out native species on both sides of 17-Mile Drive (Ferreira 1992a).

The only population of *Potentilla hickmanii* occurs at Indian Village, where Ferreira (1992b) noted four non-native grass taxa associated with the potentilla at this site: *Aira caryophylla*, *Bromus mollis*, *Festuca arundinacea*, and *Lolium multiflorum*. The *Festuca* may have been introduced in a ''meadow mix'' used on adjacent fairways; its stature and invasiveness appear to offer competition to the potentilla. *Plantago coronopus* is also present at this site.

Cortaderia atacamensis (pampasgrass) and *Cytisus* sp. (genesta) are two other alien plant taxa that compete with native species on the Monterey Peninsula. The Pebble Beach Company has an on-going eradication program for these two taxa in the Huckleberry Hill area adjacent to the *Cupressus goveniana* ssp. *goveniana*. However, numerous fire roads provide open habitat for these invasive taxa and it is unlikely that they will ever be completely eradicated from the area.

Nearly all occupied or potentially occupied black legless lizard localities have substantial populations of exotic plants, particularly *Carpobrotus edulis* (hottentot fig). Legless lizards are primarily associated with moist soil and leaf litter under native vegetation such as *Lupinus albifrons* (bush lupine), *Haplopappus ericoides* (mock heather), and *Artemisia* sp. (sagewort), and are less abundant in areas dominated by *C. edulis* (Bury 1985, City of Sand City 1992, Miller 1944, Morey 1988, Stebbins 1954). As part of habitat restoration efforts at Asilomar State Beach, over 12 hectares (30 acres) of *C. edulis* were removed by hand. During this effort, black legless lizards were not found in pure stands of *C. edulis*, but were encountered where native shrubs were mixed with the hottentot fig (T. Moss, pers. comm., 1993). Hottentot fig may negatively affect insect populations, the prey base for the black legless lizard (Miller 1944, Stebbins 1954), and thus, adversely affect *Anniella* populations (Bury 1985).

Fire plays an important role in the regeneration of all cypress taxa. Alteration of the natural fire cycle may negatively affect *Cupressus goveniana* ssp. *goveniana* regeneration. Fire is essential since it opens cones that otherwise remain unopened on the trees, and it creates conditions appropriate for seedling establishment (Vogl *et al.* 1988).

Griffin (pers. comm., 1992) and Ferreira (1992c) have noted that establishment of *Pinus radiata* (Monterey pine) seedlings after the 1987 fire has been so vigorous that the pine may be expanding its range at the expense of *Cupressus goveniana* ssp. *goveniana*. Yadon (retired Director, Pacific Grove Museum of Natural History, pers. comm., 1992) believes that the pine's preference for richer soils than those that support *C. goveniana* ssp. *goveniana* would prevent long-term establishment of pines in *C. goveniana* ssp. *goveniana* habitat.

Alteration of habitat due to continuing recreational use of portions of Pebble Beach threaten the precipitously small populations of *Astragalus tener* var. *titi*, and *Potentilla hickmanii*. Trampling by humans and horses can affect these taxa directly, as well as alter soil compaction and erodability such that non-native taxa increase at the expense of native taxa.

At least three, and possibly all, of the five plant taxa are threatened with stochastic extinction by virtue of the limited number of individuals and/or range of the existing populations. Inbreeding may affect small populations, making local extirpations more likely from the inability to produce viable offspring in sufficient numbers. Small populations are also vulnerable to extinction by a single human-caused or natural event. While annual plant taxa, such as *Astragalus tener* var. *titi*, will undergo radical fluctuations in population size, the long-term perpetuation of this taxa depends on maintaining seed production at some critical level, and maintaining appropriate habitat for population expansion. While short-lived perennial taxa like *Piperia yadonii* and *Potentilla hickmanii* may be able to persist through a few climatically unfavorable years, it is still essential to maintain critical seed production levels and to maintain appropriate habitat. *Trifolium trichocalyx* exemplifies a taxon that may persist only as a seedbank for years until released by a fire event. Maintaining habitat and certain fire management prescriptions may be required to prevent the extinction of this species.

The range occupied by *Cupressus goveniana* ssp. *goveniana* is considered extremely small; only *Cupressus abramsiana* (Santa Cruz cypress) and *C. macrocarpa* (Monterey cypress) have stands that occupy as few hectares (acres) as *C. goveniana* ssp. *goveniana* (Griffin and Critchfield 1976). Apparently the 1901 fire on Huckleberry Hill reduced *C. goveniana* ssp. *goveniana* to only a few hectares. Though later observers commented on the extent of recolonization after the fire (Dunning 1906 in Vogl *et al.* 1988, Wolf 1948), the reduction in genetic variability from such events may leave species unable to adapt to changing environmental conditions (Brussard 1985, Menges 1990, Shaffer 1981).

Existing black legless lizard habitat is severely fragmented due to construction of roads, golf courses, and other urban development that creates barriers to movement and isolates populations. Some extant populations are restricted to extremely small habitat patches, such as at Monterey State Beach and the U.S. Navy Post-Graduate School, where a population persists on a remnant 0.5-hectare (1.2-acre) habitat patch (Bury 1985). Because of small size, these fragmented populations have an increased probability of extinction from stochastic (i.e., random) events (Wilcox and Murphy 1985). Once extirpated, isolation can prevent recolonization of these habitat patches (Frankel and Soule 1981).

The black legless lizard exhibits relatively low fecundity and it is suspected that not all adult females breed each year (Goldberg and Miller 1985, Miller 1944). The related silvery legless lizard has a 4 month gestation period, and produces only 1 or 2 eggs per adult female per year (Goldberg and Miller 1985). Similarly, an average of 1.7 eggs were found in the oviducts of black legless lizards (Miller 1944). This low reproductive potential implies relatively long population recovery times and a heightened sensitivity to habitat impacts such as off-road vehicles, trampling, and other disturbances.

Strong storms and extreme high tides periodically occur at Monterey Bay. These high tides can result in erosion of coastal dunes and shorelines, causing destruction of habitat and mortality of black legless lizards. Without adjacent refugia, such habitats can become devoid of lizards with little chance of recolonization. Because of the fragmented distribution and relatively low reproductive potential of the black legless lizard, these natural events may increase the chance of local extirpations.

As mentioned in Factor A, the alien plant *Carpobrotus edulis* may negatively impact native insect populations that provide prey for *Anniella* species (Miller 1944) and that could conceivably affect *Anniella* populations (Bury 1985).

The Service has carefully assessed the best scientific and commercial information available regarding the past, present, and future threats faced by these species in determining to propose this rule. Based on this evaluation, the Service finds that *Astragalus tener* var. *titi*, *Piperia yadonii*, *Potentilla*