Element Stewardship Abstract

for

Pennisetum setaceum

I. IDENTIFIERS

GNAME: *Pennisetum setaceum* (Forssk.) Chiov.

Synonyms : *Phalaris setacea* Forrsk.; *Pennisetum asperifolium* (Desf.) Kunth; *P. rupellii* Steud; *P. rupellii* var. *depauperatum* Schweinf.; *P. macrostachyon* auct. non Trin.; *P. phalaroides* Schult.; *P. spectabile* Fig. & De Not; *P. tiberiadis* Boiss. *P. orientale* Engl.; *P. orientale* var. *altissimum* Chiov.; *P. ruppelianum* Hochst. ex Penzig; *P. dichotomum* I.B. Balf.; *Cenchrus asperifolius* Desf.

GCOMNAME: Fountaingrass.

GRANK: None.

GPESTWEED: Noxious weed, U.S.D.A. in Hawaii.

EOSPECS: *Pennisetum setaceum* is a medium sized clump-forming perennial foxtail grass that is naturalized in Hawaii, southern Florida, and southern California, where it has escaped from cultivation. It is common in the landscape trade and has the potential to become a pest plant in Florida and California if control efforts are not initiated.

DIAGCHARS: Caespitose perennial in the Poaceae; culms 2-13 dm tall, upper part scabrous, glabrous on basal portion. Sheaths 6-15 cm long, long-pilose at throat, otherwise glabrous; ligule a dense row of silky hairs 1-1.5 mm long; blades rigid, glaucous, 50-60 cm long, convolute, midrib noticeably thickened on upper surface. Panicles pink to purple, cylindrical, 6-30 cm long, rachis cylindrical with shallow angular ribs, glabrous to pilose; spikelets 1 to 3 per fascicle, the fascicles borne on slender, pubescent stipes 1-3 mm long, each spikelet lanceolate, 1 spikelet sessile, the others short-pedicellate, 4.5 - 6.5 mm long, at least the inner involucral bristles loosely plumose near base, scabrous toward apex, the longest ones 16-40 mm long, outer involucral bristles 4-12 mm long, scabrous, occasionally rachilla prolonged beyond second lemma as a tiny bristle; first glume minute, ovate to suborbicular, up to 1/3 the length of the spikelet, or absent, second glume 1-3 mm long, 1/4 to 2/3 the length of the spikelet, nerveless, glabrous; first lemma membranous, as long as the spikelet, 3-nerved, apex attenuate, apiculate, scabrous; second palea membranous, slightly shorter than second lemma, inconspicuously 2-keeled. Caryopsis oblong-obovoid, ca. 2.5 mm long. [2n = 18, 27, 54.] (from Wagner & Herbst 1990).

II. STEWARDSHIP SUMMARY

STEW.SUM: *P. setaceum* is a serious pest weed in Hawaii (Tunison 1992, Wagner et. al. 1990, Williams et. al. 1995), and has been found as an escape from cultivation in southern Florida (K. Bradley & G. Gann pers. obs, R. Hammer pers. comm.) and southern California (Wiggins 1980, Hickman 1993, C. Brey pers. comm.). In Hawaii it occurs in most open canopy forest types across a broad altitudinal gradient. In Florida and California it has primarily been found recruiting on roadsides, but in California it is also known to escape sparingly into desert and steppe ecosystems.

III. NATURAL HISTORY

GRANGECOM: The natural range of *P. setaceum* includes tropical Africa, SW Asia, and Arabia. It has escaped from cultivation in the following locations: Hawaii where it is primarily on the island of Hawai'i (L. Loope pers. comm.) where it was introduced in the beginning of the 20th century (Tunison 1992); In south Florida from the Cutler Ridge area of Dade County south to central Key Largo (K. Bradley & G. Gann pers. obs, R. Hammer pers. comm.); in southern California (Wiggins 1980, Hickman 1993, C. Brey pers. comm.); Fiji (Smith 1979); and the Cape Peninsula of South Africa (Adamson & Salter 1950).

IMPACTS: In Hawaii *P. setaceum* is an aggressive, fire adapted colonizer which quickly accumulates biomass that burns very fast and hot, causing damage to native forests, and forms dense monocultures, excluding native species. It is considered one of the worst exotic pest plants in Hawaii where it has the ability to invade all open canopy communities (Tunison 1992). In Florida it has not yet impacted natural communities (Bradley & Gann, pers. obs.; R. Hammer pers. comm.). In California it has only sparingly escaped into natural communities, including desert and steppe ecosystems (C. Brey pers. comm.)

GHABCOM: In its native range *P. setaceum* has been collected on cliffs, rocky ledges, river beds, and rocky gorges from the sea coast to over 2200 meters (Prain 1950). Outside of its native range it is a colonist of well drained soils or rocky substrates. In Hawaii it colonizes barren lava flows and cinder fields (Wagner et. al. 1990) and xeric to mesic habitats from sea level to above 2700 meters, having a greater altitudinal distribution than any other grass in Hawaii (Williams et. al. 1995; Rundel 1980). In Florida it has been seen escaping to roadsides and the edge of one pine rockland fragment (K. Bradley & G. Gann pers. obs, R. Hammer pers. comm.). In southern California it is frequent on roadsides and sparingly escapes into desert and steppe regions (C. Brey, pers. comm.). In the Cape Peninsula of South Africa and in Fiji it is a colonist of roadsides (Adamson & Salter 1950; Smith 1979).

GECOLCOM: Data on flowering phenology in Hawaii has not been seen. In one station where *P. setaceum* has naturalized in Dade County, Florida it has been observed flowering throughout the year (K. Bradley pers. obs.). In has been recorded as flowering from May and December in cultivation at the Experiment Station of the University of Florida at Gainesville (Hall 1978). In the Cape Floristic regional of south Africa it flowers from December to June (Adamson and Salter 1950). In Fiji it has been noted flowering in January (Smith 1979).

P. setaceum is dispersed by wind, water, and humans (vehicles), and possibly by birds (Tunison 1992) It reestablishes quickly after fire (Wagner et. al. 1990). Its cold tolerance is unknown, but is believed to have relatively little cold tolerance (Simpson & Bashaw 1969). It has been cultivated in Florida as far north as the Experimental Station of the University of Florida at Gainesville and in northeastern south Florida (Hall 1978). It is sold by Florida nurseries only as far north as Sebring (Plantfinder 1995), but is listed as suitable for use in horticultural zone 9 (Royal Horticultural Society 1992), which extends through most of north Florida, along the coast to southeast South Carolina, and west to the entire gulf Coast of Texas. *Pennisetum setaceum* seeds may be remain in a seed bank for at least six years (Tunison 1992).

Growth rates of 37 individuals of *P. setaceum* were monitored by Tunison (1992) for four years. Plants grew in length an average of 11.6 cm/yr., in basal diameter 7.74 cm/yr., and 15 of the plants flowered during the study. The average length of plants after flowering was 105.5 cm and the average basal diameter at flowering was 6.5 cm. Tunison believes however that plants may grow more rapidly than these data indicate.

Extensive ecophysiological studies were conducted by Williams et. al. (1995) and showed that *P. setaceum* has a high degree of phenotypic plasticity. In transplant experiments across different altitudes several components of fitness (e.g. inflorescence number, plant size, and survivorship), were not found to differ between resident and transplanted populations. Williams attributes the broad ecological amplitude of *P. setaceum* in Hawaii to this "substantial and widely expressed phenotypic plasticity."

IV. CONDITION

GTHREATCOM: In Hawaii *P. setaceum* is a threat to all open canopy ecosystems. In Florida *P. setaceum* poses a potential threat to xeric to mesic open canopy communities including pine rocklands, florida scrub, scrubby flatwoods, and coastal dunes. In California it poses a threat to desert and steppe communities. Florida and California ecosystems could be impacted in a similar manner as those in Hawaii, through the disruption of fire regimes and displacement of native plant species. Data on threats to specific species in Hawaii has not been seen. Endangered plant species that could be impacted in Florida include *Polygala smallii, Chamaesyce deltoidea,* and *Galactia smallii,* all listed as endangered by the U.S. Fish and Wildlife Service. Data on threats to specific species in California has not been seen.

V. MANAGEMENT/MONITORING

MGMT.REQS: Management of *P. setaceum* in Hawaii consists of hand pulling plants and removing inflorescences from the site. Follow up to initial management is required because of a persistent seed bank. Management strategies in Hawaii focus on the best way to contain populations (Tunison 1992). I Florida extant naturalized populations are currently small and should be eliminated. *P. setaceum,* however, is common in the landscape trade in southern Florida. in order to prevent the continued spread of this species it should be prevented from being sold, although proposals to ban ornamentals are seldom well received. It is however, probably acceptable to allow the continued use of purple cultivars since they are essentially sterile (Simpson & Bashaw 1969). These cultivars are widely available and widely used. They are available under the cultivar names "rubrum" with rose colored foliage, "cupreum" with reddish foliage, and "atrosanguineum" with purple foliage. Restrictions should also be placed on its use in California where much of its spread is due to use along roadsides by CalTran.

MGMT.PROG: An extensive management program is underway in Hawaii Volcanoes National Park. This program has been underway since the early 1960's. Treatments of hand pulling have been repeated at three to six month intervals since 1979. Populations with three or more individuals almost always required follow up treatments because of new seedlings. Between 1976 and 1983 ca. $125,000 was spent on management in Hawaii Volcanoes National Park (Tunison 1992). Biological control was considered unfeasible by Tunison (1992). Tunison believed that biological control agents may not be found, that permits to import control agents may not be obtainable because the may be harmful to a valuable forage grass (*Pennisetum clandestinum*), that biological control research may take over 10 years and cost approximately $1 million, and that extant facilities are occupied by other target species. No control programs are underway in Florida and none are known in California.

MONIT.PROG: An extensive monitoring program has been conducted in Hawaii Volcanoes National; Park. Extensive mapping of its distribution in the park was conducted by helicopter, horseback, and by foot (Tunison 1992)

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1V. DOCUMENTATION & MAINTENANCE

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EDAUTHOR: Keith Bradley, Research Associate
George Gann, Director
The Institute for Regional Conservation
Miami, FL. 33170