is also associated with sandy washes dominated by alluvial scrub vegetation associations. *Ceanothus ophiochilus, F. mexicanum,* and *N. interrata* are often found in association with specific soil types.

The chaparrals of interior foothill southern California are dense shrub associations of moderate height that are dominated by Adenostoma fasciculatum (chamise), Ceanothus sp. (California lilac), Rhamnus ilicifolia (red berry), Arctostaphylos sp. (manzanita), Quercus berberidifolia (California scrub oak), Rhus ovata (sugar bush), Malosma laurina (laurel sumac), Heteromeles arbutifolia (toyon), Eriogonum fasciculatum (California buckwheat), and Salvia mellifera (black sage) (Beauchamp 1986, Holland 1986, and Wiggins 1980). Chaparral species are adapted to soils poor in nutrients, a cool, wet winter, and hot dry summers.

Many chaparral species are adapted to periodic wildfires. For example, seeds of some plants require fire before they can germinate. Other plants reproduce vegetatively by sprouting from the burned stumps of the parent plant. Fires that occur too frequently, however, burn young plants before they become reproductively mature, thus depleting the seed bank. Sustained fire prevention can cause plant communities to become senescent (old) and thus they may not survive an unpredictable fire to reproduce vegetatively (Boyd 1991).

Chaparral habitats occur on many different soil types but the plants under consideration herein, with the exception of Berberis nevinii, typically occur in clay soils derived from gabbro or metavolcanic bedrock (Boyd 1991, California Native Diversity Data Base (CNDDB) 1992, Oberbauer 1991). Berberis nevinii grows in sandy habitats (Mistretta 1989b, CNDDB 1992). Clay soils have unique physical and chemical properties that contribute to the disproportionally large number of rare plants found on this substrate, as compared to other soil types. For these reasons, clay soils are an important contributor to floristic diversity in the **Riverside County and San Diego County** region. The Vail Lake area in Riverside County has a large complex of highly unique habitats on clay soils formed from gabbro bedrock that support many sensitive or endangered plant and animal species including two of the species in this proposed rule (see Metropolitan Water District (MWD) 1991). The largest population of Berberis nevinii grows in this area adjacent to the type location of Ceanothus ophiochilus (California Natural Diversity Data Base (CNDDB 1992). The ranges of all four species are restricted to small areas.

The population centers for two of the plants considered in this proposal, Berberis nevinii and Ceanothus ophiochilus, are located in the Vail Lake area of southwestern Riverside County. Populations of B. nevinii located outside the Vail Lake area are small and found in isolated patches in San Diego, San Bernardino, and Los Angeles Counties. Small populations of C. ophiochilus occur in the Agua Tibia Wilderness Area (Cleveland National Forest) adjacent to Vail Lake. Nolina interrata and Fremontodendron mexicanum are found only in southern San Diego County and northwestern Baja California, Mexico.

## Discussion of the Four Species Proposed for Listing

Ceanothus ophiochilus was first discovered and collected by S. Boyd, T. Ross, and L. Arnseth in 1989 on Oak Mountain (also known as Vail Mountain), west of Vail Lake in Riverside County, California. It was formally described by Boyd et al. (1991) based on the Vail Lake collection and was subsequently accepted by Schmidt (1993). Ceanothus ophiochilus is a rounded, divaricately-branched (widely forked) shrub of the buckthorn family (Rhamnaceae), from 12 to 15 decimeters (dm) (4 to 5 feet (ft.)) in height with leaves about 3 to 7 millimeters (mm) (0.1 to 0.3 inches (in.)) long and 1.5 to 2.5 mm (0.1 in.) wide. Blue flowers, narrow leaves, and hornless fruit capsules differentiate C. ophiochilus from other members of the genus. This species resembles Adenostoma fasciculatum (chamise), the codominant shrub in its habitat. Ceanothus ophiochilus flowers from mid-February to March and fruit capsules mature from about May to mid-June (Boyd et al. 1991, Schmidt 1993).

Ceanothus ophiochilus is restricted to xeric (dry) habitats on ridgetops and north to northeast-facing slopes in chamise chaparral. It occurs on shallow soils formed from ultra-basic parent materials or deeply weathered gabbro, both of which are phosphorus deficient. This species is adapted to this harsh environment, whereas other members of the genus are not. Ceanothus ophiochilus hybridizes with the locally common C.crassifolius in places where the two species occur together. The strong association of *C. ophiochilus* with nutrient poor soils may be critical for the species to maintain reproductive isolation (Boyd et al. 1991).

Ceanothus ophiochilus is found at four localities in southwestern Riverside County. One population of *C. ophiochilus* occurs on privately owned land at Vail Lake. Estimates for the Vail Lake population range from 3,000 to 5,000 plants; this population occupies about 8 hectares (ha) (20 acres (ac.)) within a 16 ha (40 ac.) area (Boyd 1991). Individual plants within the Vail Lake population exhibit indications of hybridization with C. crassifolius. Large populations of *C. crassifolius* are present approximately one-half mile south and east of the Vail Lake C. ophiochilus population (Boyd et al. 1991). The remaining three populations exist on land managed by the Forest Service, where over 4,000 plants exist within about 14 ha (35 ac.) of the Agua Tibia Wilderness Area. These populations are scattered along borders of creeks and dry canyons, and sometimes on gabbro soils (Shaffer 1993). At least two of the three Agua Tibia populations are hybridizing with C. crassifolius and these populations may represent hybrid swarms. The third Agua Tibia population consists of plants that are too young to determine the degree of hybridization taking place (Shaffer 1993; Steve Boyd, Rancho Santa Ana Botanical Garden, pers. comm. 1995). While these populations evidently are not pure C. ophiochilus, the Service continues to recognize their importance to the long-term survival of the species. These populations are important because they represent about 50 percent of the known acreage of the species and a significant number of individuals, and because conservation actions for C. ophiochilus would be unnecessarily limited to a single location.

Fremontodendron mexicanum, a member of the cacao family (Sterculiaceae), is a small tree or shrub with evergreen, palmately lobed leaves, 25 to 50 mm (1 to 2 in.) wide. The inflorescence is about 60 mm (2.4 in.) wide, and lacks petals. The showy orange sepals, which are reddish toward the bases, distinguish F. mexicanum from *F. californicum*, which has yellow sepals. The seeds of F. mexicanum are quite distinctive from other species of Fremontodendron (Kelman 1991). *Fremontodendron mexicanum* also has a unique petiole (leaf stalk) internal structure that is unlike that found in any other member of the family (Kelman 1991). Reliable distribution records for Fremontodendron mexicanum indicate that this species is found in southern San Diego County and northern Baja California, Mexico between 300 and 1,000 meters (m) (900 to 3,000 ft.) in elevation. This species blooms from March to August and occurs primarily in closed cone coniferous forest and southern mixed chaparral often in association with metavolcanic soils