. When ecological conditions are favorable, individuals using both strategies can be found in adjacent populations. The frequency of neoteny varies among all *Dicamptodon* species populations, and it is unclear whether this phenomenon is genetically or environmentally determined.

Pacific giant salamander have been collected from the area as part of a research project at UC Santa Cruz exploring their genetic relationships (Sinervo 2005). All salamanders collected from Empire Cave are neotenes/paedomorphs consistent with the view that a new form has arisen specifically associated with this cave and associated karst features at UC Santa Cruz. Genetic tests have not been carried out to determine the extent of gene flow between the two forms.

It is unclear whether further analysis will show the UC Santa Cruz population as genetically distinct. Neotony is known in all populations of the species (Nussbaum et al. 1983; Good 1989). In British Columbia populations of Pacific giant salamander, genetic analysis has confirmed that both paedomorphic and adult forms occur within the same species (Daugherty et al. 1983; Good 1989; Steele et al. 2005).

Given the current state of knowledge on the genetics and life history of Pacific giant salamander populations and lack of data on the campus population, it would be speculative to assume that this new form is genetically distinct or rare and it will therefore not be considered further in this EIR.

Reptiles

Southwestern Pond Turtle. The southwestern pond turtle (*Clemmys marmorata pallida*) is a federal species of concern and a California species of special concern. The species occurs along the central coast of California east to the Sierra Nevada and along the southern coast inland to the Mojave and Sonoran deserts. Southwestern pond turtle habitat is characterized by streams and ponds, with rocky or muddy bottoms, that are located in woodlands, grasslands, and open forests. Hatchlings and juveniles require shallow water with dense submergent vegetation for foraging. Pond turtles also require woody debris, rocks, or other suitable substrate in or near water on which to bask for thermoregulation.

Southwestern pond turtles have been reported in Moore Creek south of the campus (CNDDDB 2005). The Arboretum Pond and the pool area of lower Moore Creek are the only suitable breeding habitat for southwestern pond turtles on the campus (Jones & Stokes 2004). EcoSystems West (2004a) did not

observe Southwestern pond turtles on the north campus. Other aquatic habitats on the north campus are too ephemeral to support Southwestern pond turtles.

Coast Horned Lizard. The Coast horned lizard (*Phrynosoma coronatum frontale*) is a federal species of concern and a California species of special concern. The species occurs throughout the Central Valley west of the Sierra Nevada to the coast and south through Baja California.

Coast horned lizards are found in a variety of habitats, ranging from open, sandy areas with scattered shrubs to openings in riparian woodlands, to chaparral (Jennings and Hayes 1994). During long periods of inactivity and hibernation, California horned lizards utilize small mammal burrows or burrow into loose soils under surface objects.

Suitable habitat is present in the open grassland areas and open forest habitats near Marshall Field (Chinquapin Road), chaparral habitat in upper campus near Seven Springs trail, and in portions of the lower campus including the mima mounds area, grassland areas east of Hagar Drive, and the vicinity of the Arboretum (Jones & Stokes 2004). Suitable habitat for the coast horned lizard does not occur on the north campus due to the absence of loose sandy soil and ant nests, the species' primary foraging source. In addition, there are no records of coast horned lizards on the north campus (EcoSystems West 2004a).

Birds

Sharp-Shinned Hawk. The Sharp-shinned hawk (*Accipiter striatus*) is a California species of special concern. It breeds in low densities at mid elevations in the Sierra Nevada, Klamath Mountains, and Cascade and North Coast Ranges, and along the coast in Marin, San Francisco, San Mateo, Santa Cruz, and Monterey counties. The species winters over the rest of the state except at very high elevations.

Sharp-shinned hawks usually nest in deciduous riparian habitat or in small, dense stands of even-aged conifers that are cool and well shaded and have little groundcover (Zeiner et al. 1990). Nests are usually situated on north-facing slopes and are often associated with a watercourse. Potential nesting habitat for sharp-shinned hawk occurs on the north campus in tall stands of coniferous or deciduous trees, especially near water sources such as springs, drainages, and creeks. The sharp-shinned hawk has been recorded as breeding on the UC Santa Cruz campus and in surrounding mixed evergreen forests, including behind the Baskin Engineering building and across from the trailer park entrance (Warrick 1982; EcoSystems West 2004a). Breeding behavior has also been observed near Red Hill Road on north campus (EcoSystems West 2004a). The hawk may also be present as a winter migrant.

Golden Eagle. The Golden eagle (*Aquila chrysaetos*) is federally protected under the Bald and Golden Eagle Protection Act. It is a California species of special concern and is fully protected under Section 3511 of the California Fish and Game Code. Golden eagles are sparsely distributed throughout most of California, and primarily occupy mountain and desert habitats. Golden eagles construct their nests on cliff ledges and high rocky outcrops or in large trees. Grassland, oak savanna, and open woodland and chaparral habitats provide suitable foraging habitat.

There is one historical record of a golden eagle nest on the north campus but no recent records of golden eagles nesting on the campus (Warrick 1982; Clark 1997). Nesting and wintering golden eagles are relatively rare in Santa Cruz County and are thought to be limited to fewer than 10 pairs (EcoSystems

West 2004a). There is a potential for the eagles to nest on the north campus in the future; however, it is unlikely that the bird currently nests on the north campus based on the lack of nesting observations over the past few years. Golden eagles are observed regularly foraging over the UC Santa Cruz and in Pogonip City Park (EcoSystems West 2004a). One juvenile and one adult golden eagle were observed foraging and perching on the ground in the grassland habitat east of Hagar Drive during the 2002 field surveys. The observation was made after the end of the nesting season. A single adult bird was observed over the lower campus during surveys conducted in 2000 (EcoSystems West 2001). Suitable nesting and foraging habitat is present on the lower campus, but the relatively high degree of human disturbance makes it unlikely that this species would nest in these areas.

Northern Harrier. The Northern harrier (*Circus cyaneus*) is a California species of special concern. The species ranges from annual grasslands in the Central Valley to alpine meadows as high as 9,800 feet above sea level. Northern harriers are permanent residents in the northeastern plateau, coastal areas, and Central Valley. They are widespread winter residents throughout the rest of California except at the higher elevations.

Northern harriers nest on the ground in shrubland, dense grasslands mixed with forbs, and sometimes in marshes. Suitable nesting habitat is present in the grasslands on the lower campus. Northern harriers were not observed during field surveys in 2002 (Jones & Stokes 2004).

White-Tailed Kite. The White-tailed kite (*Elanus caerules*) is a fully protected species under Section 3511 of the California Fish and Game Code. White-tailed kites are permanent residents in lowland areas west of the Sierra Nevada from coastal Del Norte County and the Sacramento Valley south to San Diego County, including coastal valleys and foothills.

Although white-tailed kites will forage on an array of small-mammals, lizards, insects and even birds, studies have indicated that over 80 percent of the white-tailed kite's total diet in California consists of California meadow mice (*Microtus californicus*) (Stendell and Myers 1973). Thus, white-tailed kite populations in California are thought to be correlated with populations of diurnal, small-mammal populations, especially those of California meadow mice. Nesting and communal wintering locations are intrinsically dependent on prey availability.

White-tailed kites are rarely found away from agricultural areas or extensive grasslands. Their nests are constructed in dense stands of oak, willow, or other trees located near open foraging areas. The species has extended its range and increased in numbers in recent decades (Zeiner et al. 1990).

White-tailed kites have been observed foraging over the lower campus grasslands on a regular basis (Clark 1997; EcoSystems West 2004a; Jones & Stokes 2004). During surveys in 2000, biologists observed a pair of white-tailed kites exhibiting active nesting behavior in the north campus in the top canopy of a Douglas fir tree (EcoSystems West 2004a). This tree was approximately 180 feet tall with a diameter at breast height of 8 feet 6 inches. A pair of white-tailed kites was suspected to be nesting in the north campus Environmental Reserve area during surveys conducted in 2000 (EcoSystems West 2001). The Santa Cruz Bird Club provided a record from December 2000 of 24 individual white-tailed kites roosting in a tree snag and a neighboring Douglas fir tree between Red Hill Road and Fuel Break Road in the north campus (EcoSystems West 2004a). In addition, a white-tailed kite nest with chicks in the

neighboring Pogonip City Park has been observed in the same location over several years (EcoSystems West 2004a). A courting pair was found in the lower campus in 2005 during the site visit for this EIR. Suitable foraging habitat for white-tailed kites is present in open grassland areas on lower campus.

White-tailed kites are known to have both nest-site fidelity as well as colonial winter-roost fidelity; therefore, campus structures are potentially revisited each year for nesting and during winter migration. These recent observations of white-tailed kite breeding, roosting, and foraging confirm the bird's presence and use of the variety of habitats available on the UC Santa Cruz campus.

Long-Eared Owl. The Long-eared owl (*Asio otis*) is a state species of special concern that occurs in a variety of wooded habitats. The owl typically uses abandoned nests of raptors and tree squirrels, occasionally nests in tree cavities, and rarely nests in hollows on the ground (Marks 1986). Within the north campus, forested and wooded areas offer suitable breeding habitat for the long-eared owl, whereas the open environments provide suitable habitat for the owl's nighttime foraging for rodents, amphibians and fish.

Breeding records for long-eared owl within Santa Cruz County are rare and recent (CNDDDB 2005). Clark (1997) reports winter records of the long-eared owl—two in the north campus and one in the lower campus. Mori reports a record of long-eared owl within north campus along Fuel Break Road during the breeding season (Stanley et al. 1990). These preliminary data suggest that the long-eared owl may be expanding its range within Santa Cruz County, including the vicinity of the campus.

Western Burrowing Owl. The Western burrowing owl (*Athene cunicularia hypugea*) is a federal species of concern and a California species of special concern. In California, western burrowing owls occur in lowlands throughout the state, including the Central Valley, coastal areas, northeastern plateau, and southern deserts. Burrowing owls nest in ground squirrel burrows in grasslands, deserts, and agricultural areas (Zeiner et al. 1990). Pipes, culverts, concrete piles, and other artificial structures are also used for nesting.

The UC Santa Cruz western burrowing owl population is one of very few known populations in Santa Cruz County, but consists primarily of a small overwintering population spread across several discrete grassland areas at UC Santa Cruz (Alley 1988; Biosystems Analysis 1989; Pelc 1995; Beyer 2001). Several breeding pairs of western burrowing owls were observed on campus during the 1970s, and active burrows were last observed in the grasslands south of the East Remote parking lot in 2001 (Beyer 2001). Other records indicate the presence of owls in the meadow north of the CASFS and Arboretum and also in Campus Habitat Reserve and the adjacent Campus Resource Lands west of Empire Grade Road (Pelc 1995; Beyer 2001). The majority of owl sightings were between Hagar Drive and Glenn Coolidge Drive, south of the East Remote parking lot (Alley 1988; Pelc 1995; Beyer 2001).

No western burrowing owls were identified during field surveys in 2002 (Jones & Stokes 2002), but the species is known to inhabit breeding and foraging habitat in the East Meadow and grasslands in the southwest corner of campus (Linthicum 2005). The larger blocks of grassland habitat north of the Arboretum are also suitable foraging and nesting habitats for western burrowing owl.

Vaux's Swift. The Vaux's swift (*Chaetura vauxi*) is a California species of special concern. In California, the species occurs in the Coast Ranges from Del Norte County south to Santa Cruz County, the Cascade Ranges, and the Sierra Nevada.

Vaux's swifts appear to prefer redwood and Douglas fir forest types, constructing their nests in large hollow trees and snags and burned-out hollows (Bull and Cooper 1991). Although Vaux's swifts appear to be positively correlated with old-growth forests, this may be at least partially due to the availability of suitable nest trees (Bull and Hohmann 1993). They also nest in suitable artificial chimneys in California, especially in areas devoid of natural nesting snags (Sterling and Paton 1996). Vaux's swifts forage on insects above the canopy and above rivers and lakes.

Vaux's swifts were not observed during field surveys in 2002 (Jones & Stokes 2004). However, suitable habitat could occur in forest stands of older age classes, such as those located east and southeast of Marshall Field in the upper campus as well as in chimneys in campus buildings.

Yellow-Breasted Chat. The Yellow-breasted chat (*Icteria virens*) is a California species of special concern. Yellow-breasted chats are a migratory species that breed primarily in the northern third of the state and are currently scarce in central and southern California (Comrack 2002). The southern California and Monterey County populations have declined in tandem with the destruction of much of the species' riparian habitat and increased nest parasitism by the brown-headed cowbird (*Molothrus ater*) (Garrett and Dunn 1981; Roberson and Tenney 1993). Its statewide range has decreased by 35 percent during the 20th century (Comrack 2002). Yellow-breasted chats migrate annually between their breeding grounds in North America and their wintering grounds in Mexico and Central America (Dunn and Garrett 1997).

In central California, yellow-breasted chats require riparian woodland or riparian shrub thickets with dense vegetation typically comprised of Himalayan blackberry (*Rubus discolor*), wild grape (*Vitis* sp.), and willows (Grinnell et al. 1930; Grinnell and Miller 1944; Comrack 2002). Tall willows, cottonwood, and sycamore (*Platanus* sp.) are often used for song perches (Grinnell and Miller 1944; Dunn and Garrett 1997).

Yellow-breasted chats eat a variety of arthropods, including beetles and weevils, true bugs, ants, bees, caterpillars, and spiders; they forage in dense thickets, gleaning off leaves and twigs. They also eat fruit, especially blackberries (*Rubus* sp.), elderberries (*Sambucus* sp.), and wild grapes (Eckerle and Thompson 2001). A few breeding pairs of yellow-breasted chats have recently been recorded in Santa Cruz County (Suddjian 2004). Although this species was not observed on campus during the 2002 surveys, Moore Creek has been used as migratory stopover habitat and could host migrants in the future (EcoSystems West 2004a). The riparian woodland along lower Moore Creek could serve as breeding habitat.

California Yellow Warbler. The California yellow warbler (*Dendroica petechia brewsteri*) is a state species of special concern. In California, yellow warblers nest primarily in riparian habitats (Grinnell and Miller 1944), but in some montane areas they also nest in a variety of shrub habitats (e.g., manzanita, ceanothus) far removed from water (Grinnell et al. 1930; Beedy and Granholm 1985; Gaines 1992).

Yellow warblers feed primarily on arthropods and rarely on wild fruit. Yellow warblers actively glean insects from leaves and occasionally capture flying insects (Petit et al. 1990; Lowther et al. 1999). Yellow warblers migrate to Central and South America annually. Spring migration in central California takes

place from early April until late May, while fall migration begins in late July and lasts until mid-October (Dunn and Garrett 1997).

Yellow warblers were not detected during surveys in 2002 (EcoSystems West 2004a), and nesting by yellow warblers has never been recorded on campus. However, nesting habitat is present along lower Moore Creek northeast of the Arboretum. Yellow warblers are common migrants throughout the region and chaparral, riparian, ornamental plantings, and mixed evergreen forests are suitable migratory stopover habitats.

Mammals

One special-status terrestrial mammal species and eight special-status bat species have the potential to occur on the UC Santa Cruz. These species are discussed below.

Bats. The UC Santa Cruz campus is particularly rich in its diversity and abundance of bat species, many of which have special status. Bat species that are known to occur on campus were detected during an acoustic and mist net survey conducted in 2000 in north campus (EcoSystems West 2004a). Additional acoustic surveys were conducted in 2002 in an attempt to detect species that were not previously found on campus (Jones & Stokes 2004). These surveys did not detect any previously undocumented bat species. However, because of the late timing of these surveys, failure to detect a given bat species would not preclude the possibility of that species occurring on the campus. Reconnaissance-level habitat assessments were performed to supplement these acoustic surveys to identify areas throughout the campus that may support foraging and roosting habitat for known species.

Bat species that occur or may occur on the campus are the pallid bat (*Antrozous pallidus*), Townsend's big-eared bat (*Corynorhinus townsendii townsendii*), western red bat (*Lasiurus blossevillii*), long-eared myotis (*Myotis evotis*), fringed myotis (*Myotis thysanodes*), long-legged myotis (*Myotis volans*), yuma myotis (*Myotis yumanensis*), greater western mastiff bat (*Eumops perotis californicus*), big brown bat (*Eptesicus fuscus*), Mexican free-tailed bat (*Tadarida brasiliensis*), hoary bat (*Lasiurus cinereus*), and California myotis (*Myotis californicus*). Of these, the first eight are considered special-status species, and are described below.

Pallid Bat. Pallid bat is a federal species of concern, a California species of special concern, and a Western Bat Working Group species of high priority. It occurs in a variety of habitats from the Pacific Northwest to central Mexico; in most of its range it is a year-round resident (Zeiner et al. 1990). Pallid bats are distinctive in that they frequently take their prey from the ground; the sturdy skull and dentition allow them to feed on large, hard-shelled prey. They appear to hunt by the sounds produced directly by their prey, rather than by echolocation (Zeiner et al. 1990). Pallid bats generally roost in caves, crevices, and mines, and occasionally in hollow trees and buildings. They are very sensitive to disturbance of roosting sites. Although suitable habitat is present, pallid bats have not been detected on UC Santa Cruz during any surveys.

Pacific Townsend's (Western) Big-Eared Bat. Townsend's big-eared bat is a federal species of concern, a California species of special concern, and a WBWG species of high priority. Townsend's big-eared bat is the coastal subspecies of *Plecotus townsendii*, occurring in the coastal regions of California

south to Santa Barbara County (Pierson 1988). Townsend's big-eared bat requires roosting, maternity, and hibernacula sites free from human disturbance (Williams 1986). Females congregate in nursery colonies in the spring, using caves, mine tunnels, or abandoned buildings. All known maternity roosts are within about 300 feet of streams or riparian systems (Pierson 1988). Townsend's big-eared bats only roost hanging from walls and ceilings, and they require a relatively large open space that permits extended flight within the roost (Pierson 1988). Hibernation sites include buildings, mine tunnels, and caves that are structurally similar to maternity sites but often have lower ceilings (Pierson 1988). EcoSystems West observed evidence of roosting and foraging Townsend's big-eared bat on the north campus during the 2001 surveys (EcoSystems West 2004a).

Western Red Bat. Western red bat is a WBWG species of high priority. It occurs west of the Sierra Nevada crest from Shasta County into Baja California (Zeiner et al. 1990), and into southern Mexico (Bat Conservation International 2002). Although this species migrates between summer and winter ranges, the winter range of the California population is also largely within California, especially in lowlands and coastal regions south of San Francisco Bay. Western red bats roost almost exclusively in trees and other vegetation, often in edge habitats adjacent to streams, fields, or developed areas. Females and young form nursery colonies, but these bats otherwise tend to be solitary (Zeiner et al. 1990; Arizona Game and Fish Department 1999). EcoSystems West detected western red bats on the north campus during the 2000 acoustic and mist net surveys (EcoSystems West 2004a).

Long-Eared Myotis. Long-eared myotis is a federal species of concern. It occurs in a wide variety of habitats throughout most of the western United States and southwestern Canada, although it is not common in any particular one; coniferous forests and woodlands seem to be the preferred habitat types (Zeiner et al. 1990; Bat Conservation International 2002). These bats roost singly or in relatively small groups in buildings, mines, crevices, or hollow trees, as well as under slabs of bark. They may use caves as night roosts (Zeiner et al. 1990). Although very little is known of the species' winter habits, it is presumed to hibernate (Arizona Game and Fish Department 1999). EcoSystems West detected long-eared myotis on the north campus in 2001 (EcoSystems West 2004a).

Fringed Myotis. Fringed myotis is a federal species of concern and a WBWG species of high priority. It ranges from southern British Columbia to southern Mexico, but its abundance seems to vary. It occurs in a variety of habitats and may be locally common (Zeiner et al. 1990). Fringed myotis frequently feed over water; beetles constitute a significant portion of the diet, but these bats also take moths, arachnids, and orthopterans. They are capable of hovering and capture prey in flight as well as by gleaning from foliage. Fringed myotis roost in caves, mines, buildings, and crevices (Zeiner et al. 1990.). EcoSystems West detected fringed myotis on the north campus in 2001 (EcoSystems West 2004a).

Long-Legged Myotis. Long-legged myotis is a federal species of concern and a WBWG species of high priority. Common in California, it ranges from southeastern Alaska to central Mexico and from the Pacific Coast inland as far as the Dakotas and west Texas (Warner and Czaplewski 1984; Bat Conservation International 2002). Long-legged myotis primarily inhabit coniferous forest habitats, although they may also occur in riparian and desert habitats. They generally forage over water, often on moths (Warner and Czaplewski 1984). Nursery colonies are generally established in trees at least 100 years old with crevices or exfoliating bark, but they may sometimes be found in rock crevices, cliffs, and

buildings (Bat Conservation International 2002). EcoSystems West detected long-legged myotis on the north campus in 2000 (EcoSystems West 2004a).

Yuma Myotis. Yuma myotis is a federal species of concern. The species' range extends from British Columbia to central Mexico and inland from the Pacific coast as far as Idaho and west Texas. Yuma myotis appears to be somewhat dependent on proximity to water bodies, drinking frequently and generally feeding above ponds and streams. The species appears to prefer structures such as buildings and bridges for roosting, although mines, caves, and crevices are also used. Open forests and woodland are optimal habitat (Zeiner et al. 1990). EcoSystems West detected Yuma myotis on the north campus in the 2000 survey (EcoSystems West 2004a).

Greater Western Mastiff Bat. Greater western mastiff bat is a federal species of concern, a California species of special concern, and a BWG species of high priority. This is the largest native bat in the United States, with a wingspan approaching 2 feet. Its size and the long, narrow wing configuration equip it for rapid and sustained flight but reduce its maneuverability (Zeiner et al. 1990). These characteristics necessitate specialized roosting conditions; western mastiff bats require a vertical drop of 6 to 9 feet beneath the roost to achieve flight (Williams 1986). The species appears to favor rugged, rocky areas in low-elevation coastal basins. Western mastiff bats generally roost and breed in deep, narrow rock crevices, though they may also use trees, buildings, and tunnels (Zeiner et al. 1990). Data on the behavior and population trends of this species are limited. Although potential habitat is present on the campus, the species was not detected during the 2000 surveys (EcoSystems West 2004a) or during the 2002 surveys at UC Santa Cruz.

Bat Habitat on Campus

Roosting Habitat. Bat species are often grouped together on the basis of their roosting habitat requirements. Of the special-status bat species that have potential to occur on the campus, Townsend's big-eared bat, long-eared myotis, fringed myotis, long-legged myotis, yuma myotis, and greater western mastiff bat are likely to be found roosting in artificial structures throughout campus, although they are known to roost in natural features also. Throughout central California, they are known to roost in abandoned buildings and bridges, but are also found in natural crevices, tree hollows, caves, or other protected areas. Other species, such as pallid bat, western red bat, hoary bat, and California myotis, would be more likely to roost in natural features rather than artificial structures found on campus.

Roosts are used during the daytime to seek refuge; at night between foraging excursions to rest, digest prey, seek refuge from predators or poor weather conditions, or for social purposes; and in winter for hibernation. Adult females and their young use some particularly secure roosts as maternity roosts. The number of bats occupying a given roost can vary from a solitary individual to a large colony, depending on the species. Roosting sites are very sensitive to human disturbance, especially when bats are hibernating or rearing young.

Bats may roost in virtually any of the buildings on campus. However, the highest quality roosting habitat for bats is in the unoccupied historic buildings in the Historic District on the lower campus ([Figure 4.4-4, Special-Status Bat Habitat](#)). Surveys for signs of use (e.g., guano or urine staining) did not indicate current use of these areas, and acoustic surveys did not detect any local bat calls. Visual and acoustic

surveys of bridges in the central campus did not reveal any evidence of use by roosting bats, although these bridges may provide moderate-quality roosting habitat.

Areas that provide natural roosts for bats, such as trees, crevices, and hollowed-out stumps, were mapped in both the lower and upper campus (Figure 4.4-4). Because the majority of the campus was logged in the late 1800s, the redwood and mixed evergreen forest habitats are not mature enough to provide optimal habitat for bats. However, several areas provide high- and moderate-quality potential roosting habitat.

The redwood forest in the upper campus east of Marshall Field supports high-quality roosting habitat. This forest is structurally complex, with well-developed tree and shrub canopy layers. The diversity of understory species appears much higher, and the age classes of trees and shrubs are more varied than in other forests on campus. Older trees with complex bark and limb structure provide potential roosting habitat for bats. However, no burned-out stumps or snags were identified during the field surveys.

The other area on campus designated as having high potential to provide roosting habitat for bats are in forest areas adjacent to the Cave Gulch/Wilder Creek corridor. This area is near the caves in Cave Gulch and the riparian habitat of both creeks. The forest is well established and complex, and it contains many areas that could provide roosting sites for bats.

Moderate-quality roosting habitat was identified in both upper and lower campus (Figure 4.4-4). The mixed evergreen forest south of Marshall Field contains some older trees with strongly textured bark and other features that may provide roosting habitat for bats. However, the open canopy and dense, often monotypic understory does not provide habitat as high in value as the nearby redwood forest. Another area designated as moderate-quality roosting habitat is the redwood forest in the Moore Creek corridor adjacent to Oakes College and College Eight. This area of second-growth redwood forest is adjacent to the high-quality foraging area of lower Moore Creek (see discussion below), but is also adjacent to the lighting and disturbance of two busy colleges.

Foraging Habitat. At dusk, bats leave their roosts to forage for insects in nearby ponds or riparian habitats. Bats generally prey on insect species that are locally abundant near water bodies. Ecotone areas (areas of transition between habitats) are also used as foraging areas. The willow-dominated riparian area of lower Moore Creek (including some of the adjacent grassland habitat) and the Arboretum Pond were designated as having high foraging potential for bat species. The open water of the creek and pond provide an abundance of prey, and the location at the ecotone between redwood forest and grassland increases the area's value to bats that may roost nearby. Moderate-quality foraging habitat is present in the grasslands of Marshall Field and in the southwest corner of campus. Both of these grassland areas are ecotone habitats located adjacent to high-quality roosting habitat.

Other Mammals

San Francisco Dusky-Footed Woodrat. The San Francisco dusky-footed woodrat (*Neotoma fuscipes annectens*) is a California species of special concern. This subspecies is known to occur on the San Francisco peninsula and in the Santa Cruz Mountains. The Dusky-footed woodrat (*N. fuscipes*) is a common species throughout much of California, occurring in the Coast Ranges, the Sierra Nevada foothills, and the northeastern interior portion of the state. The species occupies forest habitats with moderate canopy cover and moderate to dense understory vegetation, as well as chaparral habitats (Zeiner

et al. 1990). Dusky-footed woodrats feed on a wide variety of plants, ranging from fungi to oaks. They build large, distinctive stick houses that can measure up to 8 feet in diameter. Both the rare San Francisco dusky-footed woodrat and the common dusky-footed woodrat are known to occur on campus (Bankie 2005). Identification of the San Francisco subspecies is only possible by examining skull characteristics in a dead specimen.

Jones & Stokes biologists observed a woodrat nest adjacent to lower Moore Creek during the 2002 survey (Jones & Stokes 2004). Suitable San Francisco dusky-footed woodrat habitat is also present in chaparral and mixed evergreen forest on the upper campus and occurs in the riparian, chaparral, redwood and mixed evergreen forest habitats within the north campus. EcoSystems West (2004) observed three woodrat nests in the chaparral habitats in the northeastern portion of the north campus along Chinquapin Road, but these nests could not be definitively confirmed as San Francisco dusky-footed woodrat nests. The nests lacked evidence of recent use (e.g., tracks, scat, or debris) and appeared to have been unoccupied for more than a year. Surveys conducted through the summer of 2004 found that woodrats preferred mixed evergreen habitats, with roughly three inhabited nests per acre and slightly lower numbers in mixed evergreen habitats that also contained chaparral and dwarf redwood (Bankie 2005).

Dusky-footed woodrats build their stick nests on the ground, especially within dense brush, and in tree hollows. Plant communities on campus that provide the most suitable habitat for San Francisco dusky-footed woodrats based on these features include the second growth redwoods along Cave Gulch Creek and all chaparral areas. Nests of the San Francisco dusky-footed woodrat are indistinguishable from those of the more common dusky-footed woodrat.

4.4.1.11 Wildlife Movement

The CEQA Guidelines state that a project would have a significant impact if it would “interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites.”

Habitat linkages or wildlife movement routes are general terms for areas that provide habitat connections for wildlife between two distinct points. Often, linkages or movement routes describe areas between habitat that has been separated or fragmented by topography, changes in vegetation, or other natural or human disturbances or land use changes. The fragmentation of natural habitat creates isolated “islands” of vegetation that may not provide sufficient area or resources to accommodate sustainable populations for a number of species, thus adversely affecting both genetic and species diversity.

Corridors somewhat mitigate the adverse effects of habitat fragmentation by: (1) allowing animals to move between remaining habitats to replenish depleted populations and increase the available gene pool; (2) providing escape routes from fire, predators, and human disturbances, thus reducing the risk that catastrophic events (such as fire or disease) will result in population or species extinction; and (3) serving as travel paths for individual animals moving throughout their home range in search of food, water, mates, and other needs, or for dispersing juveniles in search of new home ranges.

The campus currently provides important habitat linkages and wildlife corridors between several adjacent tracts of large open space. Wildlife with large home ranges, such as black-tailed deer, gray foxes, and bobcats, are expected to travel through the forested areas of the north campus when moving between Henry Cowell Redwoods State Park and Wilder Ranch State Park. Similarly, these species are expected to move across the grasslands of the lower campus when traveling between Pogonip City Park and Wilder Ranch State Park.

Many birds and mammals (e.g., bats, black-tailed deer, raccoon, gray foxes, and bobcat) that forage in the grassland of the lower campus seek both water and forest shelter (nest sites, roosts, and cover) within the north campus, upper campus, and on adjacent parklands. Due to existing development in the campus core, only two corridors likely provide consistent access between the Great Meadow, where many species forage, and the north campus, the Moore Creek drainage and the Jordan Gulch drainage (UC Santa Cruz 1989; EcoSystems West 2004a; Jones & Stokes 2004).

Migration is the seasonal or periodic movement of individuals one from area to another, typically over long distances. Migration typically occurs in response to seasonal changes in abundance or distribution of food sources or available breeding habitat. Examples of migratory species include many songbirds, mammals such as mule deer and many whales, and Monarch butterflies. There is no evidence that any terrestrial species use UC Santa Cruz for regular migration. Migratory songbirds are common on campus, as are Monarch butterflies and other migratory invertebrates.

A brief summary of movement patterns for some common wildlife species with larger home ranges (i.e., that would potentially bring them into contact with new development and the new loop road) is provided here in response to comments concerning migration raised during scoping. There are no known native wildlife nursery sites on campus except the bat roosting areas described above under special-status bats.

Raccoon

Raccoons (*Procyon lotor*) are found in all types of habitats, but generally prefer mature woodlands and riparian or wetland regions. Raccoons acclimate well to living near humans and often take up residence under buildings and inside chimneys or attics. In some studies, suburban and urban raccoon population densities can exceed rural raccoon population densities (Sonenshine and Winslow 1972; Schinner and Cauley 1974; Hoffman and Gottschang 1977; Oehler and Litvaitis 1996; Riley et al. 1998). An adult male may have a home range up to 4,800 acres, focused around a single waterway, commonly encompassing the ranges of several females and juveniles (Burt and Grossenheider 1976). Raccoons likely occupy both the Moore Creek drainages and Jordan Gulch and limit their ranges to the respective watersheds.

Coyote

Coyotes (*Canis latrans*) are often sighted in the campus meadows and grasslands. Coyotes are nocturnal, opportunistic feeders and will feed on a wide array of plants and animals. In a more natural setting (i.e., rural areas and open space), their diet consists of rabbits, voles, carrion, mice, berries, acorns and insects. In an urban setting they may develop an affinity for human refuse and possibly small, domestic animals. Coyotes at UC Santa Cruz likely are acclimated to humans and use existing riparian corridors to reach the Great Meadow (Holz 2004).

Bobcat

Similar to coyotes, bobcats (*Lynx rufus*) are opportunistic carnivores and will prey on animals ranging from tiny shrews up to adult deer. They generally prefer rabbit-sized prey, which, at UC Santa Cruz, can range from ground squirrels and raccoons to domestic pets. Bobcats are seen regularly hunting in the afternoons in the Great Meadow (Holz 2004), probably for rabbits or squirrels, and are often mistaken for mountain lions. A bobcat's home range can vary from less than one square mile to more than 100 square miles, depending on the habitat. The UC Santa Cruz campus is likely the fringe of the range of individuals that inhabit the parklands outside of campus. Individuals seen on the campus likely move down through the riparian corridors to reach grasslands in lower campus from forested areas to the north.

Mountain Lion

Mountain lions (*Felis concolor*) (also called cougars) prey primarily on large animals and prefer deer, but will also eat smaller animals, including coyotes. They can outrun deer, but only for a short distance. Lions usually stalk their prey and ambush it from the rear. After making a kill, lions will usually drag the carcass under a tree or overhang to feed on it. After feeding, they cover the carcass with debris and return later to feed again. Lions are shy and elusive. They occupy many different types of habitats and are most abundant where there is a large deer population. Male cougars can have a home range of 100 square miles, while females tend to have a smaller range of about 20 to 60 square miles. Lions are excellent jumpers and can leap distances of 20 feet, so fences do not pose a barrier to lion movement. UC Santa Cruz has seen a rise in the number of unconfirmed mountain lion sightings in recent years; however, many are likely bobcat sightings (Holz 2004). UC Santa Cruz staff has not confirmed any of the reported sightings of mountain lions at UC Santa Cruz.

Black-Tailed Deer

The black-tailed deer (*Odocoileus hemionus* ssp. *columbianus*) is a sub-species of the mule deer. Deer are widespread and very common on campus. In general, they are active primarily in the mornings and evenings, but at UC Santa Cruz are known to be active in the midday. There are an average of 12 to 15 deer/vehicle collisions per year on the UC Santa Cruz campus, mostly in the spring and fall (Raven 2004).

Monarch Butterfly

Although the Monarch butterfly (*Danaus plexippus*) is not listed by state or federal agencies, winter roost sites of the Monarch butterfly are considered sensitive habitats by CDFG, and the winter migratory population is of local concern. Overwintering sites in California typically occur within a mile of the coast, consist of trees of mixed height and trunk diameter, and support understory brush. Monarch butterflies roost in clusters of several hundred to many thousand individuals in stands of blue gum eucalyptus (*Eucalyptus globulus*), Monterey pine (*Pinus radiata*), Monterey cypress (*Cupressus macrocarpa*), or other native and nonnative trees in large groves that provide thermal regulation and cover from predators. Although monarchs tend to cluster on specific trees on the interior of the grove, the surrounding trees are important for providing shelter from adverse environmental conditions (Dayton and Bell 1992).

Monarch butterflies are known to use the eucalyptus grove in the Arboretum for overwintering (Dayton and Bell 1992; Dayton 2001; CNDDDB 2005). The Arboretum grove is a permanent overwintering site,

meaning that it supports colonies of monarchs from October through mid-February each year. Temporary or autumnal roosts support small numbers of butterflies in September and October (Dayton and Bell 1992). The suitability of the Arboretum site is enhanced by an abundant nectar source (the Arboretum's botanical collection) and a water source (the Arboretum Pond). Dayton and Bell (1992) suspect that there is movement between the two colonies and that the Arboretum may serve a role in the support of a much larger "metacolony" formed by several populations on the west side of Santa Cruz.

In recent years, the numbers of overwintering Monarch butterflies in the Santa Cruz area have substantially decreased (Dayton 2001). As a result, only a limited number of monarchs were observed in the Arboretum grove during recent surveys. Visual estimates of monarchs in the Arboretum grove were as high as 8,000 butterflies in 1991 but decreased to only 35 in 2000-01 (Dayton 2001). By comparison, in 1991, the estimated number of monarchs at Natural Bridges State Beach (the largest permanent overwintering colony in Santa Cruz County) was 83,000; in 2000-01 it was 15,000. The colony of monarchs at Natural Bridges State Beach is located within 2 miles of the Arboretum grove. The size of the overwintering population has historically varied dramatically. Dramatic declines such as those that have been observed in recent years are commonly associated with colder weather that kills off the species. For example, unusually cold and wet storms in January 2002 killed an estimated 80 percent, or 250 million, of the overwintering adults in the Mexican highlands (Taylor 2002; Brower et al. 2004).

4.4.1.12 Applicable Plans and Policies/Habitat Conservation Plans

Habitat Conservation Plans/Natural Community Conservation Plans

Pursuant to an Implementing Agreement and Habitat Conservation Plan that has been executed by the University in conjunction with an application for an Incidental Take Permit to be issued by the U.S. Fish and Wildlife Service, the UC Regents, under this agreement, will protect 13.0 acres in the southwestern corner of the campus in perpetuity as habitat for the California red-legged frog (*Rana aurora draytonii*) and Ohlone tiger beetle (*Cicendela ohlone*) (Jones & Stokes 2005). The UC Regents will also protect 12.5 acres south of the Ranch View Terrace Housing Project as habitat for the California red-legged frog and as potential habitat for the Ohlone tiger beetle. Long-term management and monitoring is provided on both sites under the agreement. As of the date of this EIR, the University has executed the Implementing Agreement and has forwarded it to USFWS for execution. Final issuance of a permit is pending.

2005 LRDP

As a state entity, the University is not subject to plans and policies of local jurisdictions. Because future campus growth will be guided by the 2005 LRDP (once that plan is adopted), goals and principles in the 2005 LRDP for the protection of biological resources are summarized below.

- **Respect major landscape and vegetation features.** Development will be sensitive to preservation of UC Santa Cruz's distinctive physical features, including ravines, major grasslands, chaparral, and areas of redwood and mixed evergreen forests

- **Maintain continuity of wildlife habitats.** To the extent possible, development will minimize interruption of wildlife movement and fragmentation of habitats.
- **Maintain natural surface drainage flows as much as possible.** UCSC will use financially viable sustainable design strategies to manage storm water, thereby preserving groundwater supplies, major springs, seep zones, year round springs, and major drainage channels, while at the same time preventing slope erosion.

In addition to these principles, biological resources on the campus would be protected by four land use designations in the 2005 LRDP that do not allow for new development other than minor interpretive centers and/or service roads. These include Campus Natural Reserve, Protected Landscape, Campus Resource Land, and Campus Habitat Reserve, which together comprise approximately 1,068 acres of the 2,020-acre main campus. Note that 26 acres of land in the southwestern portion of the campus that are designated Campus Habitat Reserve will also be protected under a Habitat Conservation Plan that is anticipated to be adopted in 2005. Lands designated as Campus Resource Land would remain undeveloped for at least the planning horizon of the 2005 LRDP (until 2020).

4.4.2 Impacts and Mitigation Measures

4.4.2.1 Standards of Significance

The following standards of significance are based on Appendix G of the CEQA Guidelines. For purposes of this EIR, development of the campus under the 2005 LRDP would have a significant adverse impact on biological resources if it would:

- Result in a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species (as defined above) in local or regional plans, policies, or regulations, or by the CDFG or USFWS
- Result in a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the CDFG or USFWS
- Result in a substantial adverse effect on federally protected wetlands as defined by Section 404 of the CWA or state protected wetlands as defined by the Porter-Cologne Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means
- Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites
- Conflict with any local applicable policies protecting biological resources
- Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan (NCCP), or other applicable HCP

All of the items above are addressed in the impact assessment below with the exception of the CEQA checklist question related to conflict with local applicable policies. The only plan that is applicable to the campus is the 2005 LRDP, which is the subject of this EIR.

4.4.2.2 CEQA Checklist Items Adequately Addressed in the Initial Study

The Initial Study that preceded this EIR concluded that impacts to biological resources were not a concern for the 2300 Delaware Avenue Project. The Initial Study determined that additional analysis is required for the 2005 LRDP, the Infrastructure Improvements Project, and the Family Student Housing Redevelopment Project. The following section addresses the potential impacts of all development of the main campus under the proposed 2005 LRDP, which would include the Infrastructure Improvements Project and the Family Student Housing Redevelopment Project. Volume III of the Draft EIR discusses additional project-specific impacts of the two projects on biological resources.

4.4.2.3 Analytical Method

Potential impacts to special-status species on the main campus are evaluated based on a review of the available literature regarding the status and known distribution of the special-status species within the project area, and data collected from studies conducted on the main campus for other projects. Botanical and wildlife surveys have been conducted for a majority of the main campus (Jones & Stokes 2004, Ecosystems West 2004a). Additional selected sources used in the impact analysis include the following:

- USFWS List of Endangered and Threatened Species that May Occur in or Be Affected by Projects in Santa Cruz County, current as of April 15, 2005
- The California Department of Fish and Game's Natural Diversity Database query results for the U.S. Geological Survey's 7.5-minute quadrangles of Santa Cruz and Felton (CNDDDB 2005)
- The California Native Plant Society's Electronic Inventory (2005)

Once all data sources were reviewed, a final list of special-status species with moderate or greater potential to occur in the vicinity of the project area was compiled, and each of the species was evaluated for presence on or absence from the site. In addition, the presence of suitable habitat characteristics was evaluated. Special-status plant species that may occur on the campus are presented in Table 4.4-1, at the end of this chapter. Table 4.4-2, also at the end of this chapter, presents local special-status wildlife species. These tables also include, for information purposes, species with no or low potential to occur on campus.

In order to refine the list of species potentially affected by development under the LRDP, species listed in Tables 4.4-1 and 4.4-2 were rated for their potential to occur on campus. Species rated as having "no potential to occur" have no suitable habitat on campus or are thought to have been extirpated from the region. Species rated as having "low potential to occur" include species whose known distribution does not include the campus; species for which little appropriate habitat or only marginal habitat is present on campus; and species that have not been observed during recent surveys. Species rated as having

“moderate or high potential to occur” include those species for whom suitable habitat characteristics are present on campus, even though the species was not detected during focused surveys. Species rated as “known to occur” have been observed on campus.

Species rated as having “moderate or high potential to occur” or “known to occur” on the main campus were considered in the impact analysis. Where impacts are significant, mitigation measures were identified to reduce these impacts to a less than-significant level.

To estimate potential impacts on sensitive natural communities, areas designated for development in the 2005 LRDP land use plan were overlain on the distribution of vegetation communities and sensitive natural communities (see [Figure 4.4-5](#), *Vegetation Communities and Sensitive Habitats within Proposed Developed Areas*) and the acreage of each sensitive natural community that would be removed by new development under the 2005 LRDP was estimated.

4.4.2.4 2005 LRDP Impacts and Mitigation Measures

LRDP Impact BIO-1: Development on the main campus under the 2005 LRDP could result in a substantial adverse effect, directly and indirectly, on northern maritime chaparral, a sensitive natural community identified by CDFG, and Santa Cruz manzanita, a special-status plant that generally occurs within northern maritime chaparral areas.

Significance: Potentially significant

LRDP Mitigation BIO-1A: The Campus shall avoid removal of large patches (greater than the patch size of 10 acres) of northern maritime chaparral, avoid fragmenting northern maritime chaparral, and shall establish habitat buffers between development and adjacent northern maritime chaparral where feasible. The Campus shall also avoid Santa Cruz manzanita occurrences that are large (greater than patch size of 2 acres) or of high or moderate density, when possible.

The habitat buffer will consist of at least 30 feet of natural vegetation from the edge of paved areas or buildings to the edge of the chaparral. This buffer may overlap with the 30- to 100-foot fire buffer around buildings where fuel reduction may occur (see LRDP Mitigation HAZ-10B).

LRDP Mitigation BIO-1B: Where avoidance of large patches is not feasible, the Campus shall mitigate losses of northern maritime chaparral through the preservation and management of northern maritime chaparral habitat at a ratio of at least 1:1. Losses of Santa Cruz manzanita stands on campus (greater than patch size of 2 acres) shall be mitigated through the preservation and management of other Santa Cruz manzanita stands according to the mitigation ratios in Table 4.4-3. The Campus shall try to preserve the

habitat on campus and would implement off-campus preservation only if the required preservation cannot be achieved on campus. Mitigation ratios for Santa Cruz manzanita vary depending on the density of the stand affected and preserved, but are designed to ensure at least 1:1 preservation overall. For off-site preservation, if any is necessary, priority will be given to sites that are closest to UC Santa Cruz in order to protect local genetic diversity. Preservation of northern maritime chaparral and Santa Cruz manzanita can occur at the same site as long as both required mitigation ratios are met.

Preservation and management to mitigate the loss of northern maritime chaparral and Santa Cruz manzanita shall be in perpetuity. The goals of management for northern maritime chaparral and Santa Cruz manzanita shall be to reduce the incursion of mixed hardwood forest and non-native invasive species into these stands, encourage regeneration of chaparral species, including Santa Cruz manzanita, and maintain or increase the density of Santa Cruz manzanita.

Protection of northern maritime chaparral and Santa Cruz manzanita shall occur prior to the loss of these resources due to development. Within one year of protecting a stand, a management and monitoring plan will be prepared that describes quantitative biological goals, management techniques, safety procedures, monitoring protocols, and schedules for that stand. The management plan will be developed in coordination with the Fire Management Plan (see LRDP Mitigation HAZ-10B) and will be consistent with safety requirements. Management plan components shall include monitoring and control of non-native invasive species and monitoring and removal of mixed hardwood forest trees.

Residual Significance: Less than significant

Direct Impacts

Up to 11.7 acres of northern maritime chaparral could be permanently removed by development of the campus under the 2005 LRDP in the area designated for employee housing on the north campus and from construction of associated infrastructure (Figure 4.4-5). In addition, up to 20 acres that are transitional between chaparral and mixed hardwood forests and up to 17.5 acres of dwarf redwoods mixed with chaparral could be removed by proposed north campus development under the 2005 LRDP. Although these transitional communities are not considered sensitive by CDFG, they contain components of the northern maritime chaparral community. Specifically, the development area north of the Colleges and Student Housing area could fragment a large patch of northern maritime chaparral, and remove a portion of a large patch of chaparral near the intersection of Chinquapin, West, and Red Hill Roads (Figure 4.4-5). In contrast, construction within the Colleges and the Student Housing and Employee Housing areas along the north campus loop road would remove smaller, already fragmented patches of

chaparral that would be difficult to maintain even with intensive management. Impacts to these smaller, marginal areas of the community would be less than significant.

The loss represents approximately 0.4 percent of the area of northern maritime chaparral in California documented in the CNDDDB, and 0.6 percent of northern maritime chaparral in Santa Cruz County documented in the CNDDDB. However, it is likely that more northern maritime chaparral exists than is documented in the CNDDDB, so the proportional impact is likely lower.

Santa Cruz manzanita occurs on campus primarily as a dominant or common species within northern maritime chaparral, so impacts to this special-status species usually overlap with impacts to northern maritime chaparral. Santa Cruz manzanita in the north campus would be removed by campus development under the 2005 LRDP (Table 4.4-4). Removal of Santa Cruz manzanita could occur as a result of construction within proposed development areas, and as a result of the construction of the north campus loop road and the road connecting Empire Grade Road with the north campus loop road. Up to 14.6 acres of Santa Cruz manzanita stands (of high, moderate, and low density—see Table 4.4-4 for density definitions), representing up to 40 percent of the extent of Santa Cruz manzanita stands on campus, could be removed by proposed development. Out of the 19 distinct patches of Santa Cruz manzanita mapped, up to nine of these patches (47 percent) could be completely or partially removed by development under the 2005 LRDP. Two of these nine stands of Santa Cruz manzanita are of high density. In addition, up to 21 out of 39 mapped Santa Cruz manzanita individuals (54 percent) could be lost to campus development under the 2005 LRDP. Actual removal of Santa Cruz manzanita stands and individuals would be expected to be lower due to the campus practice of careful project siting and retention of natural vegetation between buildings, trails, and roads. However, for the purpose of this analysis the maximum impact is assumed.

**Table 4.4-4
Potential Impacts to Santa Cruz Manzanita on the Campus from
Proposed Development under the 2005 LRDP**

Stand Density	Area on Campus (Acres)	Maximum Area Lost (Acres)	Number of Patches on Campus	Number of Patches Affected
Low	19.4	7.1 (36 %)	2	2
Moderate	4.6	0.7 (15 %)	8	5
High	12.3	6.9 (56 %)	9	2
Total	36.3	14.7 (40 %)	19	9

Sources: Jones & Stokes 2002; EcoSystems West 2004a

Notes: The following density definitions were used in mapping Santa Cruz manzanita stands (Buck 2005):

Low: manzanita comprises small percentage of stand

Moderate: manzanita is either co-dominant or subdominant percentage of stand

High: manzanita is dominant percentage of stand

The Santa Cruz manzanita stands located in proposed development areas and road alignments represent a substantial proportion of the existing stands at UC Santa Cruz. It is difficult to measure the significance of this loss relative to the species overall distribution due to a lack of population size estimates within Santa Cruz County (CNDDDB 2005). Documented population sizes of individual patches of manzanita range from 1 to 1,300 (CNDDDB 2005). Many botanists note that Santa Cruz manzanita is often abundant where

it occurs (EcoSystems West 2004; Preston 2005). Although losses of Santa Cruz manzanita on campus would occur and could be substantial at UC Santa Cruz, these losses are not likely to jeopardize the viability of the species within its overall range.

Indirect Impacts

In addition to direct losses of northern maritime chaparral and Santa Cruz manzanita, proposed development would indirectly impact these resources by fragmenting maritime chaparral stands and Santa Cruz manzanita occurrences. The development area located along Red Hill Road would fragment a large block of maritime chaparral into two patches. The eastern patch of chaparral would be relatively small, and a high proportion of its edge would be bordered by development. “Edge” refers to the boundary between the natural community and developed areas. Habitat located adjacent to edges with development often suffers from a suite of effects referred to as “edge effects.” Edge effects that affect plants typically include increased human disturbance, increased numbers of noxious weeds, and climatic modifications such as increased sunlight and wind (Watkins et al. 2003). The small patch of chaparral that would remain across Empire Grade Road from the proposed campus support area, adjacent to Empire Grade Road, would be similarly small with a high proportion of edge shared with development. While the chaparral divided by Empire Grade Road already suffers edge effects from the road, these effects would likely be exacerbated by development in this area.

The Red Hill Road development area would fragment a moderate-density and a low-density occurrence of Santa Cruz manzanita. The remaining patches of this species would be likely to suffer from increased edge effects, notably increased numbers of invasive non-native species. Thus, indirect impacts from fragmentation and increased edge effects could degrade chaparral habitat that is not directly impacted by proposed development.

It is unknown how habitat fragmentation might affect the likelihood of fire within northern maritime chaparral, an essential process needed to maintain the natural community. With the exception of wildfires in 1997, there have been no wildfires on the campus since the early 1900s (Greenlee 1978). UC Santa Cruz currently suppresses all fires on campus. The encroachment of development into northern maritime chaparral will make this long-standing practice of fire suppression even more important to reduce wildfire risk. The slow pattern of succession occurring within northern maritime chaparral (i.e., transition to forest communities on deeper soils) will therefore likely continue in the absence of fire and/or other management and the extent of northern maritime chaparral on campus will continue to diminish. This is an existing impact of campus and other regional development, which will continue under the 2005 LRDP.

Impacts to northern maritime chaparral and Santa Cruz manzanita from campus development under the 2005 LRDP would be substantial and adverse, but would be mitigated by the implementation of LRDP Mitigations BIO-1A and BIO-1B. These measures are intended to maximize the size and minimize fragmentation of large patches of chaparral and manzanita, and facilitate management of these patches to allow the community to persist. Because development will lead to a loss of northern maritime chaparral and Santa Cruz manzanita in perpetuity, preservation and management to mitigate that loss shall be in perpetuity. The habitat buffer will reduce indirect impacts to these habitats from the edge effects of development and allow for vegetation management such as brush thinning and pile burning to be

conducted in the preserved chaparral and manzanita. Table 4.4-3, below, presents the mitigation ratios that would be used to mitigate for the loss of Santa Cruz manzanita.

**Table 4.4-3
Mitigation Ratios for Impacts to Santa Cruz Manzanita**

Density of Impacted Area	Density of Mitigation Area (Preservation)		
	Low	Moderate	High
Low	1:1	0.5:1	0.33:1
Moderate	2:1	1:1	0.5:1
High	3:1	2:1	1:1

Implementation of LRDP Mitigations BIO-1A and BIO-1B would reduce this impact to a less-than-significant level.

LRDP Impact BIO-2: Development on the main campus under the 2005 LRDP could result in a substantial adverse impact to coastal prairie, a sensitive natural community.

Significance: Potentially significant

LRDP Mitigation BIO-2A: The Campus shall avoid removal of coastal prairie through redesign of proposed development areas and road alignments where possible. The design of all campus facilities shall include a buffer between development and prairie in order to reduce indirect impacts from edge effects such as increases in noxious weed species. The width of each buffer will depend on the site and the nature of adjacent development. The minimum buffer shall be 30 feet from the edge of paved areas or buildings to the edge of coastal prairie. Landscaped areas are acceptable within the habitat buffer, provided that they are planted with species that are not invasive in coastal prairie (i.e., no non-native grasses) and are not fire prone.

LRDP Mitigation BIO-2B: The Campus shall mitigate for unavoidable losses of coastal prairie by restoring coastal prairie at a 3:1 ratio. Before impacts to coastal prairie occur, a management and monitoring plan, including quantitative success criteria, shall be prepared for the restoration site. Success criteria for the restoration shall include providing equivalent or greater overall (rather than species specific) cover of native perennial bunchgrasses (such as purple needlegrass, California oatgrass, and Pacific panic grass) and native forbs (such as white hyacinth and dwarf brodiaea) as is found in the coastal prairies that will be lost to development. Management of the site shall continue for at least 15 years to protect the coastal prairie management areas from reverting to annual grassland. If coastal prairie restoration does not meet the success criteria after 5 years, restoration shall be remedied (e.g., replanting) or

restoration attempted on a new, more suitable site.

Residual Significance: Less than significant

Coastal prairie occurs in three places on the campus, representing a total of approximately 111 acres, or approximately 5 percent of the campus, and supports a disproportionately high amount of native plant diversity (Dashe 1982; Buck 1983; EcoSystems West 2004a; Jones & Stokes 2004).

Up to 1.5 acres of coastal prairie, representing about 1.3 percent of the overall coastal prairie area on the campus, could be lost to campus development under the 2005 LRDP. Impacts would occur at one location north of the Crown/Merrill Apartments, where new development may disturb or remove the eastern edge of the Crown Meadow. Development of coastal prairie at Crown Meadow also may degrade the community adjacent to the disturbance through increased human presence (e.g., trampling, bicycles) and spread of invasive weeds.

Because of the rarity of this natural community on the campus, the level of threat that it faces regionally (over 80 percent lost statewide and less than 10 percent protected), and its importance in supporting many native plants, potential impacts to coastal prairie are considered substantial adverse impacts. These impacts can be mitigated to a less-than-significant level by implementation of LRDP Mitigations BIO-2A and BIO-2B. Coastal prairie restoration may be accomplished within the Campus Habitat Reserve located near the campus entrance (between High Street and Ranch View Terrace). Restoration shall occur on the portion of the site not designated as an Ohlone Tiger Beetle Management Area.

LRDP Impact BIO-3: Development under the 2005 LRDP could result in substantial, adverse direct and indirect impacts to jurisdictional wetlands.

Significance: Potentially significant

LRDP Mitigation BIO-3A: At the time that a specific development project is proposed, the Campus shall conduct a site reconnaissance to determine whether wetlands are present on the site. If no potential wetlands are found, no further mitigation is necessary.

LRDP Mitigation BIO-3B: If potential wetlands are found, the Campus shall retain a qualified biologist to conduct a delineation of waters of the state and waters of the United States during the environmental review phase of the project to determine the location, extent, and function of wetlands within 200 feet of development footprints.

LRDP Mitigation BIO-3C: Where feasible, direct impacts to jurisdictional wetlands shall be avoided in the design of the project.

LRDP Mitigation BIO-3D: If avoidance of wetlands is not feasible, to compensate for temporary or permanent loss of jurisdictional wetlands, the Campus shall restore or create wetland habitat to ensure no net loss of the extent and function of these communities. Prior to any work that could disturb jurisdictional or other wetland habitat within the project area, the Campus shall obtain

the following permits as required:

- U.S. Army Corps of Engineers – Nationwide or individual permit as required under Clean Water Act Section 404
- Central Coast Regional Water Quality Control Board – Water quality certification or waiver under Clean Water Act Section 401
- California Department of Fish and Game – Streambed Alteration Agreement

Consultation with these agencies shall govern how the disturbance of wetlands will be mitigated, including the location and extent of wetland restoration or creation.

Residual Significance: Less than significant

Construction of new campus facilities in the development area located south of Chinquapin Road and east of Red Hill Road, as well as construction of the north campus loop road, could result in the loss of isolated wetlands. Depressional wetlands are located in mixed evergreen forest in portions of these areas (Figure 4.4-5). Water appears to leave these depressional wetlands through evaporation and infiltration, so they are not connected to any drainages. Therefore, they are unlikely to be jurisdictional waters of the United States. However, they may be jurisdictional waters of the state, regulated by the Central Coast Regional Water Quality Control Board.

In addition, forest springs and seeps may be lost to development under the 2005 LRDP. Forest springs and seeps may or may not be jurisdictional waters of the United States, depending on whether or not they flow into a larger drainage. If streamlets associated with forest springs show evidence of bed and bank, they may be regulated by Section 1602 of the California Fish and Game Code as a jurisdictional stream. The extent of jurisdictional waters of the state and/or of the United States within the proposed development area is not known.

Indirect impacts to forest springs and seeps may occur through hydrologic modifications from development. A discussion of these impacts, and mitigation measures to address them, can be found in Section 4.8, *Hydrology and Water Quality* (Volume II).

Impacts to jurisdictional wetlands from development of the campus under the 2005 LRDP would be substantially adverse and therefore potentially significant but could be mitigated to a less-than-significant level by the implementation of LRDP Mitigations BIO-3A through BIO-3C. Mitigation for impacts to wetlands shall occur on a project basis, because the extent of jurisdictional wetlands that would be affected would be determined on a project level. In addition, the extent and quality of wetlands may change over time, so impacts and mitigation must be assessed close to the time that impacts will occur.

Opportunities for wetlands restoration are available on campus. Underdrained forest depressions appear to undergo a process of succession to less hydrophytic vegetation as sediment accumulates in these depressions. Reversal of this process and restoration of wetlands could be accomplished by grading or mowing areas with the proper poorly drained substrate and planting characteristic vegetation typical of

underdrained depressions. It may be possible to create springs and seeps by redirecting drainage from development areas and allowing it to daylight in forested areas. Forest springs and seeps adjacent to fire roads in north campus are good candidates for enhancement. These springs and seeps currently are impacted by human disturbance and sediment from the fire roads. Enhancement could be achieved by relocating fire roads, preventing sediment from entering springs and seeps, and planting characteristic vegetation in areas where they are lacking due to human disturbance.

LRDP Impact BIO-4: Construction of bridge crossings and other improvements under the 2005 LRDP could result in a substantial temporary and permanent adverse impact on riparian vegetation.

Significance: Potentially significant

LRDP Mitigation BIO-4A: Campus construction projects shall avoid patches of riparian vegetation greater than 0.1 acre in size or longer than 300 linear stream feet. If avoidance is not feasible, LRDP Mitigation BIO-4B shall be implemented.

LRDP Mitigation BIO-4B: The Campus shall compensate for the loss of patches of riparian vegetation greater than 0.1 acre in size or longer than 300 linear stream feet through on-site and/or off-site restoration and/or enhancement of riparian habitat in order to ensure that no significant loss of riparian habitat functions and values occurs. The size of the area(s) to be restored will be determined based on a 1:1 mitigation ratio. UC Santa Cruz shall retain a qualified restoration ecologist to develop a conceptual restoration and monitoring plan that describes how riparian habitat will be enhanced or restored and monitored over a minimum period of time. UC Santa Cruz shall be responsible for ensuring that the restoration and monitoring plan is implemented. The terms of the restoration and monitoring plan shall be determined in consultation with the CDFG and other permitting agencies.

LRDP Mitigation BIO-4C: If more than 0.2 acre or 600 linear stream feet of riparian vegetation is temporarily removed at UC Santa Cruz as a result of proposed storm water drainage improvements or other development under the 2005 LRDP, UC Santa Cruz shall restore riparian vegetation within the project area or in the nearest suitable upstream or downstream reach. Riparian vegetation shall be restored following the construction of each project that has a temporary impact on more than 0.2 acre or 600 linear feet of riparian vegetation. UC Santa Cruz shall compensate for the loss through on-site restoration and/or enhancement of riparian habitat in order to ensure that no significant loss of riparian habitat functions and values occurs. The size of the area(s) to be restored will be determined based on a 1:1 mitigation ratio. UC Santa Cruz shall retain a qualified

restoration ecologist to develop a conceptual restoration and monitoring plan that describes how riparian habitat will be enhanced or restored and monitored over a minimum period of time. UC Santa Cruz shall be responsible for ensuring that the restoration and monitoring plan is implemented. The terms of the restoration and monitoring plan shall be determined in consultation with the CDFG and other permitting agencies.

Residual Significance: Less than significant

Impacts to riparian vegetation are expected to occur from construction of bridge crossings associated with LRDP development and from the storm drainage improvements included in the Infrastructure Improvements Project. For details on the impacts to riparian vegetation from the Infrastructure Improvements Project, see IIP-SW Impact BIO-3 in Volume III.

The proposed bridges over Cave Gulch and over two branches of Jordan Gulch Creek may remove or degrade riparian vegetation in these drainages. Construction in the proposed Colleges and Student Housing development area on the north campus could also result in direct or indirect impacts to riparian vegetation in Cave Gulch. No bridge footings or other permanent structures would be constructed in the creeks, because the deep gulches in which the creeks are located would make it impracticable to do so. However, shading of the areas underneath the bridges could result in a permanent impact if it caused the mortality of riparian vegetation, such as California hazel, which is present in limited locations along these drainages. The extent of riparian vegetation present in the area and the amount of vegetation affected will be determined on a project-by-project basis. In addition, riparian vegetation would be removed by construction of storm drainage improvements, such as creek dams and channel armoring. It is estimated that about 0.38 acres of riparian vegetation would be removed by construction activities associated with the Infrastructure Improvements Project (discussed in detail in Volume III). For the purposes of this analysis, the maximum permanent impact from bridge projects and storm drainage improvements is estimated to be 0.7 acres.

Additionally, temporary degradation of riparian vegetation would occur as a result of the construction of some of the storm water drainage improvements. Riparian understory herbs and shrubs would be crushed by equipment accessing project areas. It is estimated that up to 27,000 square feet (0.62 acres) of temporary impact to riparian vegetation could occur as a result of the project.

Due to the patchy distribution and limited extent of this vegetation type, it is likely that 0.7 acre of permanent disturbance represents at least 7 percent of riparian vegetation on campus, and that 0.6-acre of temporary disturbance represents at least 6 percent of this habitat on campus. Riparian vegetation is considered a sensitive community by CDFG. As a result of the limited extent of riparian vegetation on campus and in the region and the community's high habitat value for many special-status wildlife and other species (RHJV 2004), temporary and permanent impacts to riparian vegetation from development under the 2005 LRDP are considered substantial adverse impacts and potentially significant, but would be mitigated to less-than-significant levels by the implementation of LRDP Mitigations BIO-4A, BIO-4B, and BIO-4C.

It is important to note that the use of 0.1 acre and 300 linear feet of permanent impact to riparian vegetation as a threshold for significance in LRDP Mitigation BIO-4A is derived from the (ACOE) Nationwide Permit (NWP) Program. Under several NWPs, including NWP 43, Stormwater Management Facilities, the ACOE reviews all projects with impacts to waters of the U.S. over 0.1 acre or over 300 linear feet of intermittent streambed. Projects with impacts to waters of the U.S. less than 0.1 acre must still mitigate their impacts, but the project applicants do not need to submit a project notification and wait for review before proceeding. Projects that impact over 300 linear feet of intermittent streambed must obtain a written statement from the ACOE that the project's adverse environmental effects are minimal both individually and cumulatively, and that the limitation on streambed impacts is waived for the project. The use of a threshold of 0.2 acre and 600 linear feet for temporary impacts in LRDP Mitigation BIO-4C was developed in reference to the permanent impact threshold (0.1 acre and 300 linear feet). Because riparian vegetation that is temporarily impacted may eventually recover naturally, a threshold for temporary impacts that is different from that for permanent impacts is appropriate.

LRDP Impact BIO-5: Development under the 2005 LRDP would not result in an adverse impact, directly and indirectly, to special-status plant species.

Significance: Less than significant

LRDP Mitigation: Mitigation not required

Residual Significance: Not applicable

Proposed development under the 2005 LRDP would not affect any documented occurrences of Point Reyes horkelia, marsh microseris, or San Francisco popcornflower. Point Reyes horkelia and San Francisco popcornflower have been documented in Marshall Field. However, no development is proposed for Marshall Field under the 2005 LRDP. Marsh microseris was last documented in coastal prairie habitat in the southwestern portion of the campus. No development is proposed under the LRDP for this area. There would be no impact to these species from development under the 2005 LRDP.

LRDP Impact BIO-6: Development under the 2005 LRDP has the potential to introduce or cause the spread of noxious weeds, which could reduce the abundance of native plants and sensitive communities.

Significance: Potentially significant

LRDP Mitigation BIO-6: To avoid or minimize the introduction or spread of noxious weeds into uninfested areas, UC Santa Cruz shall incorporate the following measures into the project plans and specifications for work on the north campus to be conducted under the 2005 LRDP.

- Only certified, weed-free materials shall be used for erosion control.
 - UC Santa Cruz shall identify appropriate best management practices to avoid the dispersal of noxious weeds. The Campus shall
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then include appropriate practices in construction standards to be implemented during construction in all north campus areas. Typical best management practices include the use of weed-free erosion control materials and revegetation of disturbed areas with seed mixes that include native species and exclude invasive non-natives.

- In uninfested areas, topsoil removed during excavation shall be stockpiled and used to refill the trench on site if it is suitable as backfill.

Residual Significance: Less than significant

Noxious weeds are defined as plants on the California Department of Food and Agriculture's List A or B of Noxious Weeds; or weeds rated as high or moderate by the California Invasive Plant Council (CDFA 2005; Cal-IPC 2005). Construction activities associated with the proposed project could inadvertently introduce noxious weeds or result in their spread into relatively uninfested areas adjacent to planned development, notably the forested and chaparral areas in the north campus. This could degrade habitat for common native and special-status plant and wildlife species. Plant parts or seeds of noxious weeds may be dispersed via construction equipment or personnel if appropriate measures are not implemented.

The introduction or spread of noxious weeds could reduce the abundance or vigor of common and sensitive biological resources (e.g., redwood forests, mixed evergreen forests, dwarf redwood forest, northern maritime chaparral, and coastal prairie) and cause the long-term degradation of a sensitive natural community (e.g., coastal prairie and northern maritime chaparral). This would represent a substantially adverse impact to these sensitive natural communities. The impact is therefore considered potentially significant. However, implementation of LRDP Mitigation BIO-6 would reduce this impact to a less-than-significant level.

LRDP Impact BIO-7: Development under the 2005 LRDP could result in a substantial adverse impact on Ohlone tiger beetle populations on the campus from increased bicycle use on trails and obstruction of potential movement corridors by trees planted in the Arboretum.

Significance: Potentially significant

LRDP Mitigation BIO-7A: Bicycles will not be allowed on trails in Marshall Field or West Marshall Field that support Ohlone tiger beetles. In addition, during periods of adult beetle activity or larval development (January to June) additional measures to prevent illegal bicycle use shall be implemented.

These will include temporary fencing and signs that will be installed and maintained during this period at trail entry points. The information signs will advise all trail users of the need to avoid these areas. UC Santa Cruz Police or Campus Maintenance Staff shall also patrol these areas during this period in order to alert or issue citations to violators

and help ensure compliance.

LRDP Mitigation BIO-7B: Any modification of the vegetation composition and/or fencing Arboretum lands north of the currently enclosed Arboretum will be developed in consultation with the USFWS in order to protect and maintain potential movement corridors for the Ohlone tiger beetle.

Residual Significance: Less than significant

Ohlone tiger beetles are known to occur in Marshall Field and West Marshall Field on the upper campus, and on the lower campus west of Empire Grade Road. No 2005 LRDP-related new development is envisioned in these areas, which are designated Campus Resource Land, Campus Natural Reserve, Protected Landscape, Campus Habitat Reserve, and Site Research and Support in the 2005 LRDP. Development is envisioned for portions of the Porter Meadow; however, surveys of Porter Meadow conducted in 2001 did not show any evidence of the species at Porter Meadow. Therefore, there would be no direct impacts to the species or their habitat. The species would potentially be affected indirectly as discussed below.

Most occurrences of Ohlone tiger beetle on campus are within or adjacent to active recreational trails because these areas (on suitable Watsonville loam soils) are frequently disturbed and provide the microhabitat necessary for beetle foraging, breeding, and larval development. On-going trail use in Marshall Field and West Marshall Field in the upper campus is therefore important to maintain this suitable habitat, but this use also exposes beetles to hazards during certain periods of their life cycle. Adult beetles on campus may be injured or killed during their activity period (mid-January to mid-May), particularly on sunny days when beetles are most actively foraging in trails. Bicycles on trails may be especially dangerous for beetles because of their constant contact with the ground and relatively fast speed (i.e., making it more difficult for beetles to escape from bicycles than from pedestrians). Beetle larvae may be injured or killed if burrows are crushed during the early larval development period when eggs are close to the soil surface (approximately March to late June). After this period, larvae have burrowed deeper in the soil and would likely be unaffected by trail use. Even if the natal burrow collapsed, larvae could emerge from the soil by tunneling out through an alternate location.

Recreation and trail use currently occurs within Ohlone tiger beetle habitat in the upper campus. To reduce incidences of beetle injury and mortality, since 2003 UC Santa Cruz has been erecting temporary fencing and signage on trails within areas with known beetle populations to redirect pedestrian and bicycle traffic away from these sites. Fencing and signage is erected, typically from mid-January through mid-May, and the Campus patrols each area to ensure compliance. Fencing and signage is removed in late May or at the end of the beetle activity period, whichever is later. The timing of beetle activity each year is determined in the field by a qualified biologist. These actions have been designed in close coordination with the U.S. Fish and Wildlife Service, Ventura Field Office in conjunction with the HCP that covers impacts to the species in the southwestern portion of UC Santa Cruz.

Recreational use of trails within Ohlone tiger beetle populations is expected to increase as a result of the 2005 LRDP, but the amount of this increase is unknown. Although some portion of the future recreational use of these trails will continue to be from off-campus residents and would occur regardless of the 2005

LRDP, there is expected to be an increase in use proportional to the increase of the campus population under the 2005 LRDP. Note that from an informal survey of bikers conducted on a Friday in May 2005 on Cowell-Wilder Regional Trail, near Twin Gates, 23 bike riders were observed between 11 AM and 3 PM. When questioned about their affiliation to the campus, only one was a UC Santa Cruz affiliate who resided nearby and was commuting to class. All others were not affiliated with the campus although two said that they were alumni and one held a campus recreation card.

Although it is unknown how any 2005 LRDP induced increase in recreational trail use from the 2005 LRDP will affect Ohlone tiger beetles, it is assumed that this increase, without mitigation, could result in adverse effects to Ohlone tiger beetle populations. Because of the extreme rarity of the Ohlone tiger beetle, its status as a federally endangered species, and the importance of campus populations for the species, any impacts to existing populations from campus growth under the 2005 LRDP would be considered significant. Therefore, mitigation is necessary to protect Ohlone tiger beetles during certain periods of their life cycle from increased impacts as a result of recreational use associated with the 2005 LRDP. The Campus will implement LRDP Mitigation BIO-7A to address this impact. This mitigation measure is consistent with the measures UC Santa Cruz already implements in all areas that support Ohlone tiger beetle populations on campus.

Planned expansion of plantings at the Arboretum could also block or reduce the width of the potential movement corridor of Ohlone tiger beetles between the population at UC Santa Cruz and the nearby population at Pogonip City Park. Although no one has studied the movement patterns of Ohlone tiger beetles, individuals may move between these two populations through the Great Meadow and other open sites. The area within the Arboretum on either side of Moore Creek north of the Arboretum Pond is the narrowest zone of open grassland connecting these two populations. The Arboretum proposes to expand plantings into this area (proposed as gardens for plants from the Northern California Province and Chile in their current plans). Tall trees could present a new barrier to Ohlone tiger beetles or impede their movement, thus reducing the likelihood of exchange between the Pogonip population and populations farther west (Arnold 2002; Sculley 2002). This impact is considered potentially significant. Implementation of LRDP Mitigation BIO-7B would reduce this potential impact to a less-than-significant level.

LRDP Impact BIO-8: Development under the 2005 LRDP would not result in a substantial adverse impact (i.e., loss or degradation of habitat) for cave invertebrates, including the Santa Cruz telemid spider, Dollof Cave spider, Empire Cave pseudoscorpion, or Mackenzie's Cave amphipod.

Significance: Less than significant

LRDP Mitigation BIO-8: The Campus shall continue to limit visitation of caves on campus, and discourage activities by members of the public that could jeopardize the physical integrity, condition or scientific value of the caves, through appropriate signage and educational literature, Campus Natural Reserve website information, or other appropriate measures.

Residual Significance: Not applicable

The campus contains suitable habitat for four special-status cave invertebrate species: Santa Cruz telemid spider, Dolloff Cave spider, Empire Cave pseudoscorpion, and Mackenzie's Cave amphipod (i.e., karst features such as caves, sinkholes, fissures, cracks, crevices). All of these species are federal species of concern. New development could have direct impacts on these species if it were to take place on top of karst features where the species is known to occur. Indirect impacts could occur if development altered the species' habitat or changed the quality and/or quantity of water that enters the cavities occupied by these species.

Direct Impacts

As discussed under Impact HYD-6, there are five known caves on or immediately adjacent to the campus. However, the only caves known to support these species are Empire Cave and Dolloff Cave. Dolloff Cave is located off campus and Empire Cave lies within Campus Natural Reserve and is not proposed for development. Therefore, there would be no direct impacts from development under the 2005 LRDP on known occupied habitat for special-status cave invertebrates.

Suitable habitat for these invertebrates may be present within subterranean caves or karst features such as fissures, cracks, and underground caverns that are present in the marble bedrock of the central campus and lower campus. These features may provide suitable microhabitats for these species, but their occupancy would depend on underground physical connections with occupied caves such as Empire Cave. Researchers in central Texas, where karst systems and karst invertebrates are common, determined that caves or voids less than 4.9 feet below the surface, less than 6.6 feet wide and 3.3 feet high, or highly dissimilar in morphology to occupied caves are unlikely to contain suitable habitat for special-status invertebrate species (Veni and Reddell 2002). These factors have been adopted by the USFWS as guidelines for identification of potential central Texas karst invertebrate habitat (USFWS 2004) and may also be applicable to the karst system at UC Santa Cruz.

Direct impacts to suitable habitat for special-status cave invertebrates could occur if underground "voids" (i.e., fractures) that meet the criteria of suitable habitat described above were filled or otherwise disturbed. Construction does not occur over near-surface voids or fractures because these features present extreme building and safety hazards. Building does occur, however, on soils that overlay voids, fractures, or other karst features, as described below.

A standard technique that has been used on the main campus to reduce the hazard from sinkhole settlement under buildings is compaction grouting of the soft sediments in the soil above the marble bedrock. In order to reduce the potential for building damage from soil subsidence, compaction grouting is done to densify and stabilize the soft soil. The object of the compaction grouting program is not to grout the existing voids in the marble bedrock. Instead, the object of the program is to plug the throat in the bedrock through which the soil has been washing and then densify the overlying soft soil by injecting very stiff cement grout into the soil, displacing the soil and increasing its strength, and decreasing the settlement potential. Extreme care is taken not to pump grout significantly into the bedrock voids. The grout is extremely expensive to place, and grout lost down crevices or channels in bedrock will not serve to densify the soft soil above.

Geologists log closely spaced (5 to 8 feet apart) borings (which double as grout points) to avoid grouting into voids. This allows the top of the marble to be identified, and provides an understanding of the material that will be grouted. The grouting is performed relatively near the ground surface, since the foundation pressure from buildings becomes insignificant at depth. The grouting starts 3 feet into the top of the marble, and the grout injection points are gradually lifted up towards the ground surface from the top of the marble. Pressure readings are taken during the grouting procedure in order to confirm that grout is not entering into the marble but into the soil. At the main campus, grouting has never been performed at or below the water table. Grout injection is done in relatively dry (unsaturated) soils, and there is no direct introduction of grout into the groundwater. While grouting could potentially occur deeper than 4.9 feet below the surface, grouting is not performed in voids that meet the USFWS guidelines for identification of potential central Texas karst invertebrate habitat (i.e., greater than 6.6 feet wide and 3.3 feet high). The majority of grouting occurs in loose soils, fissures, and smaller voids. Thus, grouting is not expected to adversely affect suitable habitat for special-status cave invertebrates at UC Santa Cruz.

Indirect Impacts

As noted earlier, indirect impacts to cave invertebrates could occur if there were significant changes in the hydrology of the caves or other karst features or if the quality of water discharged into the karst system were degraded as a result of campus growth. As discussed previously, a significant portion of storm water runoff on the UC Santa Cruz campus is captured by sinkholes, and transmitted within the subsurface karst aquifer by an extensive network of bedrock fractures. The manner in which water travels within the karst aquifer is not fully understood and therefore a direct link between a cave and any on-campus area cannot be assumed. However, based on site topography and the locations of Empire Cave and Bat Cave on the eastern wall of Cave Gulch, it is considered likely that some or all of the water that drains through these caves has its origin on the campus. Stump, Dolloff, and IXL caves are other nearby caves that are located on the western wall of Cave Gulch; therefore these caves do not discharge water from the campus.

An increase in surface runoff due to increased impervious surfaces could increase the quantity of water that drains into sinkholes and enters the karst system, and therefore could potentially cause flooding of Empire and Bat Caves.¹⁰ However, as discussed under LRDP Impact HYD-6, the Campus would implement LRDP Mitigation HYD-3C, which would ensure that post-development peak flows do not exceed pre-development peak flows from a 25-year storm, and LRDP Mitigation HYD-3D which would maximize infiltration. As a result, peak flows would generally remain at the same levels as under existing conditions, and because infiltration of runoff would occur adjacent to the new impervious surfaces, the general pattern of infiltration would not be significantly affected. In light of these measures, water levels in the caves or the karst system may not increase. To the extent that there is periodic flooding and water levels in the caves are somewhat higher than under existing conditions, this would not adversely affect the special-status invertebrates, as it would be within the range of the natural fluctuation in water levels that results from large storms.

¹⁰ Note that even under existing conditions, most of the rain that falls on the campus ends up in the karst aquifer; however there is some water that is lost via evapotranspiration. If more areas were placed under impervious surfaces, the rain that falls on these impervious surfaces would become runoff that will end up as additional discharge in the karst aquifer.

Changes to the quality of water in the caves would be a concern for cave invertebrate species. As discussed above under LRDP Impacts HYD-2 and HYD-3, increased human activity on the campus could result in changes in the quality of storm water runoff. Because Dolloff Cave is to the west of Cave Gulch, groundwater from the campus development areas would not affect that cave. Campus development generally upgradient of the Empire Cave would include student and employee housing areas and the campus support area on Empire Grade Road. The campus support area is underlain by granitic rock rather than marble. Therefore, urban runoff from that site would not enter Empire Cave through infiltration into the karst system. However, runoff that does not infiltrate would drain to Cave Gulch and, to the extent that flows in the cave derive from surface flows in that drainage, could enter the cave. On account of the largely residential uses that would be in karst areas upgradient of Empire Cave, the runoff that could potentially enter this cave via the karst system is unlikely to be highly polluted. Bat Cave is located high on the wall of Cave Gulch so it would not be affected by surface flows in Cave Gulch. However, this cave is on the east side of Cave Gulch, adjacent to the lower campus, so runoff from the western portion of the central campus could potentially enter this cave via the karst system.

With the Phase II NPDES requirements, the Campus will be required to implement a rigorous program to avoid water quality impacts. Furthermore, the Campus will implement LRDP Mitigations HYD-3C and HYD-3D, which are in addition to the requirements of the campus's draft SWMP. With this increased effort, the quality of runoff that drains through these caves should not degrade, and the impact would be less than significant.

Indirect impacts to Empire Cave may be possible, however, from increases in the campus population as a result of the 2005 LRDP. Although the Campus does not sanction recreational use of the caves, it is known that the cave entrance is used for parties. This use can result in damage to the cave, and debris and garbage are often left behind. It is not known what effect this use has on the special-status invertebrates in Empire Cave, which is the most-frequently visited cave. Because this recreational use is generally confined to the cave entrance and immediate vicinity, there may be little or no overlap with use by special-status invertebrates. Furthermore, the damage to the habitat near the cave mouth may already have occurred, so an increase in use as a result of a larger campus population may have little or no additional adverse effect.

In summary direct and indirect impacts on the local population of these species are not expected to be significant because:

- Development under the 2005 LRDP would not directly affect any known populations of these special-status invertebrates or known suitable habitat.
- Grouting operations are monitored through borings and pressure readings to ensure that significant open voids (i.e., voids not currently filled with sediment) are not filled.
- There would be no direct impacts to potentially occupied caves. There would be no indirect impacts to occupied caves, including Empire Cave, from changes in water quality as a result of the 2005 LRDP, although there may be indirect impacts related to increased recreational use of caves. This impact is speculative.

- Indirect impacts to karst invertebrates from changes in peak flows would be negligible. Drainage currently enters the caves in which the species are found, so it is assumed that they have adapted to some level of hydrologic variation. Changes to drainage patterns as a result of the 2005 LRDP are expected to be within the current range of variation of drainage patterns.

For the above reasons, it appears that impacts to these four invertebrate species would be less than significant. However, the Campus would implement LRDP Mitigation BIO-8 to better inform the public and the campus community about the value of the caves and seek their cooperation in avoiding potential indirect impacts. The implementation of this measure would further reduce the potential for indirect impacts as a result of increased recreational use of the caves in relation to population growth on campus, and the impact would be less than significant.

LRDP Impact BIO-9: Development under the 2005 LRDP could result in a substantial adverse effect on breeding or important movement habitat for California red-legged frog; direct impacts to California red-legged frog populations; or indirect impacts on the species from downstream hydrological changes in the Moore Creek watershed.

Significance: Potentially significant

LRDP Mitigation BIO-9: UC Santa Cruz will implement the following measures to avoid impacts to the California red-legged frog:

- Initial ground-disturbing activities in the Moore Creek watershed, including grading and vegetation removal, will not occur during the period when CRLF are most likely to be in or near aquatic environments and not dispersing. Therefore, construction in CRLF habitat shall be restricted to the period after May 1 and before October 15.
- A qualified biologist shall examine the project area 24 hours before project activities begin and during any initial vegetation, woody debris, tree removal, or other initial ground-disturbing activities. If a CRLF is observed at any time before or during project activities, all activities will cease. The Campus will coordinate with the appropriate agencies to develop avoidance measures before commencing project activities.
- Initial construction activities, including vegetation removal and grading, shall not occur when it is raining.

Residual Significance: Less than significant

Suitable breeding and movement habitat for California red-legged frog is present within the Moore Creek watershed along Moore Creek and its tributaries and in the Arboretum Pond. Red-legged frogs may also occur in marginal upland habitats adjacent to Moore Creek during juvenile dispersal or adult aestivation. During periods of wet weather, red-legged frogs may make overland excursions through upland habitat. No development is proposed in suitable breeding or high-quality movement habitat under the 2005 LRDP. All areas in the Moore Creek watershed that provide suitable breeding habitat and movement habitat are designated Campus Natural Reserve, and Site Research and Support that limit development. However, additional development is envisioned under the 2005 LRDP in the campus core, portions of which are adjacent to Moore Creek and its tributaries. Grassland habitat within Site Research and Support areas managed by the Arboretum may be planted in the future with woody and herbaceous plants native to other regions (current plans call for conifers, a Chilean garden, and California Klamath Province garden). Installation of ornamental plant irrigation systems and paved or dirt pathways associated with the Arboretum will still allow use of that area by frogs for occasional aestivation and movement. Therefore, this type of development will not have a significant effect on the red-legged frog.

Red-legged frogs may disperse into areas envisioned for future development in the campus core, however, this possibility is considered remote because red-legged frogs have not been documented on campus within developed areas or outside of the Moore Creek riparian corridor (EcoSystems West 2004b; Jones & Stokes 2004). Also, the campus core has been determined to have the lowest probability of red-legged frog occurrence due to the presence of movement barriers and abundant hazards to dispersal (EcoSystems West 2000; Jones & Stokes 2002). However, some infill adjacent to Moore Creek drainage and storm drainage improvements in Moore Creek could adversely impact CRLF habitat and could result in potentially significant impacts to the species.

Campus development under the 2005 LRDP and the associated increase in impermeable surfaces would be anticipated to result in increased volumes of storm water runoff. The 2005 LRDP stipulates that, to the extent feasible, natural surface drainage would be maintained and changes to hydrological conditions would be minimized. To these ends, future development projects would employ strategies such as infiltration devices to minimize non-point source discharge, collecting rainwater for controlled aquifer recharge, and recycling rainwater collected from impervious surfaces for irrigation uses. As described in Section 4.8, *Hydrology and Water Quality* (Volume II), the water quality of the surface runoff entering the Moore Creek and the Arboretum Pond would not change in relation to existing conditions as a result of proposed development under the 2005 LRDP, so no adverse effects to red-legged frogs and their habitats are expected as a result of changes in water quality.

Therefore, the 2005 LRDP could have a substantial adverse effect on the local or regional red-legged frog population, but the impact would be reduced to a less-than-significant level by the implementation of LRDP Mitigation BIO-9.

LRDP Impact BIO-10: Development under the 2005 LRDP would not result in a substantial adverse impact associated with the loss of potential habitat or other indirect impacts to the southwestern pond turtle or coast horned lizard.

Significance: Less than significant

LRDP Mitigation: Mitigation not required

Residual Significance: Not applicable

Southwestern pond turtle habitat at UC Santa Cruz is only known to occur at the Arboretum Pond in the lower Moore Creek watershed. Turtles have not been observed in Moore Creek or at the Arboretum since 1992 (CNDDDB 2005) and the habitat is currently considered to be unoccupied. Only minimal development, limited to the existing Arboretum footprint, is envisioned for the lower Moore Creek watershed under the 2005 LRDP. Similarly, changes in hydrology that would occur as a result of the 2005 LRDP development would not change the basic hydrologic function of the pond. Thus, impacts to the habitats or to individuals of the species are considered to be less than significant.

The coast horned lizard could potentially breed on or adjacent to the areas proposed for development under the 2005 LRDP, including the grasslands to the east of Hagar Drive and in the vicinity of Porter Meadow, although the species has not been found at either site. Although this species could potentially occur in these areas and regional populations of the species are likely declining, impacts to its relatively common habitats or to individuals of the species are considered to be unlikely given the lack of known occurrences in areas proposed for development. Therefore, the impact would be less than significant.

LRDP Impact BIO-11: Development under the 2005 LRDP could result in the loss or abandonment of active nests for special-status raptors.

Significance: Potentially significant

LRDP Mitigation BIO-11: Prior to construction or site preparation activities, a qualified biologist shall be retained to conduct nest surveys at each site that has appropriate nesting habitat. The survey shall be required for only those projects that will be constructed during the nesting/breeding season of sharp-shinned hawk, golden eagle, northern harrier, long-eared owl, or white-tailed kite (typically February 1 through August 31).

The survey area shall include all potential nesting habitat, including the mixed evergreen forest, redwood forest, and isolated trees that are within 200 feet of the proposed project grading boundaries. The survey shall be conducted no more than 14 days prior to commencement of construction activities.

If active nests of sharp-shinned hawk, golden eagle, northern harrier, long-eared owl, and white-tailed kite (or other species protected under the Migratory Bird Treaty Act and the California Fish and Game Code) are present in the construction zone or within 200 feet of the construction zone, a temporary fence shall be erected at a distance of 200 feet around the nest site (or less if determined to be appropriate by the biologist according to the species and site conditions). Clearing and construction within the fenced area shall be postponed until juveniles

have fledged and there is no evidence of a second nesting attempt as determined by the biologist.

Residual Significance: Less than significant

Several special-status bird species, including sharp-shinned hawk, golden eagle, northern harrier, long-eared owl, and white-tailed kite, use the campus grasslands as foraging habitat. The proposed project involves the potential development and/or disturbance of approximately 98 acres of grassland area within which special-status birds have been observed foraging. However, the campus contains large undeveloped expanses of grassland habitat such as the Great Meadow (roughly 90 acres) and the East Meadow (roughly 80 acres), both of which would remain largely undisturbed. Therefore, the loss of foraging habitat potentially used by special-status birds would be considered a less-than-significant impact.

The five species of special-status raptors listed above could nest in forested areas on the central campus and north campus where new development is envisioned under the 2005 LRDP. Development of the proposed project could result in the removal or disturbance of approximately 60 acres of redwood forest and 73 acres of mixed evergreen forest habitats, although the acreage could be smaller because if the north campus areas are developed in a manner similar to the existing central campus, significant numbers of trees would remain even within areas otherwise disturbed by development. Additional trees would be removed within the central campus as a result of infill development under the 2005 LRDP. Trees remaining within development footprints may be unsuitable for nesting by some species due to on-going disturbance and noise in the surrounding area. The loss of up to 120 acres of suitable nesting habitat is considered a less-than-significant impact because of the abundance of similar habitat on undeveloped portions of campus and on extensive adjacent public lands (e.g., Wilder Ranch State Park and Henry Cowell Redwoods State Park).

Construction activities (including tree removal) and construction-related noise could result in the loss or abandonment of active nests of special-status bird species, which would be a potentially significant impact.

Implementation of LRDP Mitigation BIO-11 would reduce development related impacts to nesting sharp-shinned hawk, golden eagle, northern harrier, long-eared owl, white-tailed kite, and other protected raptors to less than significant.

LRDP Impact BIO-12: Development under the 2005 LRDP could potentially result in a substantial adverse impact on western burrowing owl.

Significance: Potentially significant

LRDP Mitigation BIO-12A: Prior to any ground disturbance of grassland habitats on the lower campus, a qualified biologist will conduct a preconstruction survey to identify western burrowing owls and/or potential habitat features (e.g., burrows) and to evaluate use by burrowing owls in accordance with current CDFG survey guidelines (CDFG 1995).

Surveys will be conducted within the proposed disturbance footprint

and a 500-foot radius of the disturbance boundary of each proposed project. For construction activities occurring within the western burrowing owl habitat (whether during breeding or non-breeding seasons), surveys will be conducted within 30 days prior to construction. The surveys will document whether burrowing owls are nesting on or directly adjacent to disturbance areas. Survey results will be valid only for the season during which the survey is conducted.

If western burrowing owls are found during the breeding or nonbreeding season, LRDP Mitigation BIO-12B will be implemented.

LRDP Mitigation BIO-12B: If burrowing owls are found, the Campus will avoid all burrowing owl nest sites to the extent feasible. Avoidance will include establishment of a non-disturbance buffer zone of at least 250 feet around each nest site during the breeding season. If burrowing owls are found outside the breeding season (September 1–January 31), avoidance will include the establishment of at least a 160-foot non-disturbance buffer zone around each burrow being used. In both cases, highly visible temporary construction fencing will delineate the buffer zone.

If burrowing owl nest sites cannot be avoided, the Campus will conduct passive relocation by installing one-way doors in suitable burrow entrances that are used or may be used by the owls. This measure is described in detail below.

In order to displace burrowing owls without destroying eggs, young, or adults, one-way doors will be installed on owl burrows before February 1 prior to disturbance, and each burrow will be monitored following CDFG's protocol (CDFG 1995). Suitable artificial burrows will be created nearby according to the conservation measures established for this species. The protocol includes monitoring the burrow for a 48-hour period after the one-way doors are installed. The doors will be checked every 24 hours following installation to determine whether they are still intact. If the one-way door is still correctly installed after a continuous 48-hour period (i.e., no animals have dug up the door and rendered it useless), then the one-way door will be removed and the burrows will be excavated using hand tools and plastic tubing to maintain an escape route for any animals still inside the burrow.

Residual Significance: Less than significant

Western burrowing owls are known to occur on campus within the East Meadow and grasslands in the southwestern corner of the campus (Linthicum 2005). Suitable habitat for Western burrowing owls also remains in the Great Meadow (Pelc 1995; Beyer 2001), but would be unaffected by proposed development under the 2005 LRDP.

Development under the 2005 LRDP is proposed on approximately 98 acres of suitable grassland habitat. Removal of this unoccupied suitable habitat is considered a less-than-significant impact because of the abundance of suitable habitat elsewhere on campus (approximately 369 acres). However, the future construction proposed under the 2005 LRDP does have the potential to kill or injure western burrowing owls that occupy nest at a project site. Impacts to individuals in occupied nests would be considered potentially significant.

Implementation LRDP Mitigations BIO-12A and BIO-12B would reduce development-related impacts to western burrowing owl to a less-than-significant level.

LRDP Impact BIO-13: Development under the 2005 LRDP could result in a substantial adverse impact associated with the disturbance of roosting sites for special-status bats.

Significance: Potentially significant

LRDP Mitigation BIO-13A: If tree removal or grading activity commences on a project site in the north campus during the breeding season of native bat species (April 1 through August 31), a field survey shall be conducted by a qualified biologist to determine whether active roosts of special-status bats (pallid bat, Pacific Townsend's big-eared bat, western red bat, long-eared myotis, fringed myotis, long-legged myotis, yuma myotis, or greater western mastiff bat) are present on the project site or in areas containing suitable roosting habitat within 50 feet of the project site.

Field surveys shall be conducted in late April or early May in the season before construction begins, when bats are establishing maternity roosts but before pregnant females give birth. If no roosting bats are found, no further mitigation would be required.

LRDP Mitigation BIO-13B: If roosting bats are found, disturbance of the maternity roosts shall be avoided by halting construction until either (1) the end of the breeding season or, (2) a qualified biologist removes and relocates the roosting bats in accordance with CDFG requirements.

Residual Significance: Less than significant

Eight special-status bat species; pallid bat, Pacific Townsend's big-eared bat, western red bat, long-eared myotis, fringed myotis, long-legged myotis, yuma myotis, and greater western mastiff bat; have been observed foraging throughout all areas of the campus. All riparian areas, which provide high quality bat foraging habitat, are protected as Campus Natural Reserve or Protected Landscape, and thus would not be subject to development under the 2005 LRDP, with the exception the bridge crossing of Jordan Gulch. Forested areas within the central campus and the north campus contain features suitable for bat foraging that could be removed or degraded by development proposed under the 2005 LRDP (estimated to be up to 100 acres of potential habitat removal). Given the extent of remaining high-quality foraging habitat (roughly 300 acres of remaining forested habitat in the north campus), and additional riparian habitats

within Campus Natural Reserve areas that will be impacted by only a single bridge crossing, impacts to foraging habitat are considered less than significant.

Most of the high-quality roosting sites are also located within riparian zones or forested areas designated as Campus Resource Lands or Campus Natural Reserve and would not be disturbed by development under the LRDP (Jones & Stokes 2004; EcoSystems West 2004; CNDDDB 2005). Should a species such as pallid bat, Pacific Townsend's big-eared bat, western red bat, long-eared myotis, fringed myotis, long-legged myotis, yuma myotis, and greater western mastiff bat establish a maternity roost within proposed development sites, tree removal and noise generated by construction could cause abandonment of roosts. Bats roosting in the campus core may be less sensitive to this disturbance, since there is already noise and activity in this area in association with existing development. Bats roosting in the north campus may be more sensitive to disturbance because of the lack of development and relatively low level of human activity in that area. Depending on the number and extent of bat maternity roosts that may be disturbed or removed, the loss of the roosts could be a potentially significant impact within the north campus where that existing habitat is contiguous and substantially less impacted by development than the central campus. LRDP Mitigations BIO-13A and BIO-13B will be implemented in conjunction with north campus projects in order to reduce the potential for impacts to bat roosting sites. Given the quality of habitat in the north campus, as opposed to the already developed habitats in the campus core, this mitigation measure shall apply only in areas of new development in the north campus. Implementation of LRDP Mitigations BIO-13A and BIO-13B, when necessary, would reduce development-related impacts to roosting special-status bat species to a less-than-significant level.

LRDP Impact BIO-14: Development under the 2005 LRDP could result in a substantial adverse impact associated with the loss of potential San Francisco dusky-footed woodrat nests.

Significance: Potentially significant

LRDP Mitigation BIO-14: A pre-construction/grading survey of all suitable San Francisco dusky-footed woodrat habitat within 100 feet of the proposed grading footprint shall be conducted by a qualified biologist to detect any woodrat nests.

The survey shall be conducted no more than 14 days prior to commencement of construction activities. If active nests (stick houses) are identified within the construction zone or within 100 feet of the construction zone, a fence shall be erected around the nest site with a 100-foot minimum buffer from construction activities. At the discretion of the biologist, clearing and construction within the fenced area would be postponed or halted until juveniles have left the nest. The biologist shall serve as a construction monitor during those periods when construction activities will occur near active nest areas to ensure that no inadvertent impacts on these nests will occur. If any woodrat is observed within the grading footprint outside of the breeding period, individuals shall be trapped and relocated to a suitable location in

proximity to the project site by a qualified biologist in accordance with CDFG requirements, and the nest dismantled so it cannot be reoccupied.

Residual Significance: Less than significant

Suitable habitat for San Francisco dusky-footed woodrat occurs in the riparian, chaparral, redwood, and mixed evergreen forest habitats within the north campus (approximately 193 acres) with the species appearing to prefer mixed evergreen habitats (Bankie 2005). Inhabited woodrat nests have been observed in the north campus area (Bankie 2005). While it has not been confirmed whether the subspecies with special status (San Francisco dusky-footed woodrat) is inhabiting these nests, it is highly likely that the subspecies comprises a portion of the population on campus. Therefore, for the purposes of this analysis, it is assumed that all woodrat nests could be habitat for the San Francisco dusky-footed subspecies. Since classification of the species requires skull classification of a dead specimen, assumption of presence is the most viable solution to ensure protection of the San Francisco sub-species. Outside of the north campus, the only observation of a woodrat nest was within a riparian area designated as Campus Natural Reserve under the 2005 LRDP (Jones & Stokes 2004). Appropriate habitat does occur interspersed throughout the campus core. Construction-related activities in proximity to nesting sites could result in the abandonment of active nests by adult woodrats. Given that recent surveys suggest that development would result in the removal of roughly a quarter of the nests in the north campus, this is considered to be a significant impact.

Implementation of LRDP Mitigation BIO-14 would reduce construction-related impacts to San Francisco dusky-footed woodrat to a less-than-significant level.

LRDP Impact BIO-15: Development under the 2005 LRDP could interfere substantially with the movement of wildlife species or with established native resident or migratory wildlife corridors.

Significance: Potentially significant

LRDP Mitigation BIO-15: New fencing planned for installation around Arboretum plantings between Moore Creek and the Great Meadow shall be constructed to allow for the movement of mammals across or around the barrier.

Residual Significance: Less than significant

Wildlife

Moore Creek and Jordan Gulch drainages, which have been identified as wildlife movement routes between the lower campus and the north campus, would be maintained through the campus core and between the new colleges proposed under the 2005 LRDP (Figure 3-4). This will help maintain the riparian connectivity between the Great Meadow and the adjacent open space areas of upper campus, Wilder Ranch State Park, Pogonip City Park, and Henry Cowell Redwoods State Park.

The north campus currently provides important wildlife movement routes between several adjacent tracts of large open space. The north campus is located immediately between the upper meadows of Wilder Ranch State Park on the northwest and the meadows of Pogonip City Park and the forest of Henry Cowell

Redwoods State Park on the east. One developed area, the Cave Gulch neighborhood, lies directly to the west. Wildlife with large home ranges are expected to travel through the north campus when moving between these environments. The proposed development under the 2005 LRDP in the north campus would shift the urban-wildland interface (i.e., the boundary between campus development and large blocks of open space) northward, maintain open space between development areas, and will not interfere substantially with the movement routes through the north campus that were identified previously (EcoSystems West 2004a). These routes allow for a northern corridor between the campus core riparian corridors and a corridor along the northern rim of the campus to adjacent parklands. The connectivity between these two corridors would be slightly impaired by development of the north campus loop road, but would not be eliminated. Migration across this new loop can occur through forested areas between developments. A discussion of the expected impacts to the wildlife species that likely use the campus for long-distance movement is presented below.

Raccoon. Raccoons would likely be only minimally impacted by the presence of new development in north campus or a new road through this area because the species prefers riparian areas (which will not be affected) and is furthermore well adjusted to human disturbance. Raccoon mortality may increase as a result of traffic on the new north campus loop road and other new roads, but this may be offset by an overall increase in raccoon population as a result of increased food sources from more human development. Potential effects to raccoon are considered less than significant.

Coyote. Use of the north campus by coyotes would likely be somewhat reduced due to increased development but they would likely still be able to move through the area between adjacent parks because of the dispersed nature of the proposed development and the species' tolerance of human disturbance. Incidences of road kill on campus would likely increase as a result of new road construction, particularly the north campus loop road. Effects to coyote are considered less than significant because the population is abundant and would continue to use the project site.

Bobcat. Bobcat use of the lower campus is expected to be minimally affected by the 2005 LRDP. Their preferred riparian travel routes on the lower campus are in deep gullies, which generally will not be affected by development in the 2005 LRDP. Because bobcats hunt during daytime, they are likely more susceptible than nocturnal species to human disturbance from the growth in campus population or from being hit by vehicles on a new loop road.

On the north campus, effects of development are considered to be potentially significant, as bobcats require large wildlife corridors to move through the north campus into the riparian corridors in the central campus and foraging areas in the grasslands at UC Santa Cruz. While the more confined riparian corridors in the lower campus provide a discrete corridor that is isolated from much of the development on campus, the riparian corridors in the northern portion of campus are much less confined and used more broadly by large mammals. The species is a common presence currently on the campus.

Mountain lion. The effect of the 2005 LRDP on mountain lions is difficult to determine given the lack of data on the species on campus. Mountain lion movement on campus will likely not be substantially reduced by the 2005 LRDP because of the clustered development pattern proposed (allowing movement between the new development sites) and the preservation of riparian corridors. The large herd of black-

tailed deer on campus could be an attractant for mountain lions in the region despite the greater human presence on campus. Construction of new roads, particularly the north campus loop road, could increase the chances of roadkill. However, effects are considered less than significant. Given the sizable natural home range of the species, it is highly unlikely that mountain lions regularly move into the campus core to forage. Mountain lions are more likely to stay within larger open spaces to the north of campus.

Black-tailed deer. Implementation of the 2005 LRDP is expected to increase the number of deer/vehicle collisions on campus because of the large size of the black-tailed deer population in the area. Development under the 2005 LRDP is not expected to substantially reduce movement of black-tailed deer because of the dispersed nature of the proposed development pattern. Black-tailed deer can also continue to move unimpeded between Henry Cowell Redwoods State Park and Wilder Ranch State Park through the upper campus. Effects are considered less than significant.

Conclusions. Maintenance of corridors is important for the movement and dispersal of a species. Preferred corridor widths would allow for a single home range of the species within the corridor, which would translate to a minimum corridor width for bobcats of 2.5 kilometers (1 mile) and a minimum width of 12 kilometers (5.5 miles) for mountain lion (Harrison 1992). At UC Santa Cruz such a corridor width is not feasible. However, the width of a wildlife crossing is ultimately related to its length. A functioning crossing can be narrow, if it is short (Harrison 1992). As observed in the Santa Ana Mountains, passageways used by a mountain lion had been as narrow as a 1.8-meter (6 feet) box culvert when no more than 15 meters (50 feet) in length, and juvenile mountain lions used a 2.6-by 3.3-meter (8-by 10-foot) box culvert that was 200 meters (656 feet) in length (LSA Associates 2003). While movement is possible through smaller corridors, such as the riparian corridors of Moore Creek and Jordan Gulch in the lower and central campus, a minimum viable corridor width for wildlife movement has been shown to be 500 feet (Ogden 1992). The Ogden study looked at the movement of deer, mountain lions, bobcats, and coyotes in 1992 in the hills around Chula Vista in San Diego County in relation to proposed development of the area.

There are important differences, however, between UC Santa Cruz and the study in Chula Vista. Currently, the main campus is developed around the Moore Creek and Jordan Gulch drainages. From this area, movement corridors to the Great Meadow that are 100 to 200 feet wide in places (i.e., much less than 500 feet wide) have proven to be viable. These drainages serve as movement corridors because both drainages are visually and topographically isolated from the surrounding campus (i.e., in a deep gulch). Additionally, the surrounding forest often provides deep shading and extensive cover not present in the coastal sage scrub, chaparral, and grassland around Chula Vista. A larger corridor is needed in the upper tributaries of Moore Creek because the more gentle topography provides less isolation from the surrounding development. Development proposed in the 2005 LRDP maintains an approximately 500-foot buffer between the proposed new west and middle development areas (i.e., the upper west fork of Moore Creek) in the north campus. The gap between the east and middle development areas is approximately 300 feet at the most narrow point, and closer to 400 feet on average. As discussed above, the primary wildlife movement routes are likely to be through the center of campus (i.e., between the proposed new west and middle development areas) where the movement route is widest. A secondary route between east and middle development areas of approximately 300 feet is adequate to maintain most wildlife movement because of the densely forested vegetation that will still provide significant cover and

visual buffering. For these reasons, impact to wildlife movement from the developments in the north campus is considered to be less than significant.

New fencing is proposed around plantings in the upper Arboretum between Moore Creek and the Great Meadow. Installation of fencing similar to that currently used at the Arboretum (10-foot-high chain link) would create an impediment for the movement of many mammals that move between the Moore Creek riparian area and into the Great Meadow to forage. This barrier could extend more than two-thirds of the way along the Great Meadow (approximately 1,500 feet). Because of the length and potential fence design, this impediment to movement could be significant. LRDP Mitigation BIO-15 will reduce this impact to a less-than-significant level by providing gaps in the fence between the Moore Creek riparian corridor and the Great Meadow.

Monarch Butterfly

Monarch butterflies use the eucalyptus grove in the Arboretum for overwintering. Development under the 2005 LRDP would not directly affect this grove of trees, nor is new development likely in its vicinity because the area is designated Site Research and Support on the 2005 LRDP land use plan. General campus growth will increase human activity, noise, and vehicular traffic in the area. However, during overwintering, monarchs do not appear to be sensitive to noise, movement or visual intrusion from nearby people or vehicles. Smoke (i.e., from controlled burns or wildfires), excessive dust, exhaust, or other forms of air pollution have been linked to loss of butterfly populations, but this relationship has not been shown to be causal.¹¹

Although slight increases in vehicle emissions are expected as a result of campus construction and the increased traffic on Empire Grade Road generated by the greater campus population, no increases in smoke or dust are expected as a result of the 2005 LRDP. Since no changes to the eucalyptus grove at the Arboretum are proposed, no direct impacts to the Monarch butterfly population are expected as a result of implementation of the proposed 2005 LRDP. As the Monarch butterfly and its habitat are common and the eucalyptus grove is not a unique migratory stopover, impacts to Monarch butterfly migratory and/or wintering habitat are considered to be less than significant.

LRDP Impact BIO-16: Development under the 2005 LRDP would not conflict with the approved HCP for California red-legged frog and Ohlone tiger beetle on campus.

Significance: Less than significant

LRDP Mitigation: Mitigation not required

Residual Significance: Not applicable

As described in the regulatory setting section, one HCP is applicable to the campus. The Ranch View Terrace HCP was approved in 2005 to address impacts of that project on the red-legged frog and Ohlone

¹¹ What appears to have the greatest potential influence on overwintering Monarch butterflies, however, are long-term microclimate changes. Prolonged cold and moist conditions are considered adverse to overwintering butterflies. Vegetation removal, manipulation of water bodies, or other activities that can alter local wind, temperature or moisture settlement patterns can lead to such changes in microclimate (Monroe 2002).

tiger beetle and all of its relevant provisions have been integrated into the 2005 LRDP (e.g., the Campus Habitat Reserve designation was created to satisfy the HCP). All actions proposed in the 2005 LRDP are consistent with the University's commitments under the Ranch View Terrace HCP. Because the two plans are consistent, no impact would occur.

4.4.2.5 Cumulative Impacts and Mitigation Measures

LRDP Impact BIO-17: Campus development under the 2005 LRDP, in conjunction with other regional development in northern Santa Cruz County, would not result in a substantial adverse cumulative impact on sensitive natural communities.

Significance: Less than significant

LRDP Mitigation: Mitigation not required

Residual Significance: Not applicable

Potential impacts to coastal prairie of the 2005 LRDP, northern maritime chaparral, and wetlands are described above (see LRDP Impacts BIO-1 through BIO-3). Where these impacts are considered potentially significant, mitigation is proposed above to reduce the impacts to a less-than-significant level (see LRDP Mitigations BIO-1 through BIO-3D). The direct and indirect impacts to these communities on campus could contribute to a cumulative impact to these communities when viewed on a regional scale.

While very little development is currently planned to occur in northern Santa Cruz County, some additional small-scale rural development may occur in the future, and this development would have limited effects on these sensitive natural communities in northern Santa Cruz County. However, no large development projects are planned or foreseeable in northern Santa Cruz County. No large areas of these natural communities are included within city boundaries, with the possible exception of Scotts Valley. Sensitive natural communities, which include coastal prairie, northern maritime chaparral, and wetlands, are protected by the County's Sensitive Habitats Protection Ordinance. This ordinance states that:

"No development activities or land disturbance can occur in a sensitive habitat until a biotic review has been completed. This review determines what kinds of development activities can be conducted and what mitigation measures may be necessary to ensure protection of the habitat" (Section 5.1.6, Santa Cruz County General Plan).

Mitigation measures that may be required by the County for impacts to sensitive habitats include minimization of disturbance and area of disturbance, protection of undisturbed sensitive habitats, restoration of disturbed sensitive habitats, and land use restrictions.

In light of the limited scale of development anticipated in the region, as well as existing protection for sensitive natural communities, cumulative impacts to sensitive natural communities from development under the 2005 LRDP in combination with reasonably foreseeable development in the region are determined to be less than significant.

LRDP Impact BIO-18: Development under the 2005 LRDP, in conjunction with other regional development, would not result in a substantial adverse cumulative impact on other special-status wildlife species or wildlife movement.

Significance: Less than significant

LRDP Mitigation: Mitigation not required

Residual Significance: Not applicable

Development proposed under the 2005 LRDP, in conjunction with other regional development or population growth, would not result in significant cumulative impacts to special-status species or common wildlife species on campus, with the exception of the Ohlone tiger beetle (discussed separately below in LRDP Impact BIO-19). The assessment of potential cumulative effect to species and habitats is summarized below.

Special Status Wildlife Species

Karst invertebrates. The karst geology that provides habitat for these species (Santa Cruz telemid spider, Dollof Cave spider, Empire Cave pseudoscorpion, or Mackenzie's Cave amphipod) is limited to the vicinity of UC Santa Cruz and the lower Cave Gulch watershed (Wilder Ranch State Park). No future development, outside of that envisioned in the 2005 LRDP, is anticipated to impact the habitat of karst invertebrates. Thus there would not be any significant cumulative impacts to karst invertebrates.

California red-legged frog. The lower Moore Creek drainage provides the only known occupied breeding habitat for CRLF in the City of Santa Cruz. Additional breeding and estivation habitat for California red-legged frog is found in Santa Cruz County west and southeast of the City of Santa Cruz. Development is proposed within the city of Santa Cruz within the Moore Creek drainage, but the areas proposed for development are largely already disturbed or do not support CRLF. The City of Santa Cruz is largely built out east of Moore Creek. The remaining undeveloped areas of the Moore Creek watershed are either protected (e.g., Wilder Ranch State Park, Natural Bridges State Park, Younger Lagoon Natural Reserve, Antonelli Pond Preserve, and Moore Creek Preserve), or are being used for agriculture. Thus, impacts to the species are isolated to those potentially associated with the 2005 LRDP and not cumulative in nature.

Southwestern pond turtle. The species is not currently known to occur on campus; thus, no impacts from the 2005 LRDP are expected that would contribute to cumulative impacts to the species.

Coast horned lizard. The species is not currently known to occur on campus; thus, no impacts from the 2005 LRDP are anticipated that would contribute to cumulative impacts to the species.

Special-status raptors. While the development envisioned under the 2005 LRDP would reduce the amount of foraging and nesting habitat of special-status raptors, including sharp-shinned hawk, golden eagle, northern harrier, long-eared owl, white-tailed kite, or other birds of prey, no development is proposed in adjacent or nearby off-campus open space (e.g., Wilder Ranch State Park, Henry Cowell Redwoods State Park, Pogonip City Park, or Moore Creek Preserve) that would result in a cumulative reduction of habitat for special-status raptors.

Western burrowing owl. The Western burrowing owl is known to occur on campus but is not expected to be adversely affected by the loss of habitat along the edge of the East Meadow. Mitigation measures would protect the species' burrows during the breeding season and thus development under the 2005 LRDP would not contribute to a cumulative loss of breeding habitat.

Bat species. While the development envisioned under the 2005 LRDP would reduce the amount of foraging, roosting, and nesting habitat of special-status bats, including pallid bat, Pacific Townsend's big-eared bat, western red bat, long-eared myotis, fringed myotis, long-legged myotis, yuma myotis, and greater western mastiff bat, no development is proposed in adjacent or nearby off-campus open space (e.g., Wilder Ranch State Park, Henry Cowell Redwoods State Park, and Pogonip City Park) that would result in a cumulative reduction of habitat for these species.

San Francisco dusky-footed woodrat. While the sub-species has not been confirmed to occur on the UC Santa Cruz campus, it is likely that the subspecies comprises a portion of the UC Santa Cruz woodrat population. Mitigation measures would protect the species' nests, if they are present, and thus development under the 2005 LRDP would not contribute to a cumulative loss of nesting habitat. Additionally, no development is proposed in adjacent or nearby off-campus open space (e.g., Wilder Ranch State Park, Henry Cowell Redwoods State Park, and Pogonip City Park) that would result in a cumulative reduction of habitat for the San Francisco dusky-footed woodrat.

Movement/migratory linkages

While the development envisioned under the 2005 LRDP would reduce the amount of unfragmented habitat in the local portions of the Santa Cruz Mountains, no substantial development is proposed in adjacent or nearby open space (e.g., Wilder Ranch State Park, Henry Cowell Redwoods State Park, or Pogonip City Park), or in the Cave Gulch neighborhood, that would result in a cumulative reduction of migration, movement, and habitat linkages in the area.

No development is proposed in the two local areas of Monarch butterfly migratory and overwintering habitat (Natural Bridges State Beach and the Arboretum) that would result in a cumulative reduction of the species and/or habitat for the species.

LRDP Impact BIO-19: Campus population growth under the 2005 LRDP, in conjunction with other regional population growth, would result in a substantial adverse cumulative impact to Ohlone tiger beetle populations on campus from increased bicycle traffic on trails suitable for this species.

Significance: Potentially significant

LRDP Mitigation BIO-19: The Campus shall implement LRDP Mitigations BIO-7A and BIO-7B.

Residual Significance: Less than significant

The historic distribution of Ohlone tiger beetle in the vicinity of UC Santa Cruz is unknown, but the species likely occurred more extensively in the past on coastal terraces within mid-coastal Santa Cruz County. Much of the suitable coastal prairie habitat has been developed with the expansion of the City of Santa Cruz, and this development has likely removed and fragmented Ohlone tiger beetle habitat. Some

remnant coastal prairie sites are protected within Wilder Ranch State Park, Pogonip City Park, and the City of Santa Cruz's Moore Creek Preserve. The UC Santa Cruz Ranch View Terrace HCP also protects additional Ohlone tiger beetle habitat at UC Santa Cruz. One small parcel on the western edge of the city of Santa Cruz within Pogonip City Park currently supports Ohlone tiger beetle. No other known or potentially suitable Ohlone tiger beetle habitat remains in the developed areas of the city of Santa Cruz. Thus, it is not anticipated that any additional cumulative loss of Ohlone tiger beetle habitat will occur nor would the 2005 LRDP contribute to the loss of habitat because no development is envisioned for areas where the habitat is present. However, the regional population of Santa Cruz and unincorporated areas of Santa Cruz County is expected to increase between now and 2020. As discussed in LRDP Impact BIO-7, a portion of the recreational traffic on trails that support Ohlone tiger beetle is from off-campus residents. The increase in off-campus populations is therefore expected to cumulatively increase the use of recreational trails and increase hazards to Ohlone tiger beetle. This cumulative increase in regional population and associated impacts to Ohlone tiger beetle is considered significant. With implementation of LRDP Mitigations BIO-7A and BIO-7B, the cumulative impact to Ohlone tiger beetle, both due to population growth under the 2005 LRDP and increased use of campus lands by the off-campus population, will be reduced to less-than-significant level.

4.4.2.6 Effects of Timberland Conversion

Development under the proposed 2005 LRDP would result in the conversion of about 120 acres of land that could be classified as timberland to other developed uses. The Z'berg-Nejedly Forest Practice Act (Section 4526) defines "timberland"¹² as "land.....which is available for, and capable of, growing a crop of trees of any commercial species used to produce lumber and other forest products...." For the purposes of this analysis, it is assumed that all of the land in the north campus mapped as redwood forest, mixed evergreen forest, dwarf redwood forest, chaparral, chaparral-forest transition, and dwarf-redwood-mixed-chaparral transition (see [Figure 4.4-5](#)) is, or might be considered, timberland, and areas within the central campus that are forested or partially forested (around buildings and between development clusters) could also be considered timberland. Thus, substantial areas of the campus meet this definition. None of the campus lands are zoned Timberland Protection Zone (TPZ)¹³.

Development on the main campus under the 2005 LRDP would result in the conversion of timberland to University uses. Timberland conversion is defined in the California Forest Practice Rules (Article 7, 1100 (g)) as "transforming timberland to a nontimber growing use through timber operations." Development under the proposed 2005 LRDP would require removal of trees from some areas that would be considered to be timberland, under the definition above, and this clearing would be considered to be timberland conversion. Areas that would subject to timberland conversion under the proposed 2005 LRDP include development areas on the central campus, where some trees could be removed to accommodate new infill development, and forested or mixed forest/chaparral areas in the north campus, where development would include the selective clearing of trees for building sites and roadways.

¹² This definition applies to timberland that is not within non-Timberland Production Zone [TPZ].

¹³ A "Timberland Production Zone" is a zoning district established consistent with the mandates of the Forest Taxation Reform Act of 1976 and administered by each County with timberland.

The Z'berg-Nejedly Forest Practice Act (PRC Section 4511-4628) was enacted to “encourage prudent and responsible forest resource management calculated to serve the public’s need for timber and other forest products, while giving consideration to the public’s need for watershed protection, fisheries and wildlife, and recreational opportunities.” The California Forest Practice Rules (14 CCR Section 895-1110), which implement the Forest Practice Act, are enforced by the California Department of Forestry and Fire Protection (CDF). The Forest Practice Rules require that an owner of land that meets the definition of timberland obtain a Timberland Conversion Permit (TCP) from CDF before removing trees or other forest products. In addition, a Timber Harvesting Plan (THP) must be filed and must be approved by CDF before timber operations (removal of trees) may begin. The THP process has been certified as a CEQA-equivalent process pursuant to PRC Section 21080.5, and THPs must include feasible mitigation measures or alternatives that would substantially lessen or avoid significant adverse impacts that the activity may have on the environment. Development under the proposed 2005 LRDP will require preparation of a TCP for areas defined as timberland that would be converted to non-timberland status under the 2005 LRDP, and a THP for each proposed development that would remove trees.

Consistent with past campus practices of developing clusters of buildings interspersed with forest, it is assumed that approximately half of the timberland in each of the proposed north campus development areas would be removed, except in the north campus area designated for Physical Education and Recreation, where nearly all of the trees would be removed to allow for the development of athletic fields. North campus development thus could result in conversion of up to 73 acres of timberland. In addition, infill development within the central campus could result in conversion of up to approximately 47 acres of timberland (most of these areas are shown as “Developed Area” on [Figure 4.4-5](#)). The maximum amount of timberland that would be converted to non-timberland uses under the 2005 LRDP would be approximately 120 acres. While commercial tree species can be found in the six vegetation types listed above, only the redwood forest type contains trees of sufficient size and density to be considered a commercial resource. Most of the redwood forest on campus is site quality III and IV, or average to below-average in productivity for redwood sites.¹⁴ Redwoods are widespread throughout the Santa Cruz Mountains, occurring on most of the more than 150,000 acres of conifer and mixed evergreen timberland reported in the timber inventory prepared for the Santa Cruz County Planning Department in 1979 (Pillsbury 1979). Furthermore, large-scale commercial logging is not compatible with the existing and proposed uses of the campus, so the existing timberland is not, in practice, available for such logging.

As noted above, none of the campus is in a TPZ. Portions of the campus west of Empire Grade Road are within the Coastal Zone; however, none of the timberland areas designated for development under the 2005 LRDP is in the Coastal Zone, and provisions of the Z'berg-Nejedly Forest Practice Act with respect to the Coastal Zone therefore do not apply. Once approved, the 2005 LRDP would be the applicable land use plan for the campus. The proposed uses of the land following timberland conversion are described in detail in Section 3.0, *Project Description*, of this EIR. Under the 2005 LRDP, timberland conversion would take place incrementally, on a project-by-project basis. Trees would be removed only in connection with approved projects on individual project sites, during the initial stages of project development.

¹⁴ For most conifer species, site quality is rated in indices or classes based on ranges of height growth over time. Redwood site classes are generally based on height of dominant trees in feet at 100 years in age. Site index or class I is 180 feet or more at 100 years, site index II is 155 to 179 feet, site III is 130 to 154 feet, site IV is 105 to 129 feet, and site V is less than 105 feet (Arvola 1978).

Timberland conversion and tree removal activities under the 2005 LRDP would not remove substantial redwood and mixed evergreen forest habitat, and would not, in and of itself, be considered to be a significant impact to biological resources under CEQA. Up to 61 acres of second growth redwood forest, which is about 13 percent of the redwood forest at UC Santa Cruz; and up to 63 acres of mixed evergreen forest, which is about 15 percent of the mixed evergreen forest on the campus, could be lost to proposed development under the 2005 LRDP. Redwood forests and mixed evergreen forest are abundant in the region, and are not protected as sensitive natural communities by CDFG. Potential impacts of tree removal activities on sensitive habitats, native plants, special-status wildlife species that could be found in forest habitat, and wildlife movement, are analyzed above, and, where appropriate and feasible, mitigation measures are identified that would reduce these impacts to a less-than-significant level. Potential impacts on drainage patterns, streams, and surface water and groundwater quality that could result from construction under the 2005 LRDP, including tree removal, are addressed in Section 4.8, *Hydrology and Water Quality*. The potential for erosion of campus soils due to development, including tree removal, is described in Section 4.6, *Geology, Soils, and Seismicity*, and Section 4.8, *Hydrology and Water Quality*. Development would not occur within the immediate vicinity of watercourses, which is where the tallest and densest stands of redwood generally occur, and where there is a higher potential for adverse soils and water quality effects. Impacts on scenic vistas are analyzed in Section 4.1, *Aesthetics*. Air quality impacts are analyzed in Section 4.2. Potential changes in existing noise or vibration levels are analyzed in Section 4.10.

Tree removal activities, like other campus construction activities, would be subject to specific requirements developed by the Campus to minimize the environmental impacts of development, including mitigation measures included in this and other sections of this EIR. Tree removal in conjunction with or necessary for development is considered a part of the impacts of construction and development under the proposed 2005 LRDP, which are discussed in each of these sections. In addition to the biological issues addressed in impact sections above, other potential effects of timber removal, such as erosion of soils on slopes, adverse effects to water quality and increases in runoff, aesthetic effects, emissions and noise from trucks and logging equipment, ground disturbing impacts to significant cultural resources, fire hazards and use of hazardous materials, are included in the analyses presented in the relevant sections of this EIR, in compliance with CEQA, and as necessary for the development of subsequent THPs.

4.4.3 References

- ACOE (U.S. Army Corps of Engineers). 1987. Corps of Engineers Wetlands Delineation Manual. Technical Report Y-87-1, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.
- Adams, P. A. 1967. A review of the Mesochrysinæ and Nothochrysinæ (Neuroptera: Chrysopidae). *Bulletin of the Museum of Comparative Zoology, Harvard University* 135(4):215–238.
- Alley, K. J. 1988. Preliminary report on the status of the burrowing owl on the UC Santa Cruz. (Draft). Santa Cruz. Prepared for Margaret Fusari, Director, Campus Natural Reserves, University of California, Santa Cruz.

- Arizona Game and Fish Department. 1999. *Arizona wildlife views* (special edition). D. C. Monday and R. Doblek (eds.). Phoenix, AZ: Information and Education Division.
- Arkley, R. J. 1963. Soils of the Santa Cruz campus. (Unpublished report.) Berkeley, CA: University of California, Berkeley, Department of Soils and Plant Nutrition.
- Arnold, D. 2002. Entomologist. Entomological Consulting Services, Ltd. Personal communication.
- Bankie, H. 2005. Distribution of the San Francisco Dusky-footed Woodrats on the UCSC north campus Analyzed in a GIS Using Houses as an Index of Population Size. UC Santa Cruz Student Research Report. Santa Cruz, CA. 19 pages
- Banks, N. 1892. A synopsis, catalogue, and bibliography of the neuropteroid insects of temperate North America. *Transactions of the American Entomological Society* 19:327–373.
- Bartolome, J. W. 1989. Ecological history of the California Mediterranean-type landscape. Pages 2-15 in J.W. Clason, editor. *Landscape Ecology : Study of Mediterranean Grazed Ecosystems. Proceedings of the Man and the Biosphere Symposium XVI International Grassland Congress, Nice, France.*
- Bat Conservation International. 2002. Website available: www.batcon.org/discover/species.
- Beedy, E. C. and S. L. Granholm. 1985. *Discovering Sierra birds*. Yosemite National Park, CA: Yosemite Natural History Association and Sequoia Natural History Association.
- Beyer, L. 2001. The western burrowing owl status and distribution, UC Santa Cruz Campus, Santa Cruz, California. Prepared for Margaret Fusari, Director, Campus Natural Reserves, University of California, Santa Cruz.
- Biosystems Analysis. 1989. Burrowing owl and golden eagle study, University of California, Santa Cruz Campus, spring 1989. Santa Cruz. Prepared for David Birnbaum, Office of the General Counsel, University of California, Berkeley, CA.
- Biosystems Analysis. 1991. *Biological Assessment, UC Santa Cruz Inclusion Areas D & E*. Prepared for Office of Campus Facilities, University of California, Santa Cruz.
- Borchert, M. D. Segotta, and M. D. Purser. 1988. Coast redwood ecological types of southern Monterey County, California. USFS PSWF&RES General Technical Report PSW-107, 22 pp.
- Briggs, T. S. and D. Ubick. 1988. Cavernicoles from Cave Gulch, Santa Cruz County. *California Caver* 28: 43-44.
- Brower, L. P., D. R. Kust E. Rendon-Salinas, E. García Serrano, K. R. Kust, J. Miller, C. Fernandez del Rey, and K. Pape 2004. Catastrophic Winter Storm Mortality of Monarch Butterflies in Mexico during January 2002. pp. 151-166 in *The Monarch Butterfly: Biology and Conservation*. Oberhauser KS, Solensky MJ (eds). Cornell University Press, Ithaca, NY.
- Buck, R. E. 1983. Botanical survey for proposed University of California, Santa Cruz, Research and Development Center. Unpublished consultant's report prepared for Office of Campus Facilities, University of California, Santa Cruz, CA.

- Buck, R. E. 1986. Botanical survey for University of California, Santa Cruz Long Range Development Plan: baseline study. Unpublished consultant's report prepared for Office of Campus Facilities, University of California, Santa Cruz, CA.
- Buck, R. E. 1987. Botanical survey for University of California, Santa Cruz Long Range Development Plan: project actions, impacts, and mitigation measures. Unpublished consultant's report prepared for Office of Campus Facilities, University of California, Santa Cruz, CA.
- Buck, R. 2005. Botanist. Email to Joel Gerwein of Jones & Stokes Associates on February 16, 2005 regarding the undescribed sedge and April 26, 2005 regarding Santa Cruz manzanita.
- BUGGY Data Base. 2003a. Occurrence records for the San Francisco lacewing. Data base maintained by Entomological Consulting Services, Ltd. Pleasant Hill, CA.
- BUGGY Data Base. 2003b. Occurrence records for the unsilvered fritillary. Data base maintained by Entomological Consulting Services, Ltd. Pleasant Hill, CA.
- Bull, E. L. and H. D. Cooper. 1991. Vaux's swift nests in hollow trees. *Western Birds* 22:85–91.
- Bull, E. L. and J. E. Hohmann. 1993. The association between Vaux's swifts and old-growth forests in northwestern Oregon. *Western Birds* 24:38–42.
- Burt, W. H. and R. P. Grossenheider. 1976. *The Peterson Field Guide Series: A Field Guide to the Mammals*. Peterson, R. A. (ed.). Houghton Mifflin Company, Boston, MA.
- CalFlora: Information on California plants for education, research and conservation [web application]. 2000. Berkeley, California: The CalFlora Database. Available: www.calflora.org/.
- Cal-IPC (California Invasive Plant Council). 2005. Invasive Plant Inventory. 2005 Revision. Available: http://groups.ucanr.org/ceppc/List_Revision/Completed_PAFs.htm
- Campus Land Management Committee. 1981. Campus land management plan for the University of California at Santa Cruz. July.
- CDFa (California Department of Food and Agriculture). 2005. Pest Ratings of Noxious Weed Species. Available: http://www.cdfa.ca.gov/phpps/ipc/weedinfo/wininfo_list-pestrating.htm.
- CDFG (California Department of Fish and Game). 1995. Special Animals List. Wildlife and Habitat Data Analysis Branch, California Natural Diversity Database: Sacramento, CA. July. Available: <http://www.dfg.ca.gov/hcpb/species/lists.shtml>
- CDFG (California Department of Fish and Game). 2003. List of California Terrestrial Natural Communities Recognized by the California Natural Diversity Database. September 6 edition.
- CDFG (California Department of Fish and Game). 2005. Special animals list. Available: www.dfg.ca.gov/whdab/spanimals.pdf. June.
- Clark, D. 1997. December check list of birds on UC Santa Cruz. University of California Santa Cruz in-house document.

- CNDDDB (California Natural Diversity Database). 2005. RareFind 3, Version 3.0.5 (April 29, 2005 update). Sacramento, CA: California Department of Fish and Game.
- CNPS (California Native Plant Society). 2001a. Electronic inventory of rare and endangered vascular plants of California, Version 1.5.1 (Data updated October 10, 2001). Sacramento, CA.
- CNPS (California Native Plant Society). 2001b. *Inventory of rare and endangered plants of California* (sixth edition). Rare Plant Scientific Advisory Committee, David P. Tibor, Convening Editor. Sacramento, CA.
- CNPS (California Native Plant Society). 2003. Inventory of Rare and Endangered Plants (online edition, v6.2). Rare Plant Scientific Advisory Committee, David P. Tibor, convening editor. California Native Plant Society. Sacramento, CA. Available: <http://www.cnps.org/inventory>.
- CNPS (California Native Plant Society). 2005. Inventory of Rare and Endangered Plants (online edition, v6-05c). California Native Plant Society. Sacramento, CA. Available: <http://www.cnps.org/inventory>.
- Collett, R., K. S. Norris, J. E. Pepper, L. Cahn, K. Hart, C. Johnson, J. Mott-Smith, and S. Salasky. 1977. A proposed UC Santa Cruz natural resources management plan. August 26.
- Comrack, L. 2002. Draft yellow-breasted chat account. In: *The bird species of special concern*. California Department of Fish and Game and Pt. Reyes Bird Observatory.
- Dashe, M. L. 1982. Plant life. In: *The natural history of the UC Santa Cruz campus*, ed. S. F. Warrick, 105–161. Publication No. 11, Environmental Field Program. Santa Cruz, CA: University of California.
- Dashe, M. L. and S. Sellers. 1982. A guide to the common flowering plants. In *The natural history of the UC Santa Cruz campus*, ed. S. F. Warrick, 229–263. Publication No. 11, Environmental Field Program. Santa Cruz, CA: University of California.
- Daugherty, C. H., F. W. Allendorf, W. W. Dunlap, and K. L. Knudsen. 1983. Systematic implications of geographic pattern of genetic variation in the genus *Dicamptodon*. *Copeia* 1983, 679–691.
- Dayton, J. J. 2001. Letter to Bill Davilla of EcoSystems West Consulting Group regarding monarch butterfly habitat at the UC Santa Cruz Arboretum. Santa Cruz.
- Dayton, J. J. and E. A. Bell. 1992. Overwintering monarch butterflies at the UC Santa Cruz Arboretum, University of California, Santa Cruz. Santa Cruz. Prepared for the University of California, Santa Cruz.
- Dunn, J. and K. Garrett. 1997. *A field guide to the warblers of North America*. Boston and New York: Houghton Mifflin.
- Eckerle, K. P., and C. F. Thompson. 2001. Yellow-breasted chat (*Icteria virens*). In A. Poole and F. Gill (eds.), *The birds of North America*, No. 575. Philadelphia, PA: The Academy of Natural Sciences and Washington, DC: The American Ornithologists' Union.

- EcoSystems West (EcoSystems West Consulting Group). 2000. *University of California Santa Cruz California red-legged frog site assessment*. Draft. July 25. Prepared for UC Santa Cruz Campus Planning, Santa Cruz, CA.
- EcoSystems West (EcoSystems West Consulting Group). 2001. *Results of bat surveys at Inclusion Area D*. Santa Cruz. Prepared for the University of California, Santa Cruz.
- EcoSystems West (EcoSystems West Consulting Group). 2004a. *Botanical and Wildlife Assessment of the University of California, Santa Cruz north campus Study Area*. October. Prepared for University of California, Santa Cruz. Office of Physical Planning & Construction.
- EcoSystems West (EcoSystems West Consulting Group). 2004b. Draft Biological Assessment of the Proposed West Kiosk Improvement Area. January. Prepared for University of California Santa Cruz, Environmental Assessment Group. Santa Cruz, CA.
- Elkhorn Slough Coastal Training Program. 2004. Conservation Strategy for Coastal Prairie Conservation. March 10, 2004. Available at <http://www.elkhornsloughctp.org/uploads/1108496129DRAFTConservationStrategy.pdf>
- Entomological Consulting Services, Ltd. 2001. *UC Santa Cruz Inclusion Area D Project Report on Ohlone Tiger Beetle Survey*.
- Entomological Consulting Services, Ltd. 2002. UC Santa Cruz Campus-Wide Habitat Assessment for the Ohlone Tiger Beetle. Pleasant Hill, CA. Prepared for the Law Offices of Cheryl Tillotson, San Francisco, CA.
- Entomological Consulting Services, Ltd. 2003a. UC Santa Cruz—San Francisco Lacewing Survey Report. Letter report prepared for Jones & Stokes, dated July 2, 2003.
- Entomological Consulting Services, Ltd. 2003b. Ohlone Tiger Beetle Monitoring for 2003 in Marshall Field. Prepared for the University of California, Santa Cruz, Physical Plant, Ground Services. December 23.
- Ertter, B. 1993. A re-evaluation of the *Horkelia bolanderi* (Rosaceae) complex, with the new species *Horkelia yadonii*. *Systematic Botany* 18:137–144.
- Freitag, R., D. H. Kavanaugh, and R. Morgan. 1993. A new species of *Cicindela* (*Cicindela*) (Coleoptera: Carabidae: Cicindelini) from remnant native grassland in Santa Cruz County, California. *The Coleopterists Bulletin* 47:113-120.
- Gaines, D. 1992. *Birds of Yosemite and the east slope*. Lee Vining, CA: Artemisia Press.
- Garland, J. A. 1985. Identification of Chrysopidae in Canada, with bionomic notes (Neuroptera). *Canadian Entomologist* 117:737–762.
- Garrett, K. and J. Dunn. 1981. *Birds of Southern California*. Los Angeles, CA: Los Angeles Audubon Society.
- Good, D. A. 1989. Hybridization and cryptic species in *Dicamptodon* (Caudata: Dicamptodontidae). *Evolution* 43:728–744.

- Greenlee, J. 1978. Fire Management Plan. University of California, Santa Cruz, CA.
- Greenlee, J. M. and J. H. Langenheim. 1990. Historic fire regimes and their relation to vegetation patterns in the Monterey Bay Area of California. *American Midland Naturalist* 124:239-253.
- Griffin, J. R. 1978. Maritime chaparral and endemic shrubs of the Monterey Bay region. *Madrono* 25: 65-81.
- Grinnell, J. and A. H. Miller. 1944. *The distribution of the birds of California*. Berkeley, CA: Cooper Ornithological Club, Pacific Coast Avifauna. Number 27. Reprinted 1986. Lee Vining, CA: Artemisia Press.
- Grinnell, J., J. Dixon, and J. Linsdale. 1930. *Vertebrate natural history of a section of northern California through the Lassen Peak region*. Berkeley, CA: University of California Press.
- Hanes, T. L. 1977. California chaparral. Pages 417-469 In M. G. Barbour and J. Major, eds., *Terrestrial vegetation of California*. John Wiley and Sons, New York.
- Harrison, R. L. 1992. Toward a Theory of Inter-Refuge Corridor Design. *Conservation Biology*, Volume 6, No. 2.
- Hernandez, Charles. 2005. University Fire Marshal. Personal communications with Jones & Stokes. June.
- Hickman, J. C. (ed.). 1993. *The Jepson Manual: higher plants of California*. University of California Press, Berkeley, CA. 1400 pp.
- Hoffman, C. O. and J. L. Gottschang. 1977. Numbers, distribution and movements of a raccoon population in a suburban residential community. *Journal of Mammalogy* 58: 623-636.
- Holland, R. F. 1986. Preliminary descriptions of the terrestrial natural communities of California. Nongame-Heritage Program, California Department of Fish and Game, Sacramento, CA. 156 pp.
- Holz, Jen. 2004. Living with Wildlife at UC Santa Cruz. Available at <http://www2.ucsc.edu/police/wildlife.html>. Accessed on March 29, 2005.
- Huenneke, L. F. and H. A. Mooney. 1989. The California annual grassland: an overview. Pages 213-218 in L.F.A.H.M. Huenneke, editor. *Grassland Structure and Function: California Annual Grassland*. Kluwer Academic Publishers, Dordrecht, Netherlands.
- Jennings, M. R. and M. P. Hayes. 1994. *Amphibian and reptile species of special concern in California*. Contract number 8023. Final report submitted to the California Department of Fish and Game Inland Fisheries Division, Rancho Cordova, CA.
- Jones & Stokes. 2002. *California red-legged frog site assessment of the University of California, Santa Cruz Lower Campus*. Draft. San Jose, CA. Prepared for the Office of Current Planning Department, University of California, Santa Cruz.

- Jones & Stokes. 2003. *Biological Baseline Study of Inclusion Area D, University of California, Santa Cruz*. July. (J&S 02-278) Sacramento, CA. Prepared for Office of Physical Planning and Construction, Campus and Community Planning Office, University of California, Santa Cruz.
- Jones & Stokes. 2004. *Biological Baseline Study of the Lower, Central, and Upper Campus, University of California, Santa Cruz*. August. (J&S 02-778) Sacramento, CA. Prepared for Office of Physical Planning and Construction, Campus and Community Planning Office, University of California, Santa Cruz.
- Jones & Stokes. 2005. *Final habitat conservation plan, Ranch View Terrace, University of California, Santa Cruz*. February. (J&S 02-428.) Sacramento, CA. Prepared for Office of Physical Planning and Construction, Campus and Community Planning Office, University of California, Santa Cruz.
- Keeley, J. E. 1987. Role of fire in seed germination of woody taxa in California chaparral. *Ecology* 68:434-443.
- Knisley, C. B. and J. M. Hill. 1989. Human impact on *Cicindela dorsalis dorsalis* at Flag Ponds, Maryland. Final report to USFWS, Annapolis Field Office.
- Lake, D. 2004. Rare, Unusual, and Significant Plants of Alameda and Contra Costa Counties. California Native Plant Society, East Bay Chapter.
- Linthicum, J. 2005. Avian Biologist, Santa Cruz Predatory Bird Research Group. Personal communication with Mathew Jones, Jones & Stokes.
- Lowther, P. E., C. Celada, N. K. Klein, C. C. Rimmer, and D. A. Spector. 1999. Yellow warbler (*Dendroica petechia*). In: *The birds of North America*, ed. A. Poole and F. Gill. No. 454. Philadelphia, PA and Washington, DC: The Academy of Natural Sciences, The American Ornithologists' Union.
- LSA Associates, Inc. 2003. Literature Review Paper: Ventura 118 Wildlife Corridor Assessment Project. Prepared for: Caltrans District 7, Division of Environmental Planning. July 23, 2003.
- Luckenbach, R. A. 1982. Animals. In *The natural history of the UC Santa Cruz campus*, ed. S. F. Warrick, 163–227. Publication No. 11, Environmental Field Program. Santa Cruz, CA: University of California.
- Marks, J. S. 1986. Nest site characteristics and reproductive success of large-eared owls in southwestern Idaho. *Wilson Bull.* 98:547-560.
- Mayer, K. E. and W. F. Laudenslayer, Jr. 1988. *A guide to wildlife habitats of California*. Sacramento, CA: California Department of Forestry and Fire Protection.
- McBride, J. R. 1987. Analysis of Vegetation and Land Management Program. Prepared for the University of California, Santa Cruz. Albany, CA.

- McBride, J. R. 2005. Professor of Forestry, University of California Berkeley. July 19, 2005. Email correspondence to Joel Gerwein of Jones & Stokes Associates.
- Miles, S. R. and C. B. Goudy. 1997. Ecological subregions of California: section and subsection descriptions. USDA Forest Service Pacific Southwest Region Technical Paper R5-EM-TP-005, San Francisco, CA.
- Monroe, Mia. 2002. National Park Service. Personal communication, February 2002, cited in Presidio Trust. 2002. Water Recycling Project Environmental Assessment. Available: <http://www.presidio.gov/Trust/Documents/EnvironmentalPlans/>
- Morgan, R. 1987. *Botanical survey for University of California, Santa Cruz, long range development plan*. Supplement I. Soquel, CA. Prepared for the Campus and Community Planning Department, University of California, Santa Cruz.
- Morgan, R. 2000. *Inclusion Area D project biotic study*. (Draft). Santa Cruz. Prepared for University of California, Santa Cruz.
- Muchmore, W. B. 1996. Another pseudoscorpion from Empire cave, Santa Cruz County, California (Chthoniidae). *Journal of Arachnology* 24:74–75.
- Muchmore, W. B. and J. C. Cokendolpher. 1995. Generic placement of the Empire cave pseudoscorpion, *Microcreagris imperialis* (Neobisiidae), a potentially endangered arachnid. *Journal of Arachnology* 23:171–176.
- Myers, N., R. A. Mittermeier, C. G. Mittermeier, G. A. B. da Fonseca, and J. Kent. 2000. Biodiversity hotspots for conservation priorities. *Nature*, 403, 853-858.
- Natural Resources Conservation Service. 2002. Letter report, Subject: Soils Occupied by the Ohlone Tiger Beetle. Dated 28 May 2002 and addressed to Kelli Camara, USDA-NRCS. Capitola, CA.
- Norris, R. M. and R. W. Webb. 1990. *Geology of California*. Second edition. New York, NY: John Wiley & Sons.
- Nussbaum, R. A., E. D. Brodie, Jr., and R. M. Storm. 1983. Amphibians and reptiles of the Pacific northwest. University of Idaho Press, Moscow, ID.
- Oehler, J. D. and J. A. Litvaitis. 1996. The role of spatial scale in understanding responses of medium-sized carnivores to forest fragmentation. *Canadian Journal of Zoology* 74: 2070–2079.
- Ogden (Ogden Environmental and Energy Services Company, Inc.). 1992. Baldwin Otay Ranch Wildlife Corridor Studies. Unpublished report prepared for Otay Ranch Project Team.
- Pelc, N. H. 1995. A study of the wintering population of burrowing owls on the University of California at Santa Cruz. Prepared for Margaret Fusari, Director, Campus Natural Reserves, University of California, Santa Cruz.
- Petit, D., K. Petit, and L. Petit. 1990. Geographic variation in foraging ecology of North American insectivorous birds. *Studies in Avian Biology* 13:254–263.

- Pierson, E. D. 1988. The status of Townsend's big-eared bats in California: Preliminary results 1987–1988. Unpublished Progress Report, Wildlife Management Division, California Department of Fish and Game, Sacramento, CA.
- Pierson, E. D. and W. R. Rainey. 1988. Distribution, status, and management of Townsend's big-eared bat (*Corynorhinus townsendii*) in California. Wildlife Management Division Bird and Mammal Conservation Program Final Report for Contract No. FG7129. BMCP Technical Report Number 96–7.
- Preston, R. 2005. Senior Botanist, Jones & Stokes. Email to Joel Gerwein, Jones & Stokes.
- Raven, Dean. 2004. UC Santa Cruz Grounds Services Superintendent. Personal Communication.
- RHJV (Riparian Habitat Joint Venture). 2004. Version 2.0. The riparian bird conservation plan: a strategy for reversing the decline of riparian associated birds in California. California Partners in Flight. <http://www.prbo.org/calpif/pdfs/riparian.v-2.pdf>.
- Riley, S. P., D. J. Hadidian, and D. A. Manski. 1998. Population density, survival, and rabies in raccoons in an urban national park. *Canadian Journal of Zoology* 76: 1153–1164.
- Roberson, D. and C. Tenney (eds.). 1993. *Atlas of the breeding birds of Monterey County, California*. Monterey, CA: Monterey Peninsula Audubon Society.
- Santa Cruz CNPS (Chapter of the California Native Plant Society). 2005. Local Plant Communities. Accessed August 31, 2005. Available: <http://www.cruzcnp.org/CoastalTerracePrairie.html>
- Sawyer, J. O. and T. Keeler-Wolf. 1995. *A Manual of California Vegetation*. California Native Plant Society. Sacramento, CA.
- Schinner, J. R. and D. Cauley. 1974. The ecology of urban raccoons in Cincinnati, Ohio. In J. H. Noyes and D. R. Progulsk, editors, *Wildlife in an urbanizing environment*, pp. 125–130. University of Massachusetts, Springfield.
- Sculley, C. 2002. HCP Coordinator, U.S. Fish and Wildlife Service - Ventura Field Office. Personal communication.
- Sinervo, B. 2005. Professor of Ecology & Evolutionary Biology, UC Santa Cruz. Personal communication.
- Smith, R. C. 1932. The Chrysopidae (Neuroptera) of Canada. *Annals of the Entomological Society of America* 25:579–601.
- Sonenshine, D. E. and E. L. Winslow. 1972. Contrasts in distribution of raccoons in two Virginia localities. *Journal of Wildlife Management* 36: 838–847.
- Stanley, J. T., K. B. Lyons, M. Noelle, and B. Mori. 1990. Forest springs survey and wildlife assessment of the proposed colleges 9/10 site, University of California, Santa Cruz. Report prepared for the Environmental Assessment Group, Campus Facilities. Habitat Restoration Group. Scotts Valley, CA.

- Steele, C. A., B. C. Carstens, A. Storfer, J. Sullivan. 2005. Testing hypotheses of speciation timing in *Dicamptodon copei* and *Dicamptodon aterrimus* (Caudata: Dicamptodontidae). Revised 6 December 2004. Online at: <http://www.webpages.uidaho.edu/~jacks/SteeleEtAl.pdf>. Published in *Molecular Phylogenics and Evolution* Vol. 36, No. 1 (2005), pp. 90-100.
- Stein B., L. S. Kutner, and J. S. Adams. 2000. *Precious Heritage: The Status of Biodiversity in the United States*. Oxford: Oxford University Press. 399 pp.
- Stendell, R. C. and P. Myers. 1973. White-tailed kite predation on fluctuating vole population. *Condor* 75: 359-360.
- Sterling, J. and P. W. C. Paton. 1996. Breeding distribution of Vaux's Swift in California. *Western Birds* 27:30-40.
- Suddjian, D. 2004. *The checklist of the birds of Santa Cruz County, California*. Published by the Santa Cruz Bird Club in 2003. Available at: santacruzbirdclub.org/chlists.html. Last updated December 31, 2004.
- Taylor, O. R. 2002. Catastrophic mortality at the monarch overwintering sites in Mexico. Accessed at <http://www.monarchwatch.org/news/021102.html>.
- Thomas, J. H. 1961. *Flora of the Santa Cruz Mountains of California: a manual of the vascular plants*. Stanford, CA: Stanford University Press.
- Toschi, C. A. 1966. The taxonomy, life histories, and mating behavior of the Green Lacewings of Strawberry Canyon (Neuroptera: Chrysopidae). *Hilgardia* 36(11):391-431.
- Tyler, C. M. 1996. Relative importance of factors contributing to postfire seedling establishment in maritime chaparral. *Ecology* 77:2182-2195.
- Ubick, D. 2001. *Cavernicolous invertebrates of Cave Gulch, Santa Cruz County, California*. San Francisco, CA: California Academy of Sciences. Available on-line at www.parks.ca.gov/pages/734/files/cavebio.pdf.
- UCSC (University of California, Santa Cruz). 1988. *Long range development plan*. Available at: www2.ucsc.edu/ppc/lrdp/graphical/figures/lrdp.html.
- UCSC (University of California, Santa Cruz). 1989. *Environmental impact report—University of California, Santa Cruz Long Range Development Plan*. Santa Cruz, CA. University of California, Santa Cruz, Environmental Assessment Group, Physical Planning and Construction, University of California, Santa Cruz.
- UCSC (University of California, Santa Cruz). 2004. *Environmental Impact Report—University of California, Santa Cruz Marine Science Campus Coastal Long Range Development Plan*. Santa Cruz, CA. Prepared by Environmental Science Associates for the University of California, Santa Cruz, Environmental Assessment Group, Physical Planning and Construction, University of California, Santa Cruz.

- USFWS (U.S. Fish and Wildlife Service). 2001. Endangered and Threatened Wildlife and Plants: Endangered Status for the Ohlone Tiger Beetle (*Cicendela ohlone*). Federal Register 66:50340–50349.
- USFWS (U.S. Fish and Wildlife Service). 2004. USFWS Section 10(a)(1)(A) Scientific Permit Requirements for Conducting Presence/Absence Surveys for Endangered Karst Invertebrates in Central Texas. March 11, 2004. Austin Ecological Services Field Office, U.S. Fish and Wildlife Service, 10 pp.
- U.S. Soil Conservation Service. 1980. *Soil Survey of Santa Cruz County, California*. Washington, DC: U.S. Government Printing Office.
- Van Dyke, E., K. D. Holl, and J. Griffin. 2002. Maritime chaparral transition in the Prunedale Hills. *Madroño* 48: 221-229.
- Veni, G. and J. R. Reddell. 2002. Protocols for Assessing Karst Features for Endangered Invertebrate Species. Report by George Veni and Associates, San Antonio, Texas.
- Warner, R. M. and N. J. Czaplewski. 1984. *Myotis volans*. *Mammalian Species* 224:1–4. American Society of Mammologists.
- Warrick, S. F. (ed.). 1982. *The natural history of the UC Santa Cruz campus*. Publication No. 11, Environmental Field Program. Santa Cruz, CA: University of California.
- Watkins, R. Z., J. Chen, J. Pickens, and K. D. Brososke. 2003. Effects of Forest Roads on Understory Plants in a Managed Hardwood Landscape. *Conservation Biology* 17:2, pp. 411-419.
- Weiner, R. and K. Norris. 1983. *A plan for a natural areas reserve at UC Santa Cruz campus*. Publication No. 12. Santa Cruz, CA: University of California Environmental Field Program.
- Wild, Kathryn. 2002. San Francisco Bay Area Gap Analysis: A Preliminary Assessment of Priorities for Protecting Natural Communities. Prepared for the California State Coastal Conservancy, Oakland, CA. November.
- Williams, D. F. 1986. *Mammalian species of special concern in California*. Wildlife Management Division Administrative Report 86-1. California Department of Fish and Game.
- Zeiner, D. C., W. F. Laudenslayer, Jr., K. E. Mayer, and M. White (eds.). 1990. *California's wildlife*. Volume II: *Birds*. California Statewide Wildlife Habitat Relationships System. Sacramento, CA: California Department of Fish and Game.

**Table 4.4-1
Special-Status Plants Occurring or Potentially Occurring On Campus**

Species Common Name^a	USFWS Listing^b	State Status^c	CNPS Status^d	Habitat Type^e	Flowering Period	Distribution by County^f	Potential for Occurrence on Campus
<i>Amsinckia lunaris</i> bent-flowered fiddleneck	None	None	2-2-3 List 1B	Cismontane woodland, valley and foothill grassland, coastal bluff scrub	Mar–Jun	ALA, CCA, COL, LAK, MRN, NAP, SCR, SHA, SIS, SMT, SON	Reported from campus in Buck (1986), but no specific location given and no occurrences currently known
<i>Anomobryum filiforme</i> moss without common name	None	None	3-2-1 List 2	Broadleaf upland forest, lower montane coniferous forest, North Coast coniferous forest, on damp rocks and soil on outcrops	N/A	HUM, MPA(?), SCR, Oregon	Potential habitat present in mixed evergreen forest and redwood forest
<i>Arctostaphylos andersonii</i> Santa Cruz manzanita	None	None	2-2-3 List 1B	Chaparral; openings in and edges of broadleafed upland forest and north coast coniferous forest	Nov–Apr	SCL, SCR, SMT	Present in north Campus
<i>Arctostaphylos pajaroensis</i> Pajaro manzanita	None	None	2-3-3 List 1B	Chaparral in sandy soils	Dec–Mar	MNT, SCR*	Not present
<i>Arctostaphylos silvicola</i> Bonny Doon manzanita	None	None	2-2-3 List 1B	Inland marine sands in chaparral, closed-cone coniferous forest, sand parkland, sandhill ponderosa pine forest	Feb–Mar	SCR	Not Present
<i>Arenaria paludicola</i> marsh sandwort	E	E	3-3-2 List 1B	Freshwater marshes, bogs, and fens	May–Aug	LAX*, MEN, SBD*, SCR*, SFO*, SLO, Washington*	Not Present
<i>Campanula californica</i> swamp harebell	None	None	2-2-3 List 1B	Moist places: bogs and fens, closed-cone coniferous forest, coastal prairie, meadows, freshwater marshes and swamps, North Coast coniferous forest	Jun–Oct	MEN, MRN, SCR*, SON	Not present
<i>Carex comosa</i> bristly sedge	None	None	3-3-1 List 2	Marshes and swamps, lake margins, valley and foothill grasslands	May–Sep	CCA, LAK, MEN, SBD*, SCR*, SFO*, SHA, SJQ, SON, Idaho, Oregon*, Washington, other states	Not present

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<i>Carex saliniformis</i> deceiving sedge	None	None	2-2-3 List 1B	Coastal prairie, coastal scrub, meadows, coastal salt marshes	June	HUM, MEN, SCR*, SON	Not present
<i>Chorizanthe pungens</i> var. <i>hartwegiana</i> Ben Lomond spineflower	E	None	2-3-3 List 1B	Inland marine sands in chaparral, closed-cone coniferous forest, sand parkland, sandhill ponderosa pine forest	Apr–Jul	SCR	Reported from campus in Buck (1986), but no specific location given and no occurrences currently known
<i>Chorizanthe robusta</i> var. <i>hartwegii</i> Scotts Valley spineflower	E	None	3-3-3 List 1B	Meadows, grasslands in sandy or mudstone soil (Purissima outcrops)	Apr–Jul	SCR	Not present
<i>Chorizanthe robusta</i> var. <i>robusta</i> robust spineflower	E	None	3-3-3 List 1B	Coastal dunes, coastal scrub, openings in cismontane woodland, in sandy or gravelly soil	Apr–Sep	ALA*, MNT, SCL*, SCR, SMT*	Not present
<i>Collinsia multicolor</i> San Francisco collinsia	None	None	2-2-3 List 1B	Closed-cone coniferous forest, coastal scrub sometimes in serpentinitic soil, broadleafed upland forest	Mar–May	MNT, SCR, SCL, SFO, SMT	Not present
<i>Cupressus abramsiana</i> Santa Cruz cypress	E	E	3-2-3 List 1B	Closed-cone coniferous forest, sandhill ponderosa pine forest on sandstone or granitic substrate	N/A	SCR, SMT	Not present
<i>Elymus californicus</i> California bottlebrush grass	None	None	1-1-3 List 4	Cismontane woodland, North Coast coniferous forest, broadleafed upland forest, riparian woodland	May–(Nov)	MNT?, MRN, SCR, SMT, SON	Reported from campus in Buck (1986), but no specific location given and no occurrences presently known
<i>Eriogonum nudum</i> var. <i>decurrens</i> Ben Lomond buckwheat	None	None	3-3-3 List 1B	Inland marine sands in chaparral, closed-cone coniferous forest, sand parkland, sandhill ponderosa pine forest	Jun–Oct	SCR, ALA	Not present
<i>Erysimum teretifolium</i> Santa Cruz wallflower	E	E	2-3-3 List 1B	Inland marine sands in chaparral, closed-cone coniferous forest, sand parkland, sandhill ponderosa pine forest	Mar–Jul	SCR	Not present

**Table 4.4-1
Special-Status Plants Occurring or Potentially Occurring On Campus**

Species Common Name^a	USFWS Listing^b	State Status^c	CNPS Status^d	Habitat Type^e	Flowering Period	Distribution by County^f	Potential for Occurrence on Campus
<i>Fissidens pauperculus</i> Moss without common name	None	None	2-2-3 List 1B	North Coast coniferous forest in damp soil	N/A	HUM, MNT, MRN, SCR	Potential habitat present in redwood forest
<i>Grindelia hirsutula</i> var. <i>maritima</i> San Francisco gumplant	None	None	2-2-3 List 1B	Coastal bluff scrub, coastal scrub, valley and foothill grassland, in sandy or serpentine soil	Aug–Sep	MNT, MRN, SCR, SFO, SLO, SMT	Not present
<i>Hoita strobilina</i> Loma Prieta hoita	None	None	2-3-3 List 1B	Moist sites in chaparral, cismontane woodland, riparian woodland, usually serpentine soil	May–Oct	ALA*, CCA*, SCL, SCR	Not present
<i>Holocarpha macradenia</i> Santa Cruz tarplant	T	E	3-3-3 List 1B	Coastal prairie, valley and foothill grassland, often in clay soils	Jun–Oct	ALA*, CCA*, MNT, MRN*, SCR	Not present naturally but a population was planted within grazing exclosures in the East Meadow as part of a research project on campus.
<i>Horkelia cuneata</i> ssp. <i>sericea</i> Kellogg's horkelia	None	None	3-3-3 List 1B	Openings in closed-cone coniferous forest, maritime chaparral, coastal scrub, coastal prairie, in sandy or gravelly soil	Apr–Sep	ALA*, MRN*, MNT, SBA, SCR, SFO*, SLO, SMT	Not present
<i>Horkelia marinensis</i> Point Reyes horkelia	None	None	3-2-3 List 1B	Coastal dunes, coastal prairie, coastal scrub in sandy soil	May–Sep	MEN, MRN, SCR, SMT	Present in Marshall Field
<i>Linanthus grandiflorus</i> large-flower linanthus	None	None	1-2-3 List 4	Coastal scrub, coastal bluff scrub, closed-cone coniferous forest, cismontane woodland, coastal dunes, coastal prairie, valley and foothill grassland, usually in sandy soil	Apr–Aug	ALA, KRN, MAD, MER, MNT, MRN, SBA*, SCL, SCR, SFO, SLO, SMT, SON	Not present
<i>Malacothamnus arcuatus</i> arcuate bush mallow	None	None	2-2-3 List 1B	Chaparral	Apr–Sep	SCL, SCR, SMT	Not present
<i>Microseris paludosa</i> marsh microseris	None	None	2-2-3 List 1B	Moist places in closed-cone coniferous forest, cismontane woodland, coastal scrub, valley and foothill grassland	Apr–Jun	MEN, MNT, MRN, SCR, SFO*, SLO, SMT*, SON	Reported from lower campus in mima mound/coastal prairie

**Table 4.4-1
Special-Status Plants Occurring or Potentially Occurring On Campus**

Species Common Name^a	USFWS Listing^b	State Status^c	CNPS Status^d	Habitat Type^e	Flowering Period	Distribution by County^f	Potential for Occurrence on Campus
<i>Mielichhoferia elongata</i> Moss without common name	None	None	2-2-1 List 2	Cismontane woodland on metamorphic rock, usually vernal wet	N/A	FRE, MPA, SCR, TRI, TUL, widespread outside California	Potential habitat not present
<i>Pedicularis dudleyi</i> Dudley's lousewort	None	R	3-2-3 List 1B	Maritime chaparral, North Coast coniferous forest, valley and foothill grassland	Apr–Jun	MNT, SCR*, SLO, SMT	Not present
<i>Penstemon rattanii</i> var. <i>kleei</i> Santa Cruz Mountains beardtongue	None	None	3-2-3 List 1B	Chaparral, lower montane coniferous forest, North Coast coniferous forest, often in sandy soil	May–Jun	SCL, SCR	Not present
<i>Pentachaeta bellidiflora</i> white-rayed pentachaeta	E	E	3-3-3 List 1B	Valley and foothill grassland, coastal scrub, coastal prairie	Mar–May	MRN*, SCR*, SMT	Not present
<i>Plagiobothrys diffusus</i> San Francisco popcornflower	None	E	3-3-3 List 1B	Coastal prairie; valley and foothill grassland	Mar–Jun	ALA, SCR, SFO*	Known to occur in Marshall Field
<i>Polygonum hickmanii</i> Scotts Valley polygonum	PE	None	3-3-3 List 1B	Grassland in mudstone or sandstone	May–Aug	SCR	Not present
<i>Sidalcea malachroides</i> maple-leaved checkerbloom	None	None	2-2-2 List 1B	Broadleaved upland forest, coastal prairie, coastal scrub, North Coast coniferous forest, often in disturbed places	Apr–Aug	DNT, HUM, MEN, MNT, SCL, SCR, SON, Oregon	Not present
<i>Silene verecunda</i> ssp. <i>verecunda</i> San Francisco campion	None	None	3-2-3 List 1B	Coastal bluff scrub, chaparral, coastal prairie, coastal scrub, valley and foothill grassland, generally in sandy or rocky soil	Mar–Aug	SCR, SFO, SMT	Not present
<i>Stebbinsoseris decipiens</i> Santa Cruz microseris	None	None	2-2-3 List 1B	Open areas in broadleaved upland forest, closed-cone coniferous forest, chaparral, coastal prairie, coastal scrub	Apr–May	MNT, MRN, SCR	Not present

**Table 4.4-1
Special-Status Plants Occurring or Potentially Occurring On Campus**

Species Common Name ^a	USFWS Listing ^b	State Status ^c	CNPS Status ^d	Habitat Type ^e	Flowering Period	Distribution by County ^f	Potential for Occurrence on Campus
<i>Trifolium buckwestiorum</i> Santa Cruz clover	None	None	3-3-3 List 1B	Coastal prairie, broadleaved upland forest, cismontane woodland	Apr–Oct	MNT, SCR, SON	Not present

^a Nomenclature follows Hickman (1993) and CNPS (2001)

^b U.S. Fish and Wildlife Service E = Endangered; PE = Proposed Endangered; T = Threatened

^c Section 1904, California Fish and Game Code. California Department of Fish and Game. E = Endangered; R = Rare

^d CNPS On-Line Inventory of Rare Plants, 6th Edition (Database as of September 28, 2001)

Top line: CNPS R-E-D (Rarity-Endangerment-Distribution) code. Rarity: 1 = Rare, but found in sufficient numbers and distributed widely enough that the potential for extinction is low at this time; 2 = Occurrence confined to several populations or to one extended population; 3 = Occurrence limited to one or a few highly restricted populations, or present in such small numbers that it is seldom reported. Endangerment: 1 = Not endangered; 2 = Endangered in a portion of its range; 3 = Endangered throughout its range. Distribution: 1 = More or less widespread outside California; 2 = Rare outside California; 3 = Endemic to California.

Bottom Line: CNPS List. List 1B: Rare, Threatened, or Endangered in California and elsewhere. List 2: Rare, Threatened, or Endangered in California, more common elsewhere. List 3: Plants about which more information is needed. List 4: Plants of limited distribution: a watch list.

^e Thomas (1961), Munz and Keck (1973), Hickman (1993), CNPS (2001b), and unpublished information.

^f California Native Plant Society On-Line Inventory of Rare Plants, 6th Edition (Database as of September 28, 2001); counties abbreviated by a three-letter code (below); occurrence in other states as indicated.

ALA: Alameda

MEN: Mendocino

SBD: San Bernardino

SMT: San Mateo

AMA: Amador

MER: Merced

SBT: San Benito

SOL: Solano

BUT: Butte

MNT: Monterey

SCL: Santa Clara

SON: Sonoma

CCA: Contra Costa

MOD: Modoc

SCR: Santa Cruz

SRO: Santa Rosa Island (SBA Co.)

COL: Colusa

MPA: Mariposa

SCZ: Santa Cruz Island (SBA Co.)

STA: Stanislaus

DNT: Del Norte

MRN: Marin

SDG: San Diego

TEH: Tehama

FRE: Fresno

NAP: Napa

SFO: San Francisco

TRI: Trinity

GLE: Glenn

NEV: Nevada

SHA: Shasta

TUL: Tulare

HUM: Humboldt

ORA: Orange

SIE: Sierra

TUO: Tuolumne

KRN: Kern

PLA: Placer

SIS: Siskiyou

VEN: Ventura

LAK: Lake

PLU: Plumas

SJQ: San Joaquin

YUB: Yuba

LAX: Los Angeles

SAC: Sacramento

SLO: San Luis Obispo

* Presumed extinct in these counties or states.

MAD: Madera

SBA: Santa Barbara

**Table 4.4-2
Special-Status Wildlife Species Occurring or Potentially Occurring in the Study Area**

Common Name (Scientific Name)	Federal/State/ WBWG Status^a	California Distribution	Habitat Requirements	Potential to Occur in Study Area	Information on Occurrence in Study Area
Invertebrates					
Ohlone tiger beetle (<i>Cicindela ohlone</i>)	PE/-	Known from 15 locations in Santa Cruz County, including Scotts Valley, UC Santa Cruz, Pogonip, and Santa Cruz Gardens	Coastal prairie and open grassland on Watsonville loam soils with barren areas for foraging and thermoregulation	High	Known to occur in grasslands in Marshall Field and the southwestern corner of the campus
Santa Cruz rain beetle (<i>Pleocoma conjungens conjungens</i>)	SC/-	Known from Santa Cruz, Ben Lomond, Felton, Mt. Hermon, Scotts Valley, Redwood Glen, and Waddell Creek in Santa Cruz County	Sandy soils, especially in sand parkland habitat. The Waddell Creek collection was in coastal sage scrub and redwood forest habitat	Low	Unlikely to occur because of lack of suitable habitat
San Francisco lacewing (<i>Nothochrysa californica</i>)	SC/-	Several locations throughout the Coast Ranges from Mendocino to Los Angeles, including Santa Cruz and the Berkeley Hills	Associated with riparian areas, oak woodlands, and coastal scrub habitats	Moderate	Last observed on campus in 1965 near Empire Grade (BUGGY database 2003). Not observed in 2003 during focused surveys (Entomological Consulting Services 2003), but suitable habitat is present in upper and lower campus areas.
Monarch butterfly (<i>Danaus plexippus</i>)	SC/-	Throughout California	Groves of trees, especially eucalyptus, Monterey pine, and Monterey cypress	High	Known to overwinter in the Arboretum eucalyptus grove
Unsilvered fritillary butterfly (<i>Speyeria adiastrae adiastrae</i>)	SC/-	Southern portions of the San Francisco peninsula from San Mateo south through the Santa Clara Valley and Santa Cruz mountains, and into the Santa Lucia Mountains in Monterey	Grasslands in or near redwood forests or in oak woodlands. Larval food plant is <i>Viola pedunculata</i>	Low	Unlikely to occur on campus; not known to occur on or within 5 miles of campus. However, potential breeding habitat may be present when its host plant <i>Viola pedunculata</i> is present. Adults may rarely forage at any nectar source on campus.

**Table 4.4-2
Special-Status Wildlife Species Occurring or Potentially Occurring in the Study Area**

Common Name (Scientific Name)	Federal/State/ WBWG Status^a	California Distribution	Habitat Requirements	Potential to Occur in Study Area	Information on Occurrence in Study Area
Stohbeen's parnassian butterfly (<i>Parnassius clodius strohbeeni</i>)	Former Candidate/–	Once found throughout the Santa Cruz Mountains	Associated with riparian forests, especially redwood riparian areas	Low	Thought to be extinct. Suitable habitat exists in Cave Gulch.
Santa Cruz telemid spider (<i>Telemid sp.</i>)	SC/–	Known only from Empire Cave	Known only from Empire Cave	High	Known to occur in Empire Cave
Dolloff Cave spider (<i>Meta dolloff</i>)	SC/–	Known from Empire and Dolloff Caves	Known from Empire and Dolloff Caves	High	Known to occur in Empire and Dolloff Caves
Empire Cave pseudoscorpion (<i>Microcraegris imperialis</i>)	SC/–	Known from Empire Cave	Known only from Empire Cave	High	Known only from Empire Cave
MacKenzie's cave amphipod (<i>Stygobromus mackenze</i>)	SC/–	Known only from Empire Cave	Known only from Empire Cave	High	Known only from Empire Cave
Amphibians					
California red-legged frog (<i>Rana aurora draytonii</i>)	T/SSC	Along the coast and coastal mountain ranges from Humboldt [Text says Marin] to San Diego Counties; Sierra Nevada (mid-elevations [above 1,000 feet]) from Butte to Fresno Counties)	Permanent and semipermanent aquatic habitats, such as creeks and cold-water ponds, with emergent and submergent vegetation and riparian species along the edges; may aestivate in rodent burrows or cracks during dry periods	High	Known to breed in Arboretum Pond; also known to occur in the west and east forks of lower Moore Creek

**Table 4.4-2
Special-Status Wildlife Species Occurring or Potentially Occurring in the Study Area**

Common Name (Scientific Name)	Federal/State/ WBWG Status^a	California Distribution	Habitat Requirements	Potential to Occur in Study Area	Information on Occurrence in Study Area
Reptiles					
Southwestern pond turtle (<i>Clemmys marmorata pallida</i>)	SC/SSC	Along the central coast east to the Sierra Nevada and along the southern California coast inland to the Mojave and Sonora Deserts; range overlaps with that of northwestern pond turtle throughout the Delta and in the Central Valley from Sacramento to Tulare Counties	Woodlands, grasslands, and open forests; aquatic habitats, such as ponds, marshes, or streams, with rocky or muddy bottoms and vegetation for cover and food	Moderate to high	Potential habitat in Arboretum Pond and lower Moore Creek; CNDDB lists an adult turtle in Moore Creek just south of the campus
Coast horned lizard (<i>Phrynosoma coronatum frontale</i>)	SC/SSC	Sacramento Valley, including foothills, south to southern California; Coast Ranges south of Sonoma County; below 4,000 feet elevation in northern California	Grasslands, brushlands, woodlands, and open coniferous forest with sandy or loose soil; requires abundant ant colonies for foraging	Moderate	Suitable habitat present in the grassland areas that are not too densely vegetated, open coniferous forest, chaparral portions of the campus
Birds					
Sharp-shinned hawk (<i>Accipiter striatus</i>)	-/SSC	Permanent resident in the Sierra Nevada, Cascade, Klamath, and North Coast Ranges at mid-elevations and along the coast in Marin, San Francisco, San Mateo, Santa Cruz, and Monterey Counties; winters over the rest of the state except at very high elevations	Dense canopy ponderosa pine or mixed-conifer forest and riparian habitats	High	Known to nest near the Baskin Engineering building (Ecosystems West 2001); suitable nesting and foraging habitat throughout the campus area

**Table 4.4-2
Special-Status Wildlife Species Occurring or Potentially Occurring in the Study Area**

Common Name (Scientific Name)	Federal/State/ WBWG Status^a	California Distribution	Habitat Requirements	Potential to Occur in Study Area	Information on Occurrence in Study Area
Golden eagle (<i>Aquila chrysaetos</i>)	PR, SC/FP	Foothills and mountains throughout California; uncommon nonbreeding visitor to lowlands such as the Central Valley	Cliffs and escarpments or tall trees for nesting; annual grasslands, chaparral, and oak woodlands with plentiful medium and large-sized mammals for prey	High	An adult and a juvenile observed foraging and perching in the grassland area east of Hagar Drive (Jones & Stokes 2004). No recent records of nesting in campus area. High level of human disturbance most likely precludes nesting. Suitable foraging habitat in the more open (grasslands) areas on campus.
Bald eagle (<i>Haliaeetus leucocephalus</i>)	PD, PR/E, FP	Nests in nine northern California counties and in the Lake Tahoe Basin; reintroduced into central coast; winter range includes the rest of California except the southeastern deserts, very high altitudes in the Sierras, and east of the Sierra Nevadas south of Mono County; range expanding	In western North America, nests and roosts in coniferous forests within 1 mile of a lake, a reservoir, a stream, or the ocean	Low	No records of breeding in the Santa Cruz campus area (high level of human disturbance most likely precludes nesting); outside of current breeding range in California
Northern harrier (<i>Circus cyaneus</i>)	-/SSC	Throughout lowland California; has been recorded in fall at high elevations	Grasslands, meadows, marshes, and seasonal and agricultural wetlands providing tall cover	High	Observed foraging north of the Arboretum (Jones & Stokes 2004). Suitable nesting and foraging habitat available in the tall grasslands on the lower campus.
White-tailed kite (<i>Elanus caeruleus</i>)	-/FP	Lowland areas west of Sierra Nevada from head of Sacramento Valley south, including coastal valleys and foothills to western San Diego County at the Mexico border	Low foothills or valley areas with valley or live oaks, riparian areas, and marshes near open grasslands for foraging	High	Observed foraging north of the Arboretum (Jones & Stokes 2004). Known to nest in the north campus.

**Table 4.4-2
Special-Status Wildlife Species Occurring or Potentially Occurring in the Study Area**

Common Name (Scientific Name)	Federal/State/ WBWG Status^a	California Distribution	Habitat Requirements	Potential to Occur in Study Area	Information on Occurrence in Study Area
Ferruginous hawk (nesting and wintering) (<i>Buteo regalis</i>)	SC/SSC	Does not nest in California; winter visitor along coast from Sonoma to San Diego Counties, east to the Sierra Nevada foothills, southeastern deserts, Inyo-White Mountains, plains east of the Cascade Range, and Siskiyou County	Open terrain in plains and foothills where ground squirrels and other prey are available	Low	Does not nest in California. Uncommon to rare winter visitor in Santa Cruz County where large open areas for foraging are available (Suddjian 2002)
Loggerhead shrike (<i>Lanius ludovicianus</i>)	SC/SSC	Resident and winter visitor in lowlands and foothills throughout state; less common on coastal slope north to Mendocino County	Prefers open habitats with scattered shrubs, trees, posts, fences, utility lines, or other perches	Low	Fairly common in Santa Cruz County in summer (Suddjian 2000); potential foraging habitat in the open grassland areas on lower campus. No records of birds nesting on campus.
Vaux's swift (<i>Chaetura vauxi</i>)	-/SSC	Coastal belt from Del Norte to Santa Cruz Counties; also nests rarely in mid-elevation forests of Sierra Nevada	Nests in hollow, burned-out tree trunks in large conifers; most other activities are conducted in the air	Moderate	Potential nest sites in redwood tree hollows on campus and in chimneys of houses in surrounding area. May forage over grasslands in other areas of campus.
Marbled murrelet (<i>Brachyramphus marmoratus</i>)	T/E	Marine subtidal and pelagic habitats and coastal coniferous forests from Oregon border to Imperial Beach, San Diego	Old-growth conifer (especially redwood and Douglas-fir) forests near the coast	Low	No known nesting documented on campus; unlikely to nest on campus due to lack of mature redwoods with large lateral branches suitable for nesting platforms
Tricolored blackbird (<i>Agelaius tricolor</i>)	SC/SSC	From southern Oregon through Central Valley and into Baja California	Cattail and tule marshes; open valleys and foothills	Low	No suitable nesting habitat on campus; occasional use of lower campus grasslands by foraging birds is possible

Table 4.4-2
Special-Status Wildlife Species Occurring or Potentially Occurring in the Study Area

Common Name (Scientific Name)	Federal/State/ WBWG Status^a	California Distribution	Habitat Requirements	Potential to Occur in Study Area	Information on Occurrence in Study Area
Black swift (<i>Cypseloides niger</i>)	-/SSC	Breeds very locally in the Sierra Nevada and Cascade Range; San Gabriel, San Bernardino, and San Jacinto Mountains; and coastal bluffs from San Mateo to near San Luis Obispo Counties	Nests in moist crevices or caves on sea cliffs above the surf, or on cliffs behind or adjacent to waterfalls in deep canyons	Low	Historically a common nester on ocean-facing cliffs and caves between Davenport and Santa Cruz (CNDDDB 2002); no breeding has been documented at known nesting localities from surveys in 2001 and 2002 (Suddjian 2002)
Great blue heron (<i>Ardea herodias</i>)	-/-	Permanent resident throughout most of California; locally common near rookeries February to June or July	Shallow estuaries and fresh and saline emergent wetlands; nests in colonies in tops of secluded large snags or live trees, usually among the tallest available	Low	Fairly common year-round resident in Santa Cruz (Suddjian 2002). No rookeries reported on campus (CNDDDB 2002). May forage in grasslands on campus.
Willow flycatcher (<i>Empidonax trailii</i>)	SC/E	Summers along the western Sierra Nevada from El Dorado to Madera Counties; in the Cascade and northern Sierra Nevada in Trinity, Shasta, Tehama, Butte, and Plumas Counties, and along the eastern Sierra Nevada from Lassen to Inyo Counties	Riparian areas and large wet meadows with abundant willows. Usually found in riparian habitats during migration	Low	Rare spring and fall migrant, does not nest along the California coast (Suddjian 2002)
Yellow-breasted chat (<i>Icteria virens</i>)	-/SSC	Nests locally in coastal mountains and Sierra Nevada foothills, east of the Cascades in northern California, along the Colorado River, and very locally inland in southern California	Nests in dense riparian habitats dominated by willows, alders, Oregon ash, tall weeds, blackberry vines, and grapevines	High	Locally rare in summer and fall; a few breeding records have been recorded recently in Santa Cruz County (Suddjian 2002). Birds have been observed in Moore Creek (Ecosystems West 2002).

**Table 4.4-2
Special-Status Wildlife Species Occurring or Potentially Occurring in the Study Area**

Common Name (Scientific Name)	Federal/State/ WBWG Status^a	California Distribution	Habitat Requirements	Potential to Occur in Study Area	Information on Occurrence in Study Area
California yellow warbler (<i>Dendroica petechia brewsteri</i>)	–/SSC	Nests over all of California except Central Valley, Mojave Desert region, and high altitudes in the Sierra Nevada; winters along Colorado River and in parts of Imperial and Riverside Counties; two small permanent populations in San Diego and Santa Barbara Counties	Nests in riparian areas dominated by willows, cottonwoods, sycamores, or alders or in mature chaparral; may also use oaks, conifers, and urban areas near streamcourses	Moderate	Suitable nesting habitat along lower Moore Creek on campus; however, no records of birds nesting in that area
Western burrowing owl (<i>Athene cunicularia hypugea</i>)	SC/SSC	Lowlands throughout California, including Central Valley, northeastern plateau, southeastern deserts, and coastal areas; rare along south coast	Rodent burrows in sparse grassland, desert, and agricultural habitats	High	Historical records of breeding and winter roosting on Lower Campus (CNDDDB 2002, Pelc 1995, Biosystems Analysis 1991, Beyer 2001); suitable habitat present in the low, open grasslands on the lower campus
Long-eared owl (<i>Asio otis</i>)	–/SSC	Permanent resident east of the Cascade Range from Placer County to the Oregon border; east of the Sierra Nevada from Alpine to Inyo Counties. Scattered breeding populations along the coast and in southeastern California. Winters throughout the Central Valley and southeastern California	Nests in abandoned crow, hawk, or magpie nests, usually in dense riparian stands of willows, cottonwoods, live oaks, or conifers	Moderate	No historical breeding known for campus area; one recent breeding season observation and several winter records; one recent breeding record for the county (Suddjian 2000). May forage in grassland habitat on campus.
Short-eared owl (<i>Asio flammeus</i>)	–/SSC	Permanent resident along the coast from Del Norte to Monterey Counties although very rare in summer north of San Francisco Bay, in the Sierra Nevada north of Nevada County, in the plains east of the Cascades, and in Mono County; small, isolated populations elsewhere in California	Freshwater and salt marshes, lowland meadows, and irrigated alfalfa fields; needs dense tules or tall grass for nesting and daytime roosts	Low in breeding season Moderate in winter	No recent breeding records for the county; known to winter roost near the East Field on lower campus (Ecosystems West 2001). May forage in grassland habitat on campus.

**Table 4.4-2
Special-Status Wildlife Species Occurring or Potentially Occurring in the Study Area**

Common Name (Scientific Name)	Federal/State/ WBWG Status^a	California Distribution	Habitat Requirements	Potential to Occur in Study Area	Information on Occurrence in Study Area
Mammals					
San Francisco dusky-footed woodrat (<i>Neotoma fuscipes annectens</i>)	-/SSC	Hardwood forests and chaparral throughout the Bay Area, including Santa Cruz Mountains	Riparian, chaparral, redwood, and mixed evergreen forest habitats	High	Ecosystems West (2002) observed three woodrat nests in the north campus. One nest recorded adjacent to lower Moore Creek during 2002 survey (Jones & Stokes 2004). The presence of this species on campus is unconfirmed because nests of San Francisco dusky-footed woodrat are undistinguishable from other dusky-footed woodrat species.
Pallid bat (<i>Antrozous pallidus</i>)	SC/SSC/HP	Occurs throughout California except the high Sierra from Shasta to Kern Counties and the northwest coast, primarily at lower and mid-elevations	Occurs in a variety of habitats from desert to coniferous forest. Most closely associated with oak, yellow pine, redwood, and giant sequoia habitats in northern California and oak woodland, grassland, and desert scrub in southern California. Relies heavily on trees for roosts	High	Not detected during this or any previous surveys. May forage on campus; potential roosting habitat in abandoned historic buildings in lower campus and in buildings in central campus.
Pacific Townsend's (= western) big-eared bat (<i>Corynorhinus townsendii townsendii</i>)	SC/SSC/HP	Coastal regions from Del Norte to Santa Barbara Counties	Roosts in caves, tunnels, mines, and dark attics of abandoned buildings; very sensitive to disturbances; may abandon a roost after onsite visit	High	Ecosystems West observed evidence of roosting in a Cave Gulch tree hollow in 2001 and detected them acoustically in Cave Gulch and chaparral area at the intersection of North Fuel Break Road and Red Hill Road. May forage on campus; unlikely to roost in caves on campus due to high levels of human disturbance.

**Table 4.4-2
Special-Status Wildlife Species Occurring or Potentially Occurring in the Study Area**

Common Name (Scientific Name)	Federal/State/ WBWG Status^a	California Distribution	Habitat Requirements	Potential to Occur in Study Area	Information on Occurrence in Study Area
Western red bat (<i>Lasiurus blossevillii</i>)	SC/SSC/HP	Scattered throughout much of California at lower elevations	Found primarily in riparian and wooded habitats. Occurs at least seasonally in urban areas. Day roosts in trees within the foliage. Found in fruit orchards and sycamore riparian habitats in the Central Valley	High	In 2000, Ecosystems West detected this species in acoustic surveys and mist netting in Cave Gulch and in the chaparral area at the intersection of North Fuel Break Road and Red Hill Road. May forage on campus and roost in forest areas on campus.
Long-eared myotis (<i>Myotis evotis</i>)	SC/--	Sierra Nevada, Klamath Mountains, Coast Ranges, and Transverse and Peninsular Ranges	Forages in woodlands; roosts in a variety of habitats including mines, buildings, caves, bridges, and rock crevices	High	Ecosystems West detected this species acoustically in Crown Meadow in 2001. May forage and roost in woodland areas on campus.
Fringed myotis (<i>Myotis thysanodes</i>)	SC/--HP	Sierra Nevada, Klamath Mountains, Coast Ranges, and Transverse and Peninsular Ranges	Forages in open woodlands; roosts in buildings, mines, caves bridges, conifer snags, and caves	High	In 2001, Ecosystems West detected this species in the chaparral area at the intersection of North Fuel Break Road and Red Hill Road, Crown Meadow, and at the Spring Road spring. May forage and roost in woodland areas on campus.
Long-legged myotis (<i>Myotis volans</i>)	SC/--HP	Mountains throughout California	Most common in woodlands and forests above 4,000 feet, but occurs from sea level to 11,000 feet	High	In 2000, Ecosystems West detected this species in the chaparral area at the intersection of North Fuel Break Road and Red Hill Road. May forage and roost in woodland areas on campus.
Yuma myotis (<i>Myotis yumanensis</i>)	SC/--	Considered common and widespread in northern California; colonies known from Marin and San Francisco Counties	Roosts colonially in a variety of natural and human made sites including caves, mines, buildings, bridges, and trees; in northern California, maternity colonies are usually in fire-scarred redwoods, pines, and oaks; forages for insects over bodies of water	High	In 2000, Ecosystems West detected this species in Cave Gulch, in the chaparral area at the intersection of North Fuel Break Road and Red Hill Road, and Crown Meadow. Suitable foraging and roosting habitat is found on campus in both natural and human made habitats.

**Table 4.4-2
Special-Status Wildlife Species Occurring or Potentially Occurring in the Study Area**

Common Name (Scientific Name)	Federal/State/ WBWG Status^a	California Distribution	Habitat Requirements	Potential to Occur in Study Area	Information on Occurrence in Study Area
Greater western mastiff bat (<i>Eumops perotis californicus</i>)	SC/SSC/HP	Occurs along the eastern San Joaquin Valley from El Dorado through Kern Counties; also found along the South Coast, Peninsular, and Transverse Ranges from San Francisco to the Mexico border	Roosts and breeds in deep, narrow rock crevices; may also use crevices in trees, buildings, and tunnels; forages in a variety of semiarid to arid habitats	High	Not detected during this or any other previous surveys. Suitable foraging and roosting habitat is found on campus in both natural and human made habitats.

Status explanations

Federal

E = endangered

T = threatened

PD = proposed for delisting.

SC = species of concern; species for which existing information indicates it may warrant listing but for which substantial biological information to support a proposed rule is lacking

PR = protected under the Bald and Golden Eagle Protection Act.

– = no status definition

State

E = endangered

T = threatened

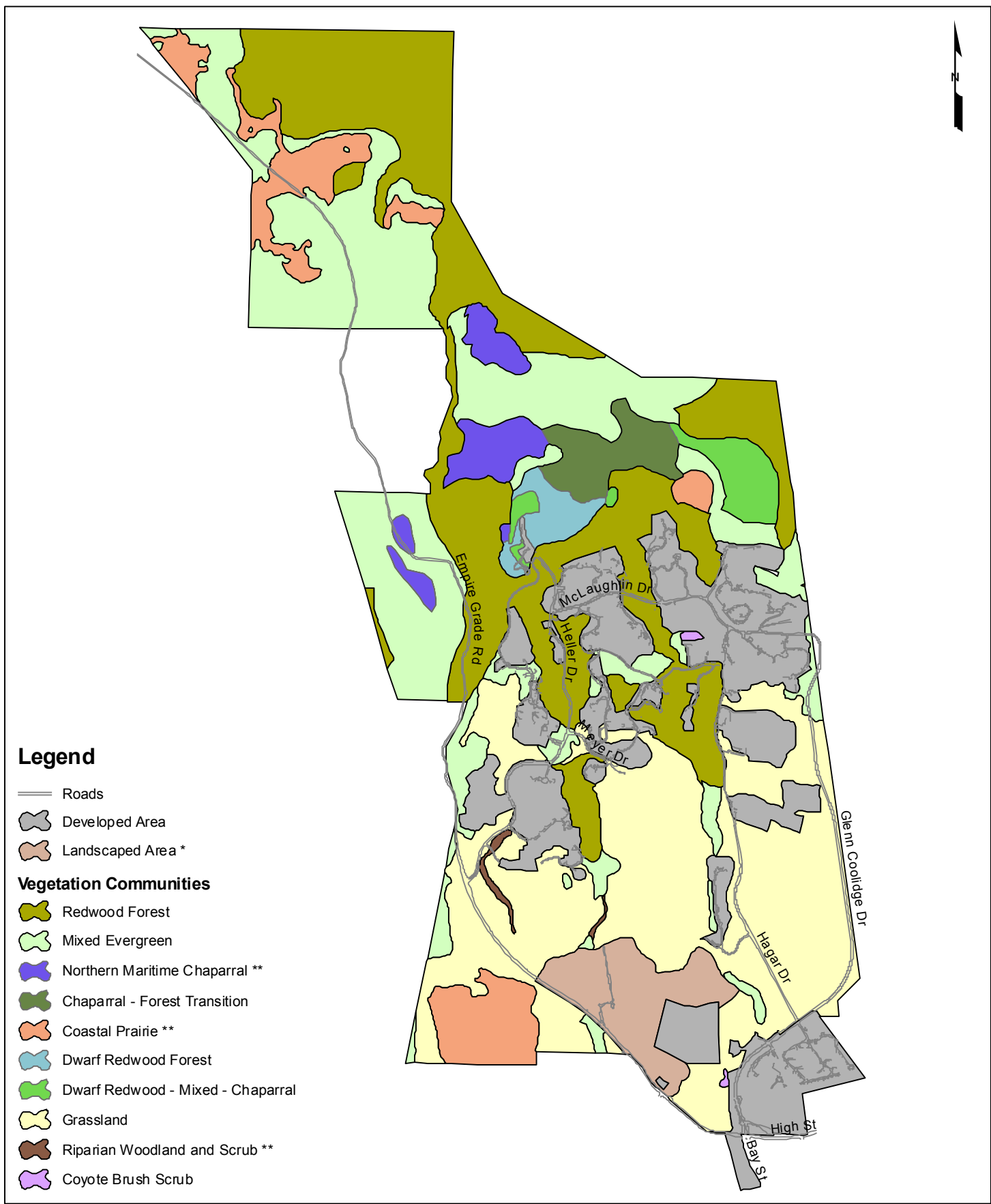
SSC = species of special concern; species for which existing information indicates it may warrant listing but for which substantial biological information to support a proposed rule is lacking

FP = fully protected

– = no status definition

Western Bat Working Group (WBWG)

HP = highest priority species



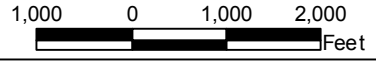
Legend

- Roads
- Developed Area
- Landscaped Area *
- Vegetation Communities**
- Redwood Forest
- Mixed Evergreen
- Northern Maritime Chaparral **
- Chaparral - Forest Transition
- Coastal Prairie **
- Dwarf Redwood Forest
- Dwarf Redwood - Mixed - Chaparral
- Grassland
- Riparian Woodland and Scrub **
- Coyote Brush Scrub

Data Sources: Jones & Stokes (2003); EcoSystems West Consulting Group (2004a).

*The areas of the Arboretum, and the Farm are shown as Landscaped. These areas are not built-up but the habitat has been altered.

** Indicates Sensitive Natural Communities



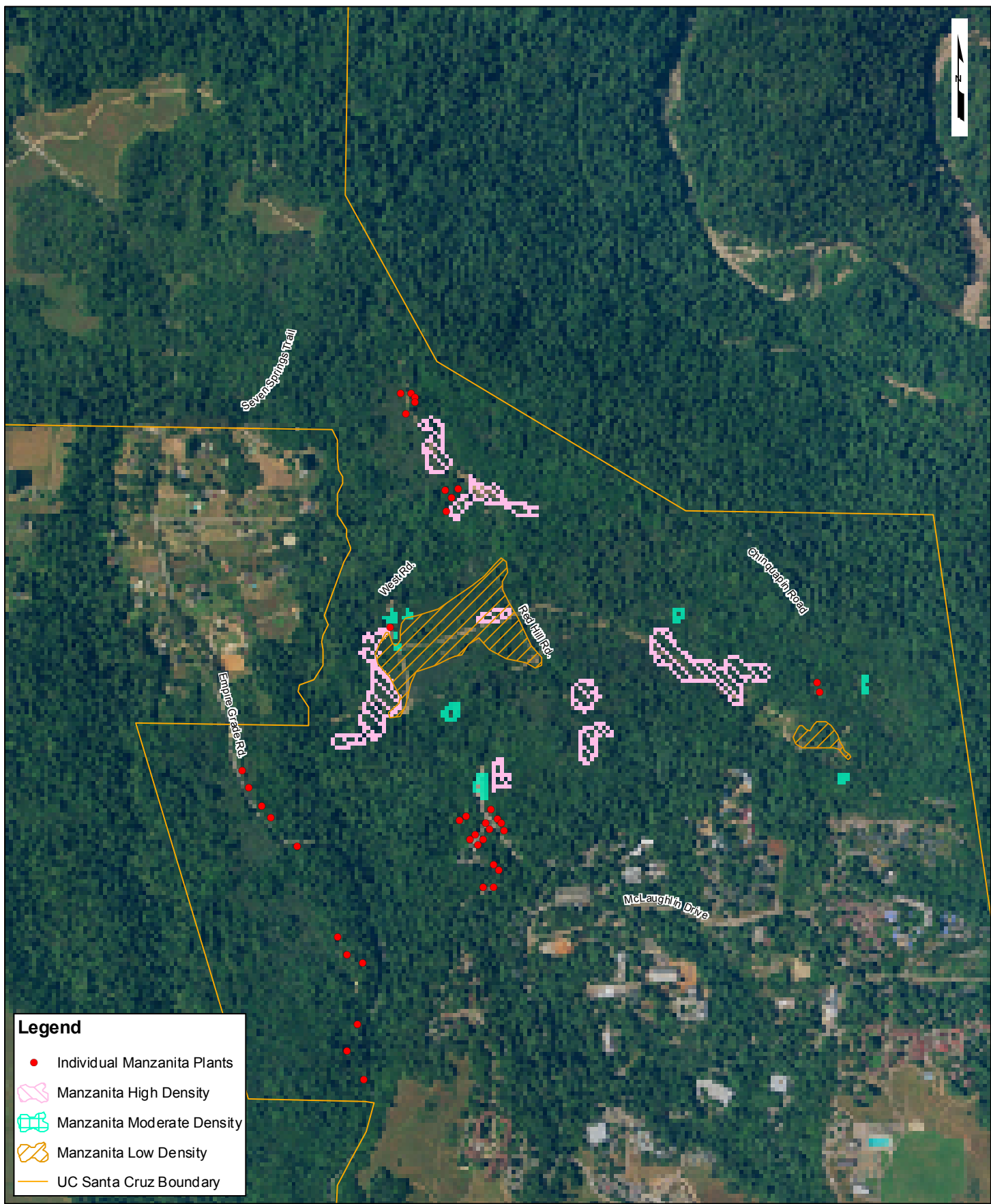
VEGETATION COMMUNITIES AND SENSITIVE HABITATS

October 2005
28649607

UC Santa Cruz LRDP EIR
Santa Cruz, California



FIGURE 4.4-1



Data Source: EcoSystems West Consulting Group (2004a).

**DISTRIBUTION OF SANTA CRUZ
MANZANITA IN THE NORTH CAMPUS**

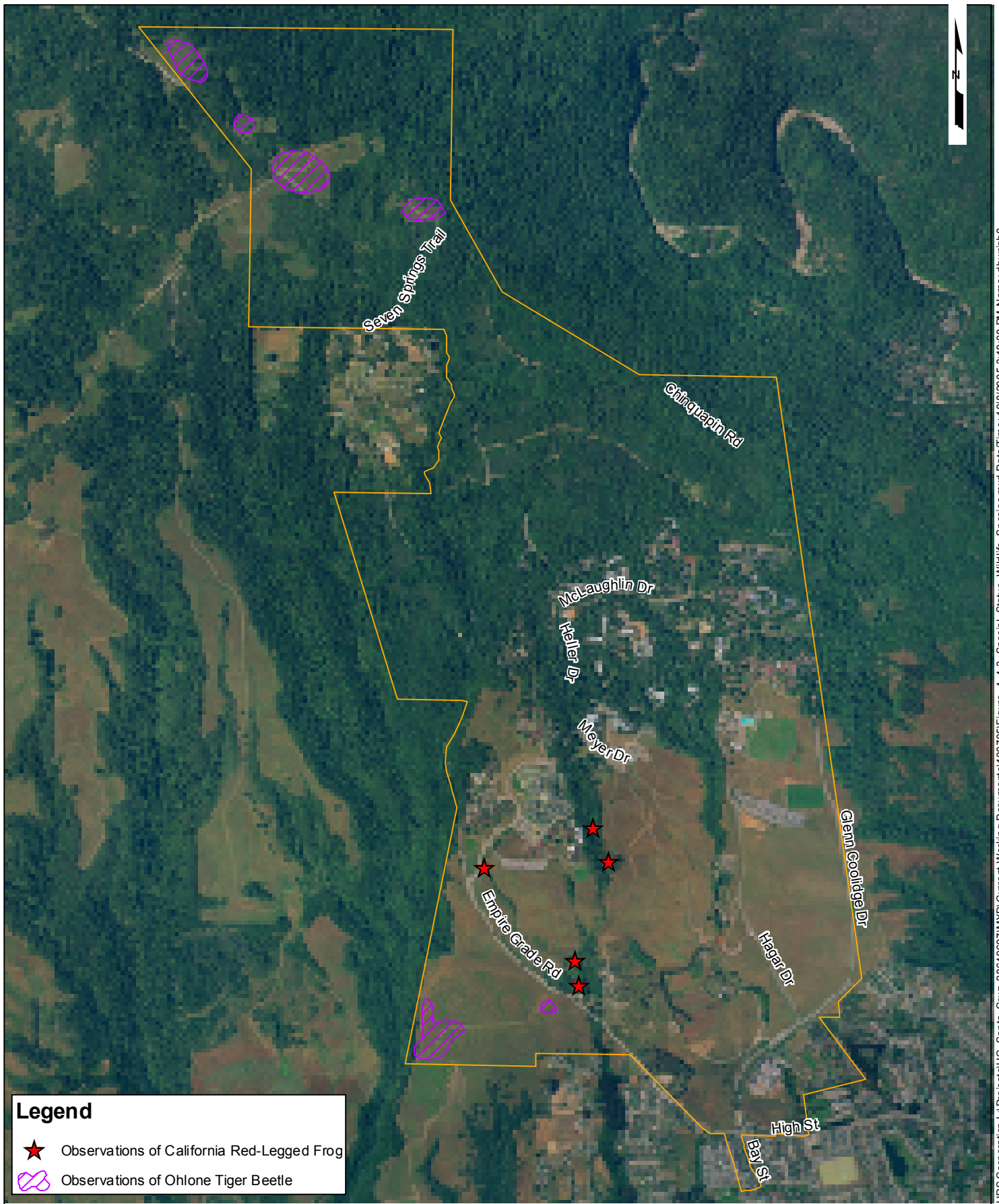
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UC Santa Cruz LRDP EIR
Santa Cruz, California



FIGURE 4.4-2

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Data Sources: Jones & Stokes (2003); EcoSystems West Consulting Group (2004a).

**SPECIAL-STATUS WILDLIFE SPECIES:
CALIFORNIA RED-LEGGED FROG AND OHLONE TIGER BEETLE**

October 2005
28649607

UC Santa Cruz LRDP EIR
Santa Cruz, California

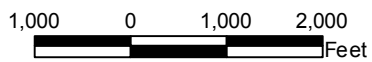
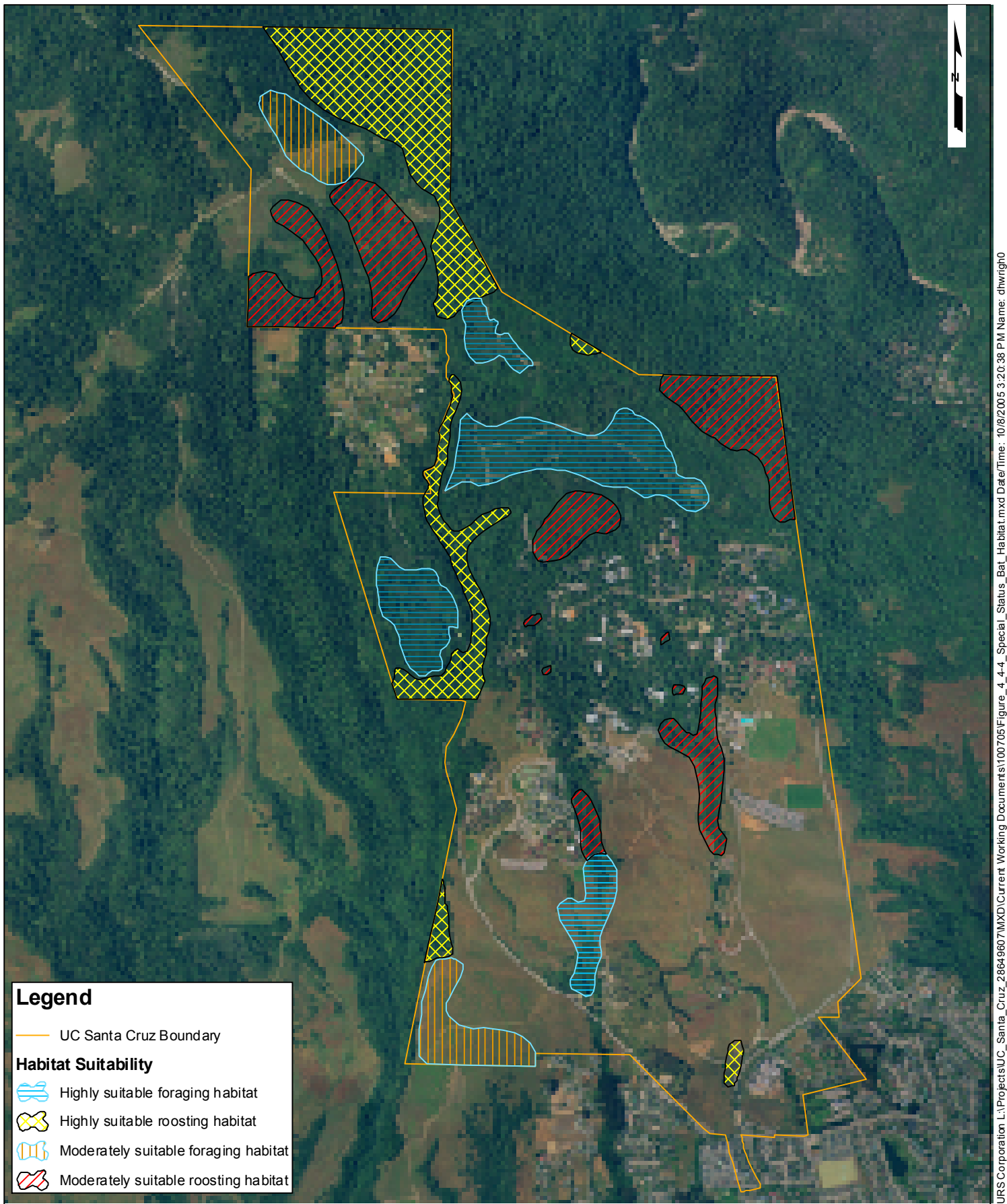


FIGURE 4.4-3



Legend

- UC Santa Cruz Boundary
- Habitat Suitability**
- Highly suitable foraging habitat
- Highly suitable roosting habitat
- Moderately suitable foraging habitat
- Moderately suitable roosting habitat

Data Sources: Jones & Stokes (2003); EcoSystems West Consulting Group (2004a).

**SPECIAL-STATUS
BAT HABITAT**

October 2005
28649607

UC Santa Cruz LRDP EIR
Santa Cruz, California

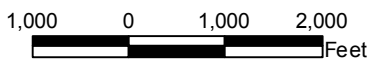
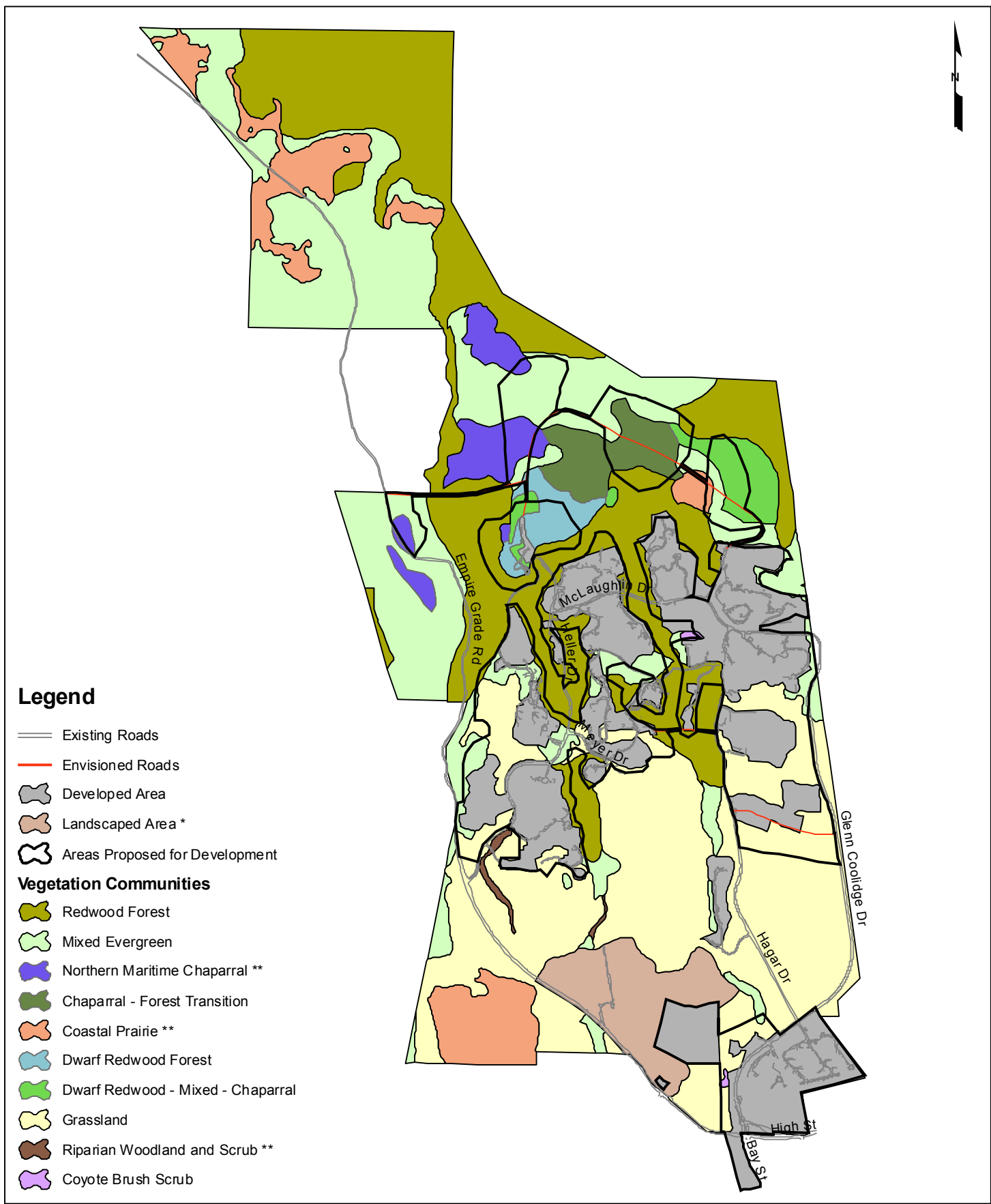


FIGURE 4.4-4

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Legend

- Existing Roads
- Envisioned Roads
- Developed Area
- Landscaped Area *
- Areas Proposed for Development

Vegetation Communities

- Redwood Forest
- Mixed Evergreen
- Northern Maritime Chaparral **
- Chaparral - Forest Transition
- Coastal Prairie **
- Dwarf Redwood Forest
- Dwarf Redwood - Mixed - Chaparral
- Grassland
- Riparian Woodland and Scrub **
- Coyote Brush Scrub

Data Sources: Jones & Stokes (2003); EcoSystems West Consulting Group (2004a).

*The areas of the Arboretum, and the Farm are shown as Landscaped. These areas are not built-up but the habitat has been altered. There will be some limited development in the Arboretum.

** Indicates Sensitive Natural Communities

VEGETATION COMMUNITIES AND SENSITIVE HABITATS WITHIN PROPOSED DEVELOPMENT AREAS

October 2005
28649607

UC Santa Cruz LRD P EIR
Santa Cruz, California

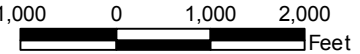


FIGURE 4.4-5