

Arundo donax

Giant reed

Poaceae

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OVERVIEW

Arundo donax, native to the Mediterranean region, has long been cultivated throughout the world for use in making mats, roofing material, erosion control, and as an ornamental (Neal 1965, Wagner et al. 1999). *A. donax* has become invasive in several places where it has been planted, such as California and Florida, where it invades riparian areas and over-runs native plants and riverside habitat (Bodle 1998, Dudley 1998). Large control programs have been established to control *A. donax* infestations in these areas. On Maui, *A. donax* was sparingly planted in several locations from sea level up to 3,500 ft (1,067 m) elevation. Plantings at higher and more arid climates are usually small patches that appear unhealthy, especially during dry periods. Plantings at lower elevations near sea level and closer to the water table appear healthier and generally these patches cover larger areas. In Hawai'i, plants spread vegetatively from underground rhizomes and have also spread in infested dirt moved by heavy machinery. Because of the limited distribution of *A. donax* on Maui, coupled with the evidence of its invasiveness elsewhere, the Maui Invasive Species Committee (MISC) has targeted this species for eradication. It is also being targeted for eradication on Moloka'i by the Moloka'i Invasive Species Committee (MOMISC) and on Kaua'i by the Kaua'i Invasive Species Committee (KISC).

TAXONOMY

Family: Poaceae (Grass family) (Wagner et al. 1999).

Latin name: *Arundo donax* L. (Wagner et al. 1999).

Synonyms: None.

Common names: Giant reed, Spanish reed, giant cane, giant feather-reed grass (GRIN 2001, Riffle 1998, Wagner et al. 1999).

Taxonomic notes: *Arundo* is a genus comprised of three species from Asia and the Mediterranean regions (Wagner et al. 1999).

Nomenclature: The latin name, *Arundo*, translates to the English word for cane (Wagner et al. 1999).

Related species in Hawai'i: The variety, *A. donax* var. *variegata* or *A. donax* var. *versicolor*, with leaves striped yellow or white is also cultivated in Hawai'i (Neal 1965) and elsewhere in the world (Riffle 1998, PLANTS 2001).

DESCRIPTION

"Large perennials; culms erect or arching, up to 8 m tall, unbranched or branched above, arising from thick, scaly rhizomes, nodes glabrous, usually concealed, internodes hollow,

up to 4 cm in diameter. Leaves strongly distichous, distributed rather uniformly along culm except on old stems; sheaths longer than internodes and strongly overlapping, glaucous, glabrous to sometimes sparsely long-villous at throat; ligule a thin, whitish or brownish, minutely ciliate membrane, 1-1.5 mm long; blades thick and coriaceous, 45-60 cm long, 4-6 cm wide, glabrous, glaucous, striate, margins scabrous, leaf bases broader than sheaths, with prominent, triangular, brownish flanges, ciliate along margins. Inflorescences paniculate, ovoid, 40-70 cm long, plumose, dense, the branches stiffly ascending; spikelets densely clustered along secondary or tertiary branches, 13-17 mm long, 4-5 flowered, rachilla glabrous; glumes hyaline, brownish or purplish, 11-13 mm long, narrow, acuminate, scabrous on the indistinct keel; lemmas membranous, lanceolate-ovate, 8-15 mm long, tapering to a short straight awn arising between 2 delicate lateral teeth, 3-7 nerved, usually 3 major ones anastomosing with midnerve, lower portions on dorsal surface of lemma heavily bearded with long silky whitish hairs, the hairs 8-10 mm long; palea whitish, membranous, 5-10 mm long, ca. 1/2 as long as lemma, scabrid on keels and pubescent near base between them, hyaline truncate. Caryopsis elongate, 1-1.5 mm long." (Wagner et al. 1999).

BIOLOGY & ECOLOGY

Cultivation: *A. donax* has long been associated with humans and has various uses and cultural significance. In the Mediterranean region, the plant has been used for medicine, lattices, mats, fish poles, and for parts in instruments such as the clarinet (Neal 1965). In Egypt, the giant reed was common and can be identified from temple drawings, often representing the letter "A" (Neal 1965). *A. donax* was useful for a variety of reasons and was brought from the Mediterranean region to many parts of the world. It does well in sand and is commonly used in seacoast gardens (Greenlee 1992). Today, it is cultivated for roofing material, erosion control, windbreaks, and as an ornamental.

Invasiveness: This tall reed spreads by underground rhizomes forming dense stands in moist to wet sites. It is invasive in the United States, particularly in southern and western states such as Florida and California, where it is a problem along riparian areas and roadsides. The large amounts of vegetation interferes with flood control, displaces native plants and animals, and is a potential fire hazard. *A. donax* propagates itself through vegetative growth and is able to form dense pure stands that can out-compete other vegetation (Wells et al. 1980). Plants spread downstream in flooding events. Giant reed is capable of rapid growth and has been reported to have growth rates up to .7 m per week over a period of several months in favorable conditions (Perdue 1958). In infested areas of the United States, native plants, such as willows and cottonwoods that provide shade along rivers, are replaced by tall vertical grassy shorelines affecting water temperature, interfering with water flow, and displacing riverside habitat (Bodle 1998). In addition, once established, *A. donax* is hard to kill.

Pollination: Uncertain, probably wind pollinated.

Propagation: *A. donax* can be propagated by seeds. Though in most areas where giant reed is cultivated, viable seeds are not produced (Perdue 1958). *A. donax* is most often propagated throughout the world by planting root rhizomes which readily sprout. On

Maui, flowering *A. donax* has been observed in a few low elevation sites, including Kihei, Kahului, and Spreckelsville, though it is uncertain whether these seeds are viable or not. No seedlings have been observed to date and most spread on Maui seems to be vegetative.

Dispersal: Plants spread downstream in flooding events. Humans spread the plant in horticulture, mostly by breaking off an underground rhizome and replanting somewhere else. Machinery, such as bulldozers, can spread the plant.

Pests and Diseases: According to Brickell and Zuk (1997), rust is sometimes a problem.

DISTRIBUTION

Native range: *A. donax* is native to the Mediterranean region (Wagner et al. 1999).

Global distribution: *A. donax* is widely cultivated and now naturalized in warm temperate to tropical areas. It is apparently an ancient introduction to Europe. *A. donax* was introduced to California by the Spanish mission fathers and planted up and down the state (Greenlee 1992). It was reported as abundant in Los Angeles, California as early as 1820 (Robbins et al. 1951). It now occupies many southern states from the east to the west coast and as far north as Maryland (PLANTS 2001).

State of Hawai'i distribution: In Hawai'i, *A. donax* is cultivated and reported as naturalized in coastal areas, often in thickets, on Kaua'i, O'ahu, Maui, and Hawai'i (Wagner et al. 1999). It is also known from Moloka'i, located at Kaunakakai, from a single garden planting, and occupies about 800 sq. ft. (Tina Lau pers. comm.).

Island of Maui distribution: During baseline surveys in 2000-2001, about 20 sites of *A. donax* were observed. Of these, about half were at mid elevations up to 3,500 ft (1,067 m) in residential areas of Kula and the other half were at lower elevations near the coast in both residential areas, garden shops, beaches, and waste areas. Most of the larger naturalized sites were located at lower elevations near the coast, where the water table is closer, allowing plants to thrive. The site at the sand dunes at the end of the Kahului airport runway appears to have been moved about with heavy machinery as several patches occur within the localized area.

CONTROL METHODS

Physical control:

Manual removal: Smaller infestations can be removed manually, though is often extremely labor intense as all underground rhizomes must be removed for complete eradication (Dudley 1998). Hand pulling of younger plants, especially in looser soils after a rain, works for new seedlings less than 2 m in height. Hand pulling is also very selective and can be done when native plants are nearby. Rhizomes can be dug up using picks and shovels, making sure to remove all parts.

Mechanical removal: Larger machines can be used to remove aboveground vegetation and dig up underground rhizomes. Vegetation can be chopped or trimmed back with a

tractor. This non-selective method works well in monotypic stands of undesirable plants where there are no native plants nearby. This is often done in preparation of removal of underground rhizomes or prior to chemical treatment.

Prescribed burns: Flame throwers or weed burner devices can be used as spot treatment to heat girdle stems at the base of plants. This technique is sometimes used instead of chemical girdling as it is cheaper and can be done in wet weather (Hoshovsky 1998). Though, Dudley (1998) does not suggest burning be used as a treatment because it does not kill the underground rhizomes and probably favors giant reed over native plants.

Chemical control:

Foliar application: The most common herbicide used to treat giant reed is glyphosate, mostly in the form of Roundup or Rodeo (in wetlands). The standard treatment is a foliar spray application of 1.5% by volume glyphosate with a .5% v/v non-ionic surfactant (Monsanto 1992). Small patches can be treated using backpack or towed sprayers, and major infestations have been treated using helicopters (Dudley 1998). A common method is to cut or mow a patch to allow regeneration before foliar application is made.

Cut stump: This method reduces herbicide costs and helps to avoid drift to desirable plants. Concentrated glyphosate solution (50% to 100% Rodeo or Roundup, or 27-54% glyphosate) is applied to cut stems (within 5-10 cm) of the substrate. Treat plants immediately after cutting for efficient translocation. In California, this treatment proved more successful than the foliar method. Finn et al. (1990) report, "Foliar spray methods showed a 10 to 90 percent success rate for killing plants, compared to a 100 percent success rate for the cut-stem method."

Follow up: The importance of follow treatment is stressed by Dudley (1998) who reports that some professional applicators suggest 6 return spot treatments over 6 months.

Biological control: No biological controls have been introduced for *A. donax* and probably won't be in the future due to the commercial value of the plant (Hoshovsky 1998).

Cultural control: In parts of California, Angora and Spanish goats are being used to control *A. donax* (Daar 1983). Other animals such as sheep and even geese may be used in weed control.

Noxious weed acts: *A. donax* is listed by the California Exotic Pest Plant Council as an "A" list weed species. This is defined as, "Most Invasive Wildland Pest Plants; documented as aggressive invaders that displace natives and disrupt natural habitats."

MANAGEMENT RECOMMENDATIONS

A. donax is a nuisance in the United States and requires much time and money to control. Controlling the few sites we have here on Maui now may save time and money in the future. MISC should continue to eradicate all known locations on Maui and continue to refine control methods. Monitoring current locations and searching for new locations

should also continue. In addition, prevention of spread to vulnerable habitats such as estuaries, reservoirs, coastal areas, and streams needs to happen through public education. *A. donax* could also be placed on the state noxious weed list to discourage future use of the plant in Hawai'i. Information on distribution on other Hawaiian Islands is needed.

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