visits by individuals interested in seeing rare plants could result from increased publicity. This is a potential threat to all of the proposed taxa, but would seriously impact the nine taxa whose low numbers and/or few populations make them especially vulnerable to disturbance (Achyranthes mutica, Cenchrus agrimonioides, Cyperus trachysanthos, Panicum niihauense, Phyllostegia parviflora, Platanthera holochila, Sanicula purpurea, Schiedea kauaiensis, and Schiedea nuttallii). Such disturbances could also promote erosion and greater ingression of alien plant species. Some taxa, such as Cenchrus agrimonioides, Cyanea grimesiana ssp. grimesiana, Isodendrion longifolium, Panicum niihauense, and Platanthera holochila, have well-known populations, or populations close to trails or roads, that are possibly threatened by trampling or by overcollection (HHP 1994d1, 1994e1, 1994i2, 1994k9). One individual of Platanthera holochila died in the late 1980s after a portion of the plant was collected for scientific purposes (Marie Bruegmann, U.S. Fish and Wildlife Service, in litt. 1994).

C. Disease and predation

Disease is not known to be a significant threat to any of the proposed taxa. Evidence of predation on Isodendrion laurifolium by deer is documented on Kauai (HHP 1994h6, 1994h11). While there is no evidence of predation on the other 13 taxa, none of them are known to be unpalatable to cattle, deer, or goats. Predation is therefore a possible threat to taxa growing at sites where those animals have been reported (Achyranthes mutica, Cyanea grimesiana ssp. grimesiana, Euphorbia haeleeleana, Isodendrion laurifolium, Isodendrion longifolium, Platanthera holochila, Schiedea hookeri, and Schiedea kauaiensis) (see Factor A). Feral pigs not only destroy native vegetation through their rooting activities and dispersal of alien plant seeds, but they also feed on plants, preferring the pithy interior of large tree ferns and fleshy-stemmed plants from the bellflower family (Stone 1985, Stone and Loope 1987). Although there is no conclusive evidence of predation on Cyanea grimesiana ssp. grimesiana, a member of the bellflower family, it is not known to be unpalatable to pigs. Predation is therefore a possible threat to this taxon in areas where pigs have been reported (HHP 1994e1, 1994e34).

Two rat species, the black rat (*Rattus rattus*) and the Polynesian rat (*Rattus exulans*), and to a lesser extent other introduced rodents, eat large, fleshy

fruits and strip the bark of some native plants, including plants in the bellflower family (Cuddihy and Stone 1990, Tomich 1986, Wagner *et al.* 1985; J. Lau, pers. comm. 1994). The largest population of *Euphorbia haeleeleana* on Oahu is seriously threatened by rat predation (HHP 1994g5). It is possible that rats eat the fruits of *Cyanea grimesiana* ssp. *grimesiana*, which produces fleshy fruit and stems and grows in areas where rats occur (J. Lau, pers. comm. 1994).

D. The inadequacy of existing regulatory mechanisms

Hawaii's endangered species act states, "Any species of aquatic life, wildlife, or land plant that has been determined to be an endangered species pursuant to the [Federal] Endangered Species Act shall be deemed to be an endangered species under the provisions of this chapter * * *" (HRS, sect. 195D-4(a)). Therefore, Federal listing would automatically invoke listing under Hawaii State law. State law prohibits cutting, collecting, uprooting, destroying, injuring, or possessing any listed species of plant on State or private land, or attempting to engage in any such conduct. The State law encourages conservation of such species by State agencies and triggers other State regulations to protect the species (HRS, sect. 195AD-4 and 5). However, the regulations are difficult to enforce because of limited personnel. Of the 14 proposed taxa, 10 have populations located on private land, 12 on State land, 3 on City and County of Honolulu land, and 9 on land under Federal jurisdiction. Of those under Federal jurisdiction, four taxa have populations that occur on land owned by the Federal government and six on land leased to the Federal government by the State. While 12 of the taxa occur in more than 1 of those 4 ownership categories, Achyranthes mutica is known only on private land and Panicum niihauense is found only on State land.

Eight of the proposed taxa have one or more populations in State NARs, where rules and regulations for the protection of resources apply (Hawaii Revised Statutes (HRS), sect. 195-5). The majority of the populations of the 14 proposed taxa are located on land classified within conservation districts and owned by the State of Hawaii or private companies or individuals. Regardless of the owner, lands in these districts are regarded as necessary for the protection of endemic biological resources, and maintenance or enhancement of the conservation of natural resources. Activities permitted

in conservation districts are chosen by considering how best to make multiple use of the land (HRS, sect. 205–2). Some uses, such as maintaining animals for hunting, are based on policy decisions, while others, such as preservation of endangered species, are mandated by both Federal and State laws. Requests for amendments to district boundaries or variances within existing classifications can be made by government agencies and private landowners (HRS, sect. 205–4). Before decisions about these requests are made, the impact of the proposed reclassification on "preservation or maintenance of important natural systems or habitat" (HRS, sects. 205–4, 205-17) as well as the maintenance of natural resources is required to be taken into account (HRS, sects. 205-2, 205-4). Before any proposed land use that will occur on State land, is funded in part or whole by county or State funds, or will occur within land classified as a conservation district, an environmental assessment is required to determine whether the environment will be significantly affected (HRS, chapt. 343). If it is found that an action will have a significant effect, preparation of a full Environmental Impact Statement is required. Hawaii environmental policy, and thus approval of land use, is required by law to safeguard "* * the State's unique natural environmental characteristics * * *'' (HRS, sect. 344-3(1)) and includes guidelines to "protect endangered species of individual plants and animals * * *'' (HRS, sect. 344-4(3)(A)). Federal listing, because it automatically invokes State listing, would also invoke State regulations protecting the plants.

E. Other natural or manmade factors affecting its continued existence

All 14 of the taxa proposed for listing are threatened by competition with one or more alien plant taxa (see Table 2). The most significant of these are Lantana camara (lantana), Psidium cattleianum (strawberry guava), Schinus terebinthifolius (Christmas berry), Rubus rosifolius (thimbleberry), Clidemia hirta (Koster's curse), Grevillea robusta (silk oak), Melinis minutiflora (molasses grass), Paspalum conjugatum (Hilo grass), Psidium guajava (common guava), Ageratina adenophora (Maui pamakani), and Ageratina riparia (Hamakua pamakani). A number of other alien plant taxa also pose significant threats to populations of the proposed plants.

Lantana camara (lantana), native to the West Indies, is an aggressive, thicket-forming shrub that produces chemicals that inhibit the growth of