

**DRAFT: WRITTEN FINDINGS OF THE
WASHINGTON STATE NOXIOUS WEED CONTROL BOARD
DRAFT September 2014**

Scientific name:	<i>Saccharum ravennae</i> (L.) L.
Synonyms:	<i>Tripidium ravennae</i> (L.) H. Scholz, <i>Andropogon ravennae</i> L., <i>Erianthus elephantinus</i> Hook. f., <i>Erianthus purpurascens</i> Andersson, <i>Erianthus ravennae</i> (L.) P. Beauv., <i>Ripidium ravennae</i> (L.) Trin , <i>Erianthus ravennae</i> (L.) P. Beauv. var. <i>purpurascens</i> (Andersson) Hack.
Common name:	Ravenna grass, Italian sugarcane, plume grass, giant cane, hardy pampas grass
Family:	Poaceae
Legal Status:	Proposed Class A noxious weed. Update: listed as a Class A noxious weed in 2015 and changed to a Class B noxious weed in 2017.



Images of *Saccharum ravennae* plant habit: left, June 2014, plant with old flower stems; center, plant with this year's and old flower stems; right, small plant with one new flower stem. All images taken in Benton County, WA by WSNWCB.

Description and Variation:

The name Ravenna grass refers to the Italian city of Ravenna, which long ago served as the seat of the Roman Empire (Darke 2007).

Overall Habit:

Saccharum ravennae is a tall, perennial grass that forms clumps of basal leaves called tussocks. Flowering stems are erect and up to 13 feet (4 meters) tall (DiTomaso and Healy 2007). Leaves occur on stems up to the base of the inflorescences (DiTomaso et al. 2013). Stems can be reddish or other colors as flowers mature. Inflorescences are at stem tips and are slender and silvery in color.

Roots:

Plants grow in a clump and have rhizomes with fine roots (DiTomaso et al. 2013).



Red coloring on flower stems during September, image by WSNWCB.

Stems:

Stems, called culms, are stiff and grow 5 to 13 feet (1.5 to 4 meters) tall and around 0.4 inches (1 cm) in diameter, lower nodes yellowish villous, glabrous below panicle (Chen and Phillips 2006). Stems, especially large stems, can turn red when in flower. Some areas though may not have reddish coloring in fall such as what has been noticed in Colorado (Hayward 1993). Old flowering stems may remain for one year or longer.

Leaves:

Saccharum ravennae's basal leaves are long and narrow, 3 to 4 feet long by 0.5 to 1 inch wide (Greenlee 1992). Basal clumps of leaves can be 4 to 5 feet across (Hayward 1993 in Burgess 2006). Leaves are medium gray-green and have a white midvein. The base of the leaf blade is unlobed and the upper side is densely covered with long, fuzzy tawny (tan-yellowish) hairs that typically hide the ligule and upper blade base surface (DiTomaso et al. 2013). Leaves on the flowering stems are shorter, up to 60 cm, and occur all the way up the stems to the base of the inflorescence (DiTomaso and Healy 2007, Griffiths 1994). Leaves are weakly to somewhat sharply serrate. Leaves may be purple-tinted in autumn (Brickell and Zuk 1997).



Saccharum ravennae leaves: left, top side of leaf blade with white midvein; center, side view of leaf blade base and sheath showing hairs; right, tuft of hair at base of leaves, sometimes covering the ligule, all images WSNWCB.

Flowers:

Saccharum ravennae's inflorescence occurs at stem tips and is a plume-like, dense panicle, 9.8 inches to 2 feet (25 to 60 cm) long by 4 to 6 inches (10 to 15 cm) wide (Chen and Phillips 2006). Primary panicle branches are 2.4 to 7.9 inches (6 to 20 cm) and are appressed or spreading (Chen and Phillips 2006). Spikelets have 2 florets, and are 3 to 7 mm long and purplish. Spikelets have silky hairs and occur in unequal pairs, where the lower spikelet is sessile and the upper spikelet is stalked (DiTomaso and Healy 2007). Spikelet pairs usually detach as a unit (DiTomaso and Healy 2007). The lower glume is lanceolate, with a glabrous or pilose with spreading hairs on its back (Chen and Phillips 2006). The lower lemma has

an acute tip and an almost straight awn, 4-8mm long. Chen and Phillips (2006) note that *S. ravennae* shows much variability in the disposition of hairs on the glumes and that sometimes the spikelets are slightly dimorphic, with the sessile spikelet almost glabrous and the pedicelled one strongly pilose. Floret anthers 3, 2.1 to 2.2 mm (Chen and Phillips 2006).



Saccharum ravennae inflorescence images taken in Benton County Washington, 9.3.2014. Left, expanded panicles; center, contracted panicle with evident hairs; right, flowers in bloom with visible yellow anthers, images by WSNWCB.

Fruits and Seeds:

Saccharum ravennae has tiny seeds that are dispersed by wind and water (DiTomaso et al. 2013).

Look-alikes:

Pampas grass (*Cortaderia selloana*) and jubata grass (*Cortaderia jubata*) are two ornamental grasses that can resemble *Saccharum ravennae*. *Saccharum ravennae* has even been marketed as a cold-hardy alternative to pampas grass due to its similar appearance and is called 'hardy pampas grass' as one of its common names. Firestone (2007) notes differences between them include: *C. selloana* and *C. jubata* have sharply serrated leaves with no hairs while *S. ravennae* has weakly serrated leaves with hairy bases; *S. ravennae* has plumes even taller than the other two species, borne on stalks that stand well above the leaves and have nodes or joints, while *Cortaderia* spp. have plumes on node-free stems; *S. ravennae* is more cold-tolerant than these two *Cortaderia* species. Also, *Saccharum ravennae* plants that were observed blooming in Benton County WA and at the McNary Wildlife Refuge in OR had red coloring on their flowering stems. Though not all plants may have this trait, *C. selloana* and *C. jubata* stems do not have this color on their flowering stems.



Left, *Cortaderia selloana*, mature plant in bloom, image credit John Ruter, University of Georgia, Bugwood.org; center, *Cortaderia jubata* plant habit, image, John M. Randall, The Nature Conservancy, Bugwood.org; right, *Saccharum ravennae* plant habit, image WSNWCB.

Phragmites australis, common reed, is listed as a Class B noxious weed and is another large perennial grass that may resemble *S. ravennae*. One main difference between them is that *S. ravennae* grows in bunches or tussocks (or tufts) while *Phragmites australis* is a spreading rhizomatous grass that spreads by sending up single stems without a bunch of basal leaves.

Habitat:

Saccharum ravennae grows in moist places such as ditches, marshes, wetlands, and riparian areas (DiTomaso et al. 2013, DiTomaso and Healy 2007). As long as it has sun, it tolerates a wide range of conditions (Greenlee 1992). Plants may also grow in light or partial shade as well (Oakes 1990), though may not produce seedheads if shaded (Burgess 2006). *Saccharum ravennae* can survive in drought conditions and still produce tall flowering stems but may produce fewer of them (Hattori et al. 2010). In California, it was noted to be growing in much of the same type of habitat as common reed, *Arundo donax*, and saltcedar, *Tamarix parviflora* (DiTomaso 2006).

In Oklahoma, Burgess (2006) surveyed a river that had *S. ravennae* and found lower abundances of it in areas prone to periodic flooding. Burgess (2006) found monotypic stands of *S. ravennae* occurred on sandy areas approximately 1-200 meters from the river channel. The larger individuals of *S. ravennae* occurred 100-300 meters from the river and uphill from areas subjected to periodic inundation, suggesting that establishment of this species is determined by duration of soil saturation, although growth and persistence can occur in areas that experience extended inundation.



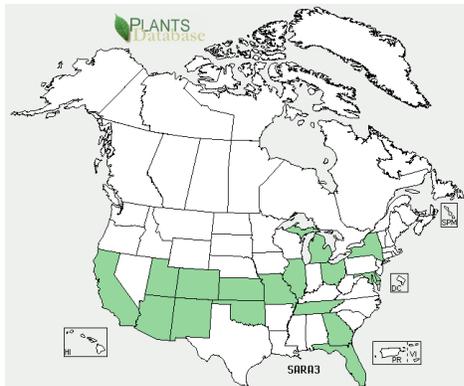
Left, *Saccharum ravennae* infestation in flower near the Yakima River in Benton County Washington; right, young *S. ravennae* growing in an open, seasonally wet, disturbed area in Richland Washington, images WSNWCB.

Geographic Distribution:

Native Distribution:

Saccharum ravennae is native to Northern Africa (Algeria, Libya, Morocco, Tunisia, Somalia), parts of Asia (Oman, Saudi Arabia, Yemen, Afghanistan, Cyprus, Iran, Iraq, Israel, Jordan, Lebanon, Syria, Turkey, Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Turkmenistan, Uzbekistan, Xinjiang (China), Northern India, Pakistan) and Europe (Albania, Bulgaria, Croatia, Greece, Italy, Romania, France and Spain) (USDA ARS 2014).

Distribution in North America:

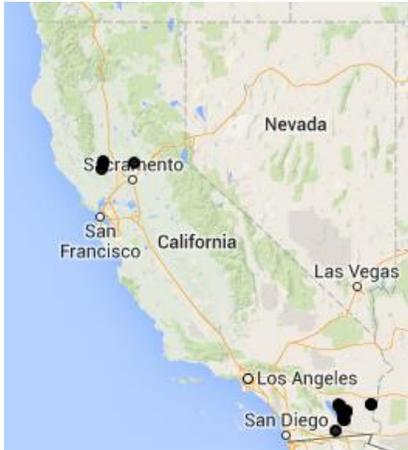


Saccharum ravennae is grown as an ornamental and it occasionally escapes and persists in North America (Webster 2003). Plants are known to have been in the horticulture trade since at least 1921 (Firestone 2007). States with *S. ravennae* are: Washington, California, Utah, Arizona, Colorado, New Mexico, Nebraska, Oklahoma, Missouri, Illinois, Michigan, Ohio, Tennessee, Georgia, Florida, Maryland, Delaware, and New York (USDA NRCS 2014). New York first documented *S. ravennae* in 2011, collected on a mound of rubble on Manhattan Island, though it is unknown if this plant overwintered (Lamont et al. 2014). Lamont et al. (2014) found

S. ravennae to be first reported escaping cultivation in Delaware (Tatnall 1946), Maryland (Norton and Brown 1946), Illinois (Thieret and Evers 1957) and then more recently in Ohio (Wilder and McCombs 2002), Washington DC (Steury 2004) and Michigan (Swink and Wilhelm 1994), though the Michigan population may only be persisting in cultivation.

DiTomaso et al. (2013) reports it has become a problem in the Grand Canyon. Stevens (n.d.) reports that it was first documented near Lees Ferry in 1981 and 55 populations were found between Lees Ferry and Diamond Creek in 1992. *Saccharum ravennae* was planted as an ornamental around Wahweap Bay on Lake Powell, and the National Park Service is beginning eradication efforts there.

In Oklahoma, large stands of Ravenna grass can be found along the Canadian River at several points (Burgess 2006).



California:

Saccharum ravennae is found in the Sonoran Desert and Sacramento Valley of California. It has been observed to be spreading rapidly along Cache Creek in the Sacramento Valley, growing well away from human cultivation (Cal-IPC, Firestone 2007).

Oregon:

The Center for Lakes & Reservoirs at Portland State University discovered *Saccharum ravennae* in July 2014 at the McNary Wildlife Nature area, just downstream of McNary Dam in northeast Oregon. They found about 20-25 plants in the area.

Locations (black dots) in California of herbarium specimen collections of *Saccharum ravennae* (Consortium of California Herbaria 2014).



Saccharum ravennae at the McNary Wildlife refuge in Oregon, left, large plant in flower near one of the ponds; center, a large blooming plant by the road; right, flowering plants on wet soil under power lines, all images WSNWCB.

Invasive and noxious weed listings:

- Listed as a Class A noxious weed in New Mexico
- In Hawaii, any species of the genus *Saccharum* is prohibited except under permit.
- Louisiana: Sugarcane plants (*Saccharum* spp.), imports are regulated and any other propagative forms of sugarcane.
- It has been designated as an invasive species in Utah (Swearington 2006 in Burgess 2006).
- Listed by the Arizona Wildlands Invasive Plant Working Group as a medium threat, indicating it has substantial and apparent ecological impacts on ecosystems, plant and animal communities, and vegetational structure and has a moderate to high rate of dispersal.
- California Invasive Plant Council listed it as 'Moderate – Alert'

- Pennsylvania Department of Conservation and Natural Resources Watch List

History and Distribution in Washington:

Prior to the recent discovery of escaped *Saccharum ravennae* in Benton County, there were no known sites in Washington. There is one herbarium specimen of *S. ravennae* in Washington, collected in 1898 by Wilhelm N. Suksdorf from his garden in Klickitat County (WSU Marion Ownbey Herbarium #148311). No other herbarium records of Ravenna grass exist in UW Herbarium's online database or in the Consortium of PNW herbaria for Washington, Oregon or British Columbia. There is also mention of one plant being found in Grant County in 1982, in a document at the WSNWCB's office. It was noted that the identification was not confirmed but did warrant further research.

In 2012, Benton County Noxious Weed Control Board discovered naturalizing plants growing in a number of areas and habitats around the county including: around Richland, near the Columbia River, near the Yakima River, growing in cracks in the asphalt, cracks along concrete walls, rocky hillsides, grassy banks, gravel roadsides, and escaped from yards. Since their discovery, a couple other locations of *S. ravennae* have been found. A few escaping plants have been located in Franklin County, in the Pasco area near Benton County as well as some ornamental plantings. In Yakima County, the county noxious weed control board found some escaped plants along I-82 and over 20 sites of ornamental plantings (Susan Bird, pers. comm.). These are the only escaped plants known in the state, though *S. ravennae* may occur elsewhere if they were/are ornamentally planted.

Biology:

Growth and Development:

Plants are perennials and may begin blooming and reach their mature height by their second growing season (Oakes 1990). Plants bloom silvery-purple inflorescences generally beginning in late July or August and continue until frost (Hayward 1993). In harsher climates, an early frost may inhibit flowering (Hayward 1993). Old flowering stems can remain on the plants through the winter and longer in some areas (Oakes 1990). In Benton County, plants that were blooming 9.3.2014 still had old flowering stems present (Wendy DesCamp pers. obs.).

Reproduction:

Plants can reproduce by seed and can also be propagated by plant division in early summer as it begins to emerge (Hayward 1993, Oakes 1990). Plants may not bloom in colder climates, but they do reseed themselves copiously in warmer climates (Oakes 1990). It prefers full sun on fertile, well-drained, moist or wet soil. The plants may be grown in light or partial shade; they are adaptable to a wide range of soil types (Oakes 1990).

It is not known how long its seeds will survive in the soil, but it is theorized that due to their small size they may not survive much more than a year (DiTomaso et al. 2013). Seeds can be spread by both wind and water (DiTomaso et al. 2013).

Control:

Though *Saccharum ravennae* leaf margins are not as sharply serrated as *Cortaderia* species, its hairs can be mildly irritating, and it is still important to protect yourself by wearing gloves when handling the plants. Once plants are controlled, plant or seed bare ground with native or non-invasive, non-native plants to provide competition (DiTomaso et al. 2013). Instead of planting *S. ravennae* in ornamental plantings, use non-invasive alternatives. Check out publications like "Garden Wise, non-invasive plants for your garden" and other similar references for plant suggestions.

Mechanical Methods:

DiTomaso et al. (2013) report that control techniques are very similar to those published for *Cortaderia* species. Plants can be dug out of the ground, but all roots and rhizome fragments should be removed to prevent resprouting (DiTomaso et al 2013). Plants will resprout after burning, cutting or grazing so follow-up control will be needed if the roots are not removed (AZ-WIPWG 2005). National Park Service staff and volunteers report the successful removal of over 25,000 plants in the Grand Canyon using mechanical methods such as digging up plants (DiTomaso et al. 2013), using shovels and come-alongs (Stevens n.d.).

If it isn't possible to remove all plants before flowers develop, consistently removing plumes before seed matures will help to prevent population expansion. However, plants that have had plumes removed may develop more plumes during the flowering season, so follow-up plume-removal may be needed. Bag and remove plumes to prevent seed developing on site.

Cultural Methods:

DiTomaso et al. (2013) do not report any cultural control methods of *S. ravennae* due to the proximity of these plants to riparian areas.

Planting or seeding desirable, non-invasive plants can provide competition to *S. ravennae* seedlings.

Biological Control:

There are no known biological controls for *Saccharum ravennae*. Chen and Phillips (2006) note in the "Flora of China" that it is also used for forage when it is young, but it is unknown what effect grazing may have on the health of the plants.

Chemical methods:

DiTomaso et al. (2013) write that most control efforts of *S. ravennae* use spot treatments of 5% glyphosate v/v solution of Rodeo or Aquamaster (2.5% a.e.), applying it to plants that are fully mature but before flowers produce viable seed. This likely occurs during the early summer months. There have also been reports that a 5% glyphosate solution mixed with 1% imazapyr (Habitat) will give very effective control (DiTomaso et al. 2013).

Catanzaro et al. (1993) tested a number of ornamental grasses' susceptibility to graminicides (fenoxaprop, fluazifop-P, quizalofop, and sethoxydim, collectively called POST grass herbicides). They found *S. ravennae* to exhibit severe (>70%) phytotoxicity from all the herbicides at 69 days after treatment, with a mortality of 96%.

Currently, herbicide treatment information on *Saccharum ravennae* is not available in the Pacific Northwest Weed Management handbook, but check back as information is continually updated. Contact your county noxious weed control board or weed district coordinator with questions.

Economic Importance:

Detrimental:

Information on the impacts of *Saccharum ravennae* is mostly observational but is provided by experienced land managers.

Because of its size and its ability to form dense stands that originate from under other vegetation, it could reduce native plant diversity, including rare and endangered species (DiTomaso et al. 2013). *Saccharum ravennae* may be displacing other plants by shading (Burgess 2006). *Saccharum ravennae* invades a wide variety of habitats including wetlands and riparian areas. Stevens (n.d.) notes that in the Grand Canyon, besides being a significant threat to the mainstream riparian zone, the real ecological danger of *S. ravennae* is that it could invade the Canyon's pristine tributary and hanging garden habitats. Stevens (n.d.) also reports that *S. ravennae* provides little bird and wildlife cover in the Grand Canyon. So far over 25,000 plants have been removed from the Grand Canyon and it is now considered rare in the area (DiTomaso et al. 2013).

The Arizona Wildland Invasive Plant Working Group (2005) noted that because *Saccharum ravennae* has growth and habitat requirements similar to pampas grass (*Cortaderia sellona*), as described in DiTomaso (2000) and Gadcil et al. (1984), and it could be possible that similar impacts (fire and flood) are potential natural detriments if *S. ravennae* populations establish large infestations. *Saccharum ravennae* is noted to form impenetrable stands (DiTomaso et al. 2013) which *Cortedaria* species have also done California.

Like *Cortaderia* species, *S. ravennae* could also reduce the aesthetic and recreational values of natural areas. Also, in an ornamental setting, flower stems may break in high winds and look tattered (Greenlee 1991).

Beneficial:

Saccharum ravennae is a large, perennial grass that is sold ornamentally to provide height and seasonal interest in the landscape. It is noted as being a hardier plant than pampas grass so could be grown in colder climates if the look of pampas grass is desired but the plant isn't hardy enough to survive there.

Chen and Phillips (2006) note in the "Flora of China" that it is also used for forage when it is young.

Saccharum ravennae is being studied in Japan for use as a possible biofuel (cellulosic bioethanol) due to its high biomass productivity (Hattori et al. 2010). Hattori et al. (2010) tests showed plants were susceptible to drought during its first year and plant growth may be restricted by a long drought period, which may hinder planting *S. ravennae* in certain environments though more studies are needed.

Rationale for Listing:

Saccharum ravennae, Ravenna grass, is a large, nonnative, perennial, ornamental grass that has been found escaping in eastern Washington in the last couple of years. It produces large basal clumps of leaves that can crowd out native and desirable plant species. It is already listed as an invasive species or noxious weed in New Mexico, Arizona, Utah and Pennsylvania. In Washington, seeds of *S. ravennae* are spreading from ornamental plantings and can successfully germinate in a wide range of habitats, including locations near the Columbia and Yakima Rivers. Just this summer, escaped *S. ravennae* plants were also found in Oregon, near the Columbia River, becoming Oregon's first document record. Locations of *S. ravennae* are still limited in Washington and by listing it as a Class A noxious weed, eradication would be required, thus eliminating the seed source and spread of plants before they become more widespread.

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