

isolated nature of the remaining populations. This rule implements the Federal protection and recovery provisions afforded by the Act for these plants.

EFFECTIVE DATE: March 6, 1995.

ADDRESSES: The complete file for this rule is available for public inspection, by appointment, during normal business hours at the U.S. Fish and Wildlife Service, 2800 Cottage Way, Room E-1803, Sacramento, California 95825-1846.

FOR FURTHER INFORMATION CONTACT: Elizabeth Warne at 916/978-4866 at the above address.

SUPPLEMENTARY INFORMATION:

Background

Cordylanthus tenuis ssp. *capillaris*, *Calochortus tiburonensis*, *Castilleja affinis* ssp. *neglecta*, *Streptanthus niger*, *Clarkia franciscana*, *Cirsium fontinale* var. *fontinale*, *Eriophyllum latilobum*, *Hesperolinon congestum*, *Pentachaeta bellidiflora*, *Ceanothus ferrisae*, *Dudleya setchellii*, and *Streptanthus albidus* ssp. *albidus* are endemic to serpentine soils in the region of the San Francisco Bay in California. Serpentine soils are derived from ultramafic rocks such as serpentinite, dunite, and peridotite, which are found in discontinuous outcrops in the Sierra Nevada and in the Coast Ranges from Santa Barbara County, California to British Columbia. The chief constituent of the parent rock is some variant of iron-magnesium silicate. Most serpentine soils are formed in place over the parent rock, and are, therefore, shallow, rocky, and highly erodible. Serpentine soils, because of the parent material, tend to have high concentrations of magnesium, chromium, and nickel and low concentrations of calcium, nitrogen, potassium, and phosphorus (Kruckeberg 1984). These characteristics make serpentine soil inhospitable for the growth of most plants. Nevertheless, some plants have adapted to the rigors of life on serpentine soils. In fact, serpentine soils often support a high diversity of plants including many rare species (McCarten 1988). Over 200 taxa in California are endemic (restricted) to serpentine soils (Kruckeberg 1984).

Serpentine soils in the San Francisco Bay region are derived from intrusive igneous rocks associated with fault zones in the sedimentary Franciscan formation. Outcrops occur south of the Bay in the Coyote Valley of Santa Clara County; west of the Bay at Edgewood County Park, near Crystal Springs Reservoir, at Stanford University's Jasper Ridge Preserve in San Mateo County, and at the Presidio in San

Francisco County; east of the Bay in the Oakland Hills of Alameda County and at Mt. Diablo in Contra Costa County; and north of the Bay on the Tiburon Peninsula in eastern Marin County and at Mt. Tamalpais, Carson Ridge, and near Nicasio Reservoir in western Marin County, as well as in Sonoma and Napa Counties. Serpentine soils are variable in soil chemistry, texture, and water availability, both within and between sites (McCarten 1987b). This variability and the variety of micro-climates in the San Francisco Bay region have a profound effect upon the local flora. Several serpentine plant communities are found in the San Francisco Bay region (McCarten 1987b). Grassland and annual forb communities (serpentine bunchgrass grasslands and serpentine wildflower fields) tend to occur on level ground or on gentle slopes with soils to 1 meter (m) (3 feet (ft)) or more in depth. Shrub communities (Franciscan serpentine coastal scrub, mixed serpentine chaparral, and Sargent cypress woodlands) tend to occur on steep rocky slopes with shallow soils. In some areas, soil development is minimal and parent rock is extensively exposed. These serpentine barrens support a distinctive community composed of only a few species, usually growing at low densities. Another unique habitat on serpentine soils occurs near seasonal springs and seeps, which support species requiring moist soil.

Most of the 12 species in this rule occur in the serpentine bunchgrass grassland and serpentine wildflower field communities. *Cirsium fontinale* var. *fontinale* occurs in serpentine seep areas. *Cordylanthus tenuis* ssp. *capillaris* and *Ceanothus ferrisae* occur in chaparral, as do a few populations of *Hesperolinon congestum*. *Dudleya setchellii* and *Streptanthus albidus* ssp. *albidus* are found on serpentine barrens. *Eriophyllum latilobum* grows on serpentine-influenced soil in the coast live oak woodland community.

Serpentine endemics may have limited or widespread distributions. Some species are restricted to a single outcrop; others occur on serpentine soils within a particular region; a few species occur throughout almost the entire range of serpentine soils in California (Kruckeberg 1984). Of the taxa considered in this rule, (*Calochortus tiburonensis*) is thought to always have been restricted to the single outcrop on which it occurs. Others, including *Cordylanthus tenuis* ssp. *capillaris*, *Streptanthus niger*, *Eriophyllum latilobum*, *Dudleya setchellii*, and *Streptanthus albidus* ssp. *albidus*, have a known historical range

of only a few miles or less. The widest ranging species in historic times was *Pentachaeta bellidiflora*, which occurred from Marin County to Santa Cruz County. It is now restricted to a single population as a result of habitat destruction.

The human population of the San Francisco Bay region has grown rapidly over the last several decades. Urban development (including highway construction) has reduced the amount of serpentine habitat by nearly 20 percent in the past 20 years (McCarten 1987b). The construction of roads, houses, recreational facilities, and waste disposal sites continues. The increasing numbers of people also place an ever greater strain on undeveloped wildlands, through activities such as pedestrian and off-road vehicle traffic, unauthorized garbage dumping, and changes in the pattern of wildland fires. Serpentine habitats, because of their often limited vegetative cover, may appear to the uninitiated as unoccupied space, and so they are especially likely to be subject to disturbances. Recreational activities may directly impact plants; or may result in increased erosion and facilitate the invasion of alien species including many introduced annual grasses common in California. Competition with introduced species is a serious threat to serpentine natives (McCarten 1987b). The destruction of serpentine habitats due to urban development also has increased the fragmentation of rare plant populations, thus, increasing the risks of extinction due to chance events such as fire, pest or disease outbreaks, reproductive failure, or other natural or human-caused disaster.

The land that supports these 12 taxa is owned by local, State, and Federal agencies, parks, and private parties.

Discussion of the Twelve Species

North Bay Species

Cordylanthus tenuis ssp. *capillaris* (Pennell's bird's-beak) was collected by Herbert Mason about 3.2 kilometers (km) (2 miles (mi)) north of Occidental in Sonoma County, California, in 1946. Francis Whittier Pennell described the plant as *Cordylanthus capillaris* in 1950, using Mason's specimen as the type (Pennell 1950). Pennell was misled by an erroneous label to think that the plants had been collected in Merced County (Bacigalupi 1966), which may have affected his treatment of the taxon (Chuang and Heckard 1986). Artificial hybridization studies of *C. brunneus* and *C. capillaris* (Chuang and Heckard 1975) showed a close relationship between the two plants. The name *C. brunneus* ssp. *capillaris* was proposed