Oregon Department of Agriculture
Plant Pest Risk Assessment for
Spartina, *Spartina ssp.*
2011

Name: Cordgrass, Spartina, *Spartina ssp., S.anglica, S. densiflora, S. alterniflora, S. patens*
Family: Grass, *Poaceae*

Findings of this Review and Assessment: *Spartina spp*. were evaluated and determined to be a category **"A"** rated noxious weed, as defined by the Oregon Department of Agriculture (ODA) Noxious Weed Policy and Classification System. This determination was based on a literature review and analysis using two ODA evaluation forms. Using the Noxious Qualitative Weed Risk Assessment v. 3.8, *Spartina spp*. Scored an average **56** indicating a Risk Category of **A;** and a score of **20** with the Noxious Weed Rating System v. 3.2, indicating an **"A"** rating.

Introduction: *Spartina anglica, S. densiflora, S. alterniflora,* and *S. patens* are similar in the habitat that they invade, but each represent unique threats to the salt water marshes and estuaries of Oregon. Due to the similarities in ecology and impacts of these four species, their assessment has been included in a single document, with individual analysis based on the biological deviations between them. *Spartina anglica, S. densiflora, S. alterniflora,* and *S. patens* have been present in the estuarine areas of the U.S. west coast for over a century. As ecological engineers, these species can alter hydrology, biogeochemistry, and food webs of invaded areas, which can be a detriment to recreation, wildlife, and commercial resources. Although relatively free of these species, Oregon has two known infestations. One, a *S. alterniflora* patch near Warrenton, Oregon was eradicated by the ODA in 2010, the other, *S. patens* on Cox Island near Florence is currently being treated by The Nature Conservancy (TNC). Major infestations of *S. anglica, S. alterniflora* and *S. densiflora* in both California and Washington may provide propagules which if transported by wildlife or ocean currents, put Oregon at risk for additional introductions. To respond to this, in 2003, ODA constructed the Oregon Spartina Response Plan that outlines a strategy to prevent, detect, identify and eradicate these species in Oregon. The purpose of Spartina Plan is to provide a framework to guide agencies in early detection and rapid response efforts that lead to eradicate of the target species. (Isaacson et al., 2003).

"*Spartina* species are robust, perennial grasses with stout, upright, densely spaced stems and thick mats of roots and rhizomes. Vegetative spread by rhizomes can rapidly expand the area covered by a clone (Sytsma and Morgan, 2010)". *Spartina densiflora*, *S. alterniflora, S patens* and *S. anglica* are four of 14 to 17 different species in the genus *Spartina*, with *S. anglica* being a hybrid between *S. maritima* and *S. alterniflora* (Qan et al., 2007). With its great capacity for reducing tidal wave energy, mitigating erosion and trapping sediments, S. *alterniflora* has been widely introduced to many coastal and estuarine regions of the world as a species for ecological engineering (Wang et al, 2010). Since those introductions, these salt marsh plants are now are considered invasive to varying degrees across the world. Infestations can approach monumental sizes rapidly such as the population of *S. alterniflora* in China that grew from 26,000 hectares in 1995 to 112,000 hectares in 2006 (Qan et al., 2007). Major infestations also exist in Australia, Europe, China, and the Pacific coast of the United States. This species negatively impacts the coastal ecosystems, displacing endemic native flora and subsequently altering native fauna population dynamics. A hyper-aggressive invader of salt marshes, *Spartina* can occasionally out-compete some of the most hardy marsh grasses such as common reed, *Phragmities australis* (Qan et al., 2007).

Growth Habits, Reproduction, and Spread: *Spartina* is a tall perennial grass with deep roots and hollow stems arising primarily in salt marshes (Blackwood et al, 2009). One of the limited differences between the species is that *Spartina* species have varying optimal and survival elevations within the intertidal zone depending on the species (Qan et al., 2007). Under optimal conditions plants may flower ranging from one to four months. *Spartina* seeds can germinate in substrate salinities as high as 40 ppt (seawater is 35 ppt), although germination rates are highest at lower salinities (Sytsma and Morgan, 2010). The species dominates the regularly flooded marsh ("low marsh") and is a common species in the irregularly flooded marsh ("high marsh") (NOAA, 2011).

Populations of *Spartina* are maintained through rhizomal reproduction, while new sites are established by sexual reproduction (NOAA, 2011). Clonal reproduction occurs via new tillers from underground rhizomes, which remain attached to the parent plant or can survive and propagate once detached (Sytsma and Morgan, 2010). Rates of asexual reproduction can be startling for the *Spartina* genus: "9,100,000 ramets were reproduced from one rhizome segment over three successive growth seasons (Qan et al, 2007)". The spread of these ecological engineers can form dense monocultures that can disrupt the hydrology and ecology of estuaries and marshes (Pfauth et al., 2003). There is also a varying degree of difference in rate of propagation via asexual and sexual methods between species. *S. alterniflora* had a stronger capacity for both sexual and asexual reproduction, whereas *S. anglica* was show weaker sexual reproduction (Qan et al., 2007). Experiments have indicated that *Spartina* species can outcompete each other (Qan et al., 2007).

Spartina spreads naturally by seeds and/or rhizomes dislodged from a coastal infestation and floating out into the ocean for at least two months. Plants that become dislodged and float out in large, floating mats called wrack during the fall and winter storms can be moved up and down the coast by storm events. *Spartina* wrack has been found along the beaches of the west coast and has been reported by fisherman miles out to sea (Sytsma and Morgan, 2010). Internal transportation within estuaries has been a major vector of spread as noted in the San Francisco bay, with seeds floating on the tide to other parts of the bay (Ayers et al., 2004). Transportation by birds is also a probable vector for *Spartina* species. Accidental and intentional introduction of *Spartina* by humans was the main vector for the Spartina genus as it was used as an ecological engineer around the world (Sytsma and Morgan, 2010). It has also been shown to spread by dredging and shipping operations (Isaacson et al., 2003).

Semi-diurnal tidal patterns that exist on the west coast of North America results in a distribution of different species of Spartina from low to high intertidal positions that differ from their locations elsewhere in the world. "*S. alterniflora* has the broadest ecological amplitude and can inhabit the entire elevation gradient. *S. anglica* colonizes the lower intertidal while *S. densiflora* and *S. patens* are found in the mid to high salt marsh (Isaacson et al., 2003)."

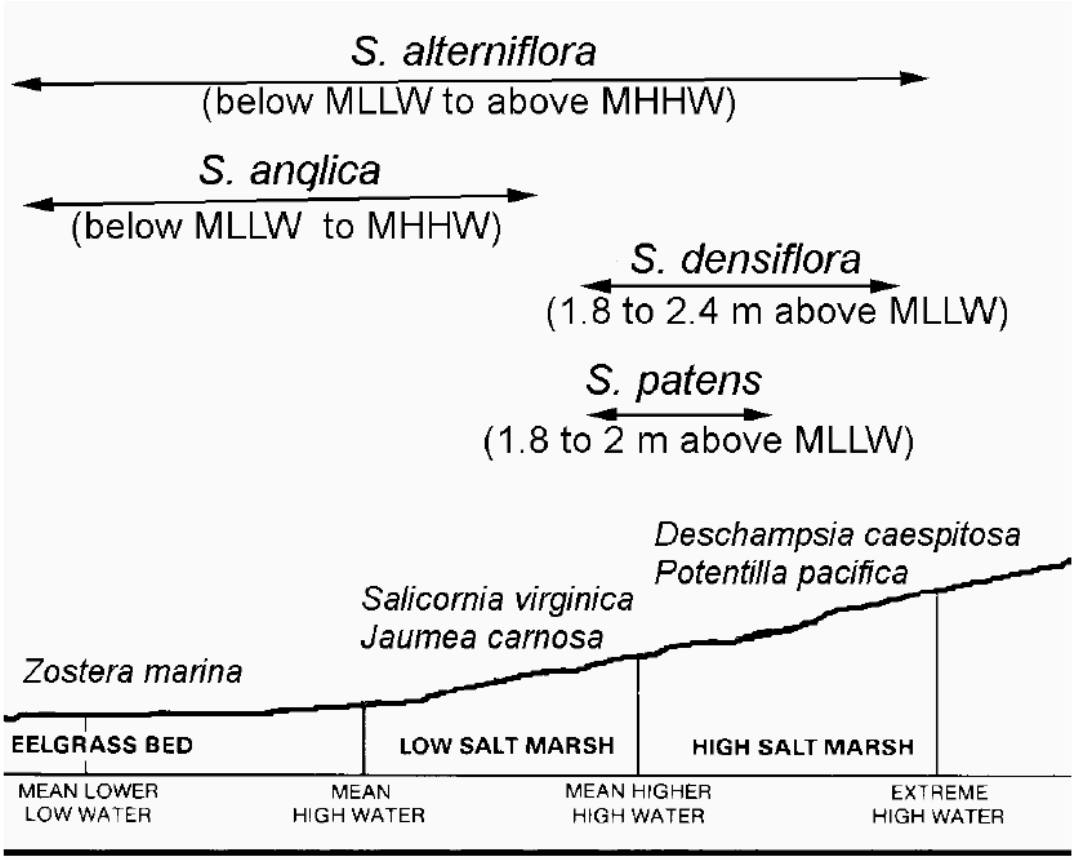


Figure 5. Distribution of exotic *Spartina* species in west coast estuaries. Dominant, native plant species are listed above each zone.

(Isaacson et al., 2003)

***Spartina* Individual Species Biology:**

S. anglica specific biology: "Forms dense monospecific stands; isolated small plants are clumpy and may appear cespitose. Tolerates a range of substrates, from tidal mud flats to sand and cobbled flats; inhabits flats and low salt marsh. Fertile offspring of a hybrid of the English *S. maritima* with *S. alterniflora*; introduced world-wide for shoreline stabilization and/or cattle forage (Sytsma and Morgan, 2010)". Experiments show that invasion of *S. anglica* varies dramatically among habitats and is mostly controlled by abiotic factors rather than biotic resistance of native species (Hacker and Dethier, 2006). *S. anglica* is efficient at transporting atmospheric oxygen to its root system, thus giving it a competitive edge of other Spartina such as *S. alterniflora* in lower elevations of the intertidal zone (Sytsma and Morgan, 2010). It is considered one of the most aggressive species of *Spartina* on the west coast (Sytsma and Morgan, 2010). *S. anglica* had an optimal and survival growth elevation of 2.5-3.5 m and 2.0-4.0 m, respectively (Qan et al, 2007). The stiff plant may be 5 to 100 cm tall, with stout stems five mm or more in diameter. The leaves lack auricles and have ligules that consist of a fringe of hairs. The leaf blades, which may be flat or inrolled, are 5 to 12 mm broad and may be persistent or falling (WDA, 2011). "*Spartina anglica* grows in variable habitats in Puget Sound from mudflats and cobble beaches, which are normally devoid of vascular plants, to salt marshes, where native vascular plants are the main biological component. Our work (Hacker et al. 2001) shows that the extent of *S. anglica* varies among the habitats with the greatest area in lower salinity marshes and mudflats and least in higher salinity marshes and cobble beaches (Hacker and Dethier, 2006)."

S. densiflora specific biology: "Distinguished by its cespitose growth habit. Inhabits mid-to- high salt marshes. Known to grow in mud or sand flats as well as rocky shores, and cobble beaches. Introduced from South America (Sytsma and Morgan, 2010)". It spreads vegetatively and by prolific seed production, creating dense tussocks with large biomass above and below ground (Mateos-Naranjo et al., 2009). *S. densiflora* in Humboldt Bay was measured to expand at rates of -6 to 26 cm/year when growing amongst other vegetation, and at 5 to 56 cm/year when growing in mudflats with no competition (Sytsma and Morgan, 2010). In Spain, *S. densiflora* is one of the most important conservation problems affecting the country and region. The species has been observed altering the composition of plant and animal communities because of vigorous clonal mats and seed production (Mateos-Naranjo et al., 2009).

S. alterniflora specific biology: "Grows in dense, monospecific stands, though isolated small plants are clumpy and may appear cespitose. Inhabits intertidal mud flats and, in the Pacific NW, low and high salt marshes. Species introduced from eastern coast of North America (Sytsma and Morgan, 2010)". *S. alterniflora* plants can reach a height of more than 3.0 m in the field (Qan et al., 2007). Clones of this species spread radially by vegetative means to form dense patches of vegetation that can be seen from the air. The species is prone to forming monocultures that can transform tidal mudflats in high, salt marsh meadows. It is considered one of the most aggressive species of *Spartina* on the west coast (Sytsma and Morgan, 2010). Growing in unvegetated mudflats, *S. alterniflora* may expand at nearly 79.3 cm/year (Sytsma and Morgan, 2010). In China, *S. alterniflora* had an optimal elevation growth of 1.5-2.5 m, and a survival elevation of 0.0-5.0 (Qan et al., 2007).

S. patens specific biology: "Dense, matted perennial forming monospecific stands; restricted to upper salt marsh. Introduced from eastern coast of North America (Sytsma and Morgan, 2010)". In China it is regarded as a latent invader (Qan et al., 2007). Clones of this species spread radially by vegetative means to form dense patches of vegetation that can be seen from the air (Sytsma and Morgan, 2010). Vegetative rates for *S. patens* have been observed from 17.78 and 22.86 cm/year (Sytsma and Morgan, 2010). The San Francisco bay saw an expansion from 2 plants in 1970 to 0.25 ha in 2004. Patches of S. Patens formed clumps up to 19m in diameter in a dense, monotypic pattern, but also plants were found sparsely throughout the bay growing amongst native vegetation in the mid-to-high marsh area (Ayers et al, 2004).

Native Range: *S. alterniflora* is native to the east and gulf coast regions of the U.S. where it an component of salt marshes. *S. anglica* (a hybrid of *S. maritima* and *S. alterniflora*) is thought to have arisen in southern Britain around 1890 and spread to France around 1906. *S. densiflora* is native to South America; along the east coast is found between Sao Paulo State, Brazil to Rio Gallegos city, Argentina and along the Chilean coast it is know between Las Cruces and Isla Talcan. *S. patens* is native to the east and gulf coast states of the U.S. and from eastern Canada (Isaacson et al., 2003).

Distribution in North America: The non-native *Spartina* species arrived in the estuaries of California, Washington, Oregon and British Columbia via deliberate plantings or as packing material for oysters and dumped onsite. Further spread has been facilitated by natural dispersal and unintended transport (Isaacson et al., 2003).

The following areas of infestation and treatment are:

California:

Humbolt Bay: *S. densiflora* currently dominates 94% of the remaining salt marsh and there is currently no bay-wide control plan (Sytsma and Morgan, 2010).

Spartina densiflora in Humbolt Bay, CA, photo credits Vanessa Morgan

San Francisco Bay: Prior to a 2006 treatment of *Spartina*, there were approximately 1000 net acres of the genus within the estuary. All four species of invasive *Spartina* are present in the bay currently. Treatment continues (Sytsma and Morgan, 2010).

Washington:

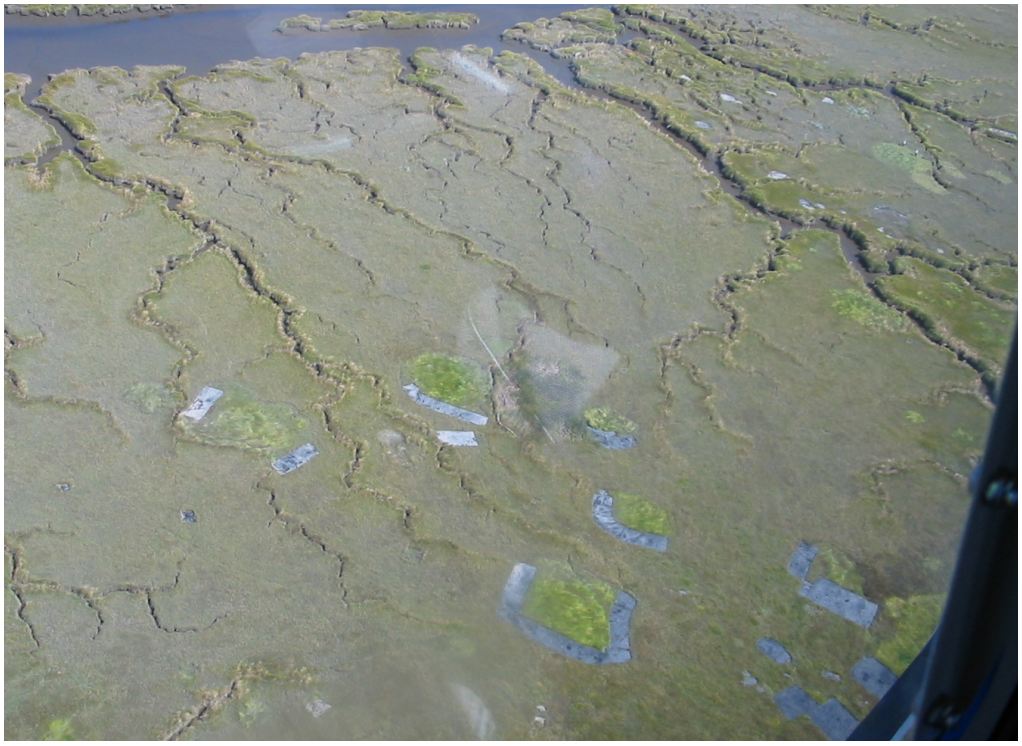
Spartina alterniflora in Willapa Bay, WA

Willapa Bay: With 8,500 net acres in 2003, Washington State began treatments utilizing glyphosate and mechanical methods on a large scale with mixed success. Recent treatments using new chemistry have reduced this acreage by 95% in 2009 (Sytsma and Morgan, 2010) and today less than 100 acres remain.

Puget Sound: There were 988 net acres of *S. anglica* in 1997. Treatments have reduced that to 350 net acres in 2006 (Sytsma and Morgan, 2010).

Grays Harbor: In 2008, 0.45 net acres were treated across 3,900 gross acres with an estimated 0.25 nets acres remaining as of 2009 (Sytsma and Morgan, 2010).

Oregon:

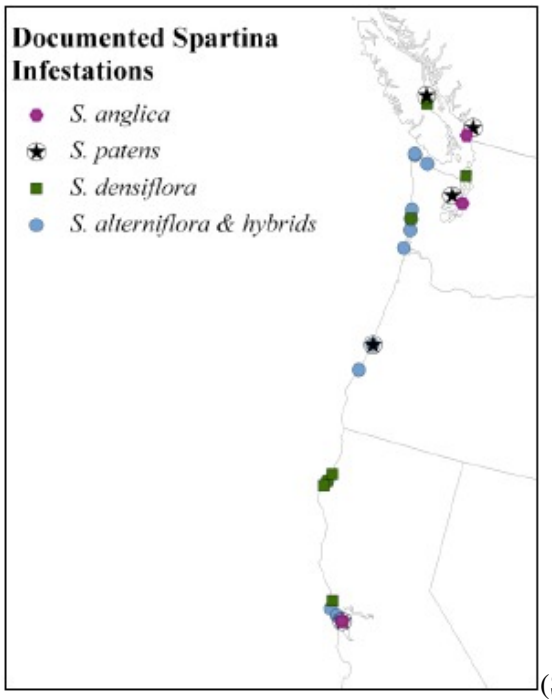


Aerial view of Spartina patens in Cox Island with geotextile fabric. Photo by Glenn Miller, ODA

Cox Island: As of 2009, TNC had treated 2.5 net acres of *Spartina patens* with a geotextile fabric covering. The practice had begun in 1996 after an unsuccessful eradication program was initiated using glyphosate in the late 70's (Sytsma and Morgan, 2010). As of 2011, complete eradication had not been achieved.

Siuslaw River: 2/100th acre of *S. alterniflora* was identified in 1990 by PSU. Two patches were a result of an intentional planting. The patches were removed by the initiator of the planting. A single plant was rediscovered by PSU staff at least 5 years after initial eradication and manually removed. There has been no regrowth as of 2005 (Sytsma and Morgan, 2010).

Coos Bay: 26 meter square of *S. alterniflora* was located and eradicated as of 2007 (Sytsma and Morgan, 2010).



(Sytsma and Morgan, 2010).

Hardiness Zones: *Spartina spp*. thrives in 2-3 hardiness zones though they are limited to coastal regions for moisture and humidity.

Probability of Detection: Surveys conducted from helicopters, boats and by foot have been ongoing and are detecting new infestations as they establish. These surveys will continue so that the potential for permanent establishment of *Spartina spp*. is low.

Positive Economic Impact: In native ranges "…cordgrass is an important food source for many endemic and migratory birds. The seeds are eaten by marsh birds, songbirds, sharp-tailed sparrows and several species of migratory waterfowl. Geese that winter along the coast are known to eat the rootstocks. Cordgrass also provides nursery and protective habitat for many aquatic species, especially juvenile crustaceans and fishes (NOAA, 2011)".

Negative Economic Impact: Replacement of native mudflats critical to clam and oyster production with high saltmarsh was beginning to impact this multi-million dollar industry. In Willapa Bay, the entire industry was at risk due to declining substrate. Deep channelization of the previously open mudflats would eliminate eelgrass beds, critical for juvenile salmon, bottom fish, and crab survival. Loss of foraging, refuge or nursery habitat eelgrass provides can impact survival and growth of benthic invertebrate communities impacting animals of larger economic value higher on the food chain (Sytsma and Morgan, 2010). Recreational opportunities such as waterfowl hunting, clamming, and birding would also be impacted by the infilling of estuaries by *Spartina*.

Ecological Impacts: *Spartina's* ecology can cause alterations on the community and ecosystem level by altering processes such as nutrient cycling, disturbance regime, species interactions, or structural and physical characteristics of the community itself (Hacker and Dethier, 2006). Dense monocultures that are resultant from Spartina infestations disrupt the hydrology and ecology of infested estuaries. As an ecological engineer, *Spartina* naturally traps sediments deposited by river and tidal movement and slowly builds up the level of sediments in an estuary, essentially eliminating habitat over time such as mudflats as they become elevated and populated with *Spartina* and changing sediment biogeochemistry (Sytsma and Morgan, 2010; Hacker and Dethier, 2006).

Dense stands of Spartina limit sunlight to the rest of the soil, eventually creating a monoculture. Alteration of the estuary structure also changes the oxygen content of the soils, threatening benthic communities wherever Spartina emerges. Resident and migratory birds use mudflats on the western coast for forage, but this relationship is altered as *Spartina* eliminates mudflat habitat (Sytsma and Morgan, 2010). By creating positive feedbacks in estuarine mudflats that negatively influence native species, but benefit their own continued expansion *Spartina* in turn dominates these ecosystems (Hacker and Dethier, 2006). Modifications to the mudflats can have community-wide consequences to native invertebrates, birds, and other plants (Hacker and Dethier, 2006).

Control: Manual control has proven successful only on the smallest of patches. For large-scale infestations it is physically and economically unfeasible. Mechanical control such as mowing and tilling runs the risk of spreading *Spartina* rhizomes around in the soil, further enlarging the population without effectively treating the plant. Limited biological control has proven ineffective in the Willapa Bay infestation. Imazapyr and glyphosate have proven to effective herbicides in treatments in Washington, Oregon and California. Although Imazapyr is more expensive than glyphosate (part for part), it is consistently more effective than glyphosate and is considered to be of low toxicity to fish and invertebrates. It can also be used at a much lower concentration, requires much lower carrier volume of water, and has shorter persistence in water than glyphosate (Sytsma and Morgan, 2010). Lower water requirements for Imazypyr (one tenth that of glyphosate) make it more cost effective than glyphosate (Sytsma and Morgan, 2010).

Noxious Weed Qualitative Risk Assessment
Oregon Department of Agriculture

Common name: Dense-flowered cordgrass
Scientific name: *Spartina densiflora*
Family: Grass, *Poaceae*

For use with plant species that occur or may occur in Oregon and to determine their potential to become serious noxious weeds. For each of the following categories, select the number that best applies. Numerical values are weighted to increase priority categories over less important ones. Choose the best number that applies, intermediate scores can be used.

Total Score: 57 **Risk Category: A**

GEOGRAPHICAL INFORMATION

1. 6 Invasive in Other Areas

0 Low- not known to be invasive elsewhere
2 Known to be invasive in climates dissimilar to Oregon's current climates.
6 Known to be invasive in geographically similar areas.

Comments: Humbolt Bay, CA. San Francisco Bay, CA,

2. 6 Habitat Availability: Are there susceptible habitats for this species and how common or widespread are they in Oregon?

1 *Low* – Habitat is very limited, usually restricted to a small watershed or part of a watershed (e.g., tree fern in southern Curry County).
3 *Medium* – Habitat encompasses 1/4 or less of Oregon (e.g., oak woodlands, coastal dunes, eastern Oregon wetlands, Columbia Gorge).
6 *High* – Habitat covers large regions or multiple counties, or is limited to a few locations of high economic or ecological value (e.g., threatened and endangered species habitat).

Comments: Invades highly valued habitats of significant economic and environmental value.

3. 3 Proximity to Oregon: What is the current distribution of the species?

0 *Present* – Occurs within Oregon.
1 *Distant* – Occurs only in distant US regions or foreign countries.
3 *Regional* – Occurs in Western regions of US but not adjacent to Oregon border.
6 *Adjacent* – Weedy populations occur adjacent (<50 miles) to Oregon border.

Comments: Occurs in Washington and California but distant from border.

4. 0 Current Distribution: What is the current distribution of escaped populations in Oregon?

0 *Not present* – Not known to occur in Oregon.
1 *Widespread* – Throughout much of Oregon (e.g., cheatgrass).
5 *Regional* – Abundant (i.e., occurs in eastern, western, central, coastal, areas of Oregon) (e.g., gorse, tansy ragwort).
10 *Limited* – Limited to one or a few infestations in state (e.g., kudzu).

Comments: Not known to occur in Oregon

BIOLOGICAL INFORMATION

5. 2 **Environmental Factors**: Do abiotic (non-living) factors in the environment effect establishment and spread of the species? (e.g., precipitation, drought, temperature, nutrient availability, soil type, slope, aspect, soil moisture, standing or moving water).

1 *Low* – Severely confined by abiotic factors.

2 *Medium* – Moderately confined by environmental factors

4 *High* – Highly adapted to a variety of environmental conditions (e.g., tansy ragwort, Scotch broom).

Comments: Confined to saline/freshwater mixed environments.

6. 6 **Reproductive Traits:** How does this species reproduce? Traits that may allow rapid population increase both on and off site.

0 *Negligible* – Not self-fertile, or is dioecious and opposite sex not present.

1 *Low* – Reproduction is only by seed, produces few seeds, or seed viability and longevity are low.

3 *Medium* – Reproduction is vegetative (e.g., by root fragments, rhizomes, bulbs, stolons).

3 *Medium* – Produces many seeds, and/or seeds of short longevity (< 5 years).

5 *High* – Produces many seeds and/or seeds of moderate longevity (5-10 years) (e.g., tansy ragwort).

6 *Very high* – Has two or more reproductive traits (e.g., seeds are long-lived >10 years and spreads by rhizomes).

Comments: Has two reproductive traits.

7. 4 **Biological Factors:** Do biotic (living) factors restrict or aid establishment and spread of the species? (What is the interaction of plant competition, natural enemies, native herbivores, pollinators, and pathogens with species?)

0 *Negligible* – Host plant not present for parasitic species.

1 *Low* – Biotic factors highly suppress reproduction or heavily damage plant for an extended period (e.g., biocontrol agent on tansy ragwort).

2 *Medium* – Biotic factors partially restrict or moderately impact growth and reproduction, impacts sporadic or short-lived.

4 *High* – Few biotic interactions restrict growth and reproduction. Species expresses full growth and reproductive potential.

Comments: Species expresses full growth and reproductive potential.

8. 4 **Reproductive Potential and Spread after Establishment - Non-human Factors:** How well can the species spread by natural means?

0 *Negligible* – No potential for natural spread in Oregon (e.g., ornamental plants outside of climate zone).

1 *Low* – Low potential for local spread within a year, has moderate reproductive potential or some mobility of propagules (e.g., propagules transported locally by animals, water movement in lakes or ponds, not wind blown).

3 *Medium* - Moderate potential for natural spread with either high reproductive potential or highly mobile propagules (e.g., propagules spread by moving water, or dispersed over longer distances by animals) (e.g., perennial pepperweed)

5 *High* – Potential for rapid natural spread throughout the susceptible range, high reproductive capacity and highly mobile propagules. Seeds are wind dispersed over large areas (e.g., rush skeletonweed).

Comments: Has potential for rapid natural spread of propagules by water or wildlife. Seeds not wind dispersed.

9. 2 Potential of Species to be Spread by Humans.

What human activities contribute to spread of species? Examples include: interstate or international commerce; contaminated commodities; packing materials or products; vehicles, boats, or equipment movement; logging or farming; road maintenance; intentional introductions of ornamental and horticultural species, or biofuel production.

1 Low – Potential for introduction or movement minimal (e.g., species not traded or sold, or species not found in agricultural commodities, gravel or other commercial products).

3 *Medium* – Potential for introduction or off-site movement moderate (e.g., not widely propagated, not highly popular, with limited market potential; may be a localized contaminant of gravel, landscape products, or other commercial products) (e.g., lesser celandine, Canada thistle).

5 *High* – Potential to be introduced or moved within state high (e.g., species widely propagated and sold; propagules common contaminant of agricultural commodities or commercial products; high potential for movement by contaminated vehicles and equipment, or by recreational activities) (e.g., butterfly bush, spotted knapweed, Eurasian watermilfoil).

Comments: Plant historically moved by humans. This threat is much reduced now.

IMPACT INFORMATION

10. 10 Economic Impact: What impact does/can the species have on Oregon's agriculture and economy?

0 *Negligible* – Causes few, if any, economic impacts.

1 *Low* - Potential to, or causes low economic impact to agriculture; may impact urban areas (e.g., puncture vine, pokeweed).

5 *Medium* – Potential to, or causes moderate impacts to urban areas, right-of-way maintenance, property values, recreational activities, reduces rangeland productivity (e.g., English ivy, Himalayan blackberry, cheatgrass).

10 *High* – Potential to, or causes high impacts in agricultural, livestock, fisheries, or timber production by reducing yield, commodity value, or increasing production costs (e.g., gorse, rush skeleton weed, leafy spurge).

Comments: Mudflat conversion due to Spartina invasion can result in significant reductions in refuge for immature fish, crabs and shellfish. Lower populations of these commercially valuable species would result.

11. 6 Environmental Impact: What risks or harm to the environment does this species pose? Plant may cause negative impacts on ecosystem function, structure, and biodiversity of plant or fish and wildlife habitat; may put desired species at risk.

0 *Negligible* – None of the above impacts probable.

1 *Low* – Can or does cause few or minor environmental impacts, or impacts occur in degraded or highly disturbed habitats.

4 *Medium* – Species can or does cause moderate impacts in less critical habitats (e.g., urban areas, sagebrush/ juniper stands).

6 *High* – Species can or does cause significant impacts in several of the above categories. Plant causes severe impacts to limited or priority habitats (e.g., aquatic, riparian zones, salt marsh; or T&E species sites).

Comments: Will cause serious alterations to Oregon coastal fauna and food chains.

12. 0 **Impact on Health:** What is the impact of this species on human, animal, and livestock health? (e.g., poisonous if ingested, contact dermatitis, acute and chronic toxicity to livestock, toxic sap, injurious spines or prickles, causes allergy symptoms

0 *Negligible* – Has no impact on human or animal health.

2 *Low* – May cause minor health problems of short duration, minor allergy symptoms (e.g., leafy spurge)

4 *Medium* – May cause severe allergy problems, death or severe health problems through chronic toxicity, spines or toxic sap may cause significant injury. (e.g., giant hogweed, tansy ragwort).

6 *High* – Causes death from ingestion of small amounts, acute toxicity (e.g. poison hemlock)

Comments: No impacts identified.

CONTROL INFORMATION

13. 5 **Probability of Detection at Point of Introduction**: How likely is detection of species after introduction and naturalization in Oregon?

1 *Low* – Grows where probability of early detection is high, showy and easily recognized by public; access to habitat not restricted (e.g., giant hogweed).

5 *Medium* – Easily identified by weed professionals, ranchers, botanists; some survey and detection infrastructure in place. General public may not recognize or report species (e.g., leafy spurge).

10 *High* – Probability of initial detection by weed professionals low. Plant shape and form obscure, not showy for much of growing season, introduction probable at remote locations with limited access (e.g., weedy grasses, hawkweeds, skeletonweed).

Comments: Easily identified by professionals. Surveys are in place.

14. 3 **Control Efficacy:** What level of control of this species can be expected with proper timing, herbicides, equipment, and biological control agents?

1 *Negligible* – Easily controlled by common non-chemical control measures (e.g., mowing, tillage, pulling, and cutting; biocontrol is very effective at reducing seed production and plant density) (e.g., tansy ragwort).

2 *Low* – Somewhat difficult to control, generally requires herbicide treatment (e.g., mechanical control measures effective at preventing flowering and but not reducing plant density; herbicide applications provide a high rate of control in a single application; biocontrol provides partial control).

4 *Medium* – Treatment options marginally effective or costly. Tillage and mowing increase plant density (e.g., causes tillering, rapid regrowth, spread from root fragments). Chemical control is marginally effective. Crop damage occurs or significant non-target impacts result from maximum control rates. Biocontrol agents are ineffective.

6 *High* – No effective treatments known or control costs very expensive. Species may occur in large water bodies or river systems where containment and complete control are not achievable. Political or legal issues may prevent effective control.

Comments: Chemical treatments generally effective but expensive. Access and working environment significantly increase control costs.

Category Scores:
15 Geographic score (Add scores 1-4) **18** Biological Score (Add lines 5-9)
16 Impact Score (Add lines 10-12) **08** Control Score (Add Lines 13-14)

---

57 Total Score (Add scores 1-14 and list on front of form)

Risk Category: 55-89+ = **A** 24-54 = **B** < 24 = unlisted.

This Risk Assessment was modified by ODA from the USDA-APHIS Risk Assessment for the introduction of new plant species
2013 v.3.8

Noxious Weed Qualitative Risk Assessment
Oregon Department of Agriculture

Common name: Common cordgrass
Scientific name: *Spartina anglica*
Family: Grass, *Poaceae*

For use with plant species that occur or may occur in Oregon and to determine their potential to become serious noxious weeds. For each of the following categories, select the number that best applies. Numerical values are weighted to increase priority categories over less important ones. Choose the best number that applies, intermediate scores can be used.

Total Score: 55 **Risk Category: A**

GEOGRAPHICAL INFORMATION

1. 6 Invasive in Other Areas
0 Low- not known to be invasive elsewhere
2 Known to be invasive in climates dissimilar to Oregon's current climates.
6 Known to be invasive in geographically similar areas.
Comments: Puget Sound, WA, San Francisco Bay, CA

2. 6 Habitat Availability: Are there susceptible habitats for this species and how common or widespread are they in Oregon?
1 *Low* – Habitat is very limited, usually restricted to a small watershed or part of a watershed (e.g., tree fern in southern Curry County).
3 *Medium* – Habitat encompasses 1/4 or less of Oregon (e.g., oak woodlands, coastal dunes, eastern Oregon wetlands, Columbia Gorge).
6 *High* – Habitat covers large regions or multiple counties, or is limited to a few locations of high economic or ecological value (e.g., threatened and endangered species habitat).
Comments: Invades highly valued habitats of significant economic and environmental value.

3. 3 Proximity to Oregon: What is the current distribution of the species?
0 *Present* – Occurs within Oregon.
1 *Distant* – Occurs only in distant US regions or foreign countries.
3 *Regional* – Occurs in Western regions of US but not adjacent to Oregon border.
6 *Adjacent* – Weedy populations occur adjacent (<50 miles) to Oregon border.
Comments: Found in neighboring states, sites not adjacent to Oregon border.

4. 0 Current Distribution: What is the current distribution of escaped populations in Oregon?
0 *Not present* – Not known to occur in Oregon.
1 *Widespread* – Throughout much of Oregon (e.g., cheatgrass).
5 *Regional* – Abundant (i.e., occurs in eastern, western, central, coastal, areas of Oregon) (e.g., gorse, tansy ragwort).
10 *Limited* – Limited to one or a few infestations in state (e.g., kudzu).
Comments: Not found in Oregon

BIOLOGICAL INFORMATION

5. 2 **Environmental Factors**: Do abiotic (non-living) factors in the environment effect establishment and spread of the species? (e.g., precipitation, drought, temperature, nutrient availability, soil type, slope, aspect, soil moisture, standing or moving water).

1 *Low* – Severely confined by abiotic factors.
2 *Medium* – Moderately confined by environmental factors
4 *High* – Highly adapted to a variety of environmental conditions (e.g., tansy ragwort, Scotch broom).

Comments: Salinity levels and water inundation periods restrict available habitat.

6. 6 **Reproductive Traits:** How does this species reproduce? Traits that may allow rapid population increase both on and off site.

0 *Negligible* – Not self-fertile, or is dioecious and opposite sex not present.
1 *Low* – Reproduction is only by seed, produces few seeds, or seed viability and longevity are low.
3 *Medium* – Reproduction is vegetative (e.g., by root fragments, rhizomes, bulbs, stolons).
3 *Medium* – Produces many seeds, and/or seeds of short longevity (< 5 years).
5 *High* – Produces many seeds and/or seeds of moderate longevity (5-10 years) (e.g., tansy ragwort).
6 *Very high* – Has two or more reproductive traits (e.g., seeds are long-lived >10 years and spreads by rhizomes).

Comments: Has two reproductive mechanisms.

7. 4 **Biological Factors:** Do biotic (living) factors restrict or aid establishment and spread of the species? (What is the interaction of plant competition, natural enemies, native herbivores, pollinators, and pathogens with species?).

0 *Negligible* – Host plant not present for parasitic species.
1 *Low* – Biotic factors highly suppress reproduction or heavily damage plant for an extended period (e.g., biocontrol agent on tansy ragwort).
2 *Medium* – Biotic factors partially restrict or moderately impact growth and reproduction, impacts sporadic or short-lived.
4 *High* – Few biotic interactions restrict growth and reproduction. Species expresses full growth and reproductive potential.

Comments: Species expresses full reproductive potential.

8. 3 **Reproductive Potential and Spread after Establishment - Non-human Factors:** How well can the species spread by natural means?

0 *Negligible* – No potential for natural spread in Oregon (e.g., ornamental plants outside of climate zone).
1 *Low* – Low potential for local spread within a year, has moderate reproductive potential or some mobility of propagules (e.g., propagules transported locally by animals, water movement in lakes or ponds, not wind blown).
3 *Medium* - Moderate potential for natural spread with either high reproductive potential or highly mobile propagules (e.g., propagules spread by moving water, or dispersed over longer distances by animals) (e.g., perennial pepperweed).
5 *High* – Potential for rapid natural spread throughout the susceptible range, high reproductive capacity and highly mobile propagules. Seeds are wind dispersed over large areas (e.g., rush skeletonweed).

Comments: Produces abundant seeds or roots dispersed locally by water.

9. 2 **Potential of Species to be Spread by Humans**. What human activities contribute to spread of species? Examples include: interstate or international commerce; contaminated commodities; packing materials or products; vehicles, boats, or equipment movement; logging or farming; road maintenance; intentional introductions of ornamental and horticultural species, or biofuel production.

1 *Low* – Potential for introduction or movement minimal (e.g., species not traded or sold, or species not found in agricultural commodities, gravel or other commercial products).

3 *Medium* – Potential for introduction or off-site movement moderate (e.g., not widely propagated, not highly popular, with limited market potential; may be a localized contaminant of gravel, landscape products, or other commercial products) (e.g., lesser celandine, Canada thistle).

5 *High* – Potential to be introduced or moved within state high (e.g., species widely propagated and sold; propagules common contaminant of agricultural commodities or commercial products; high potential for movement by contaminated vehicles and equipment, or by recreational activities) (e.g., butterfly bush, spotted knapweed, Eurasian watermilfoil).

Comments: Historically moved by humans. This avenue of dispersal greatly reduced now.

IMPACT INFORMATION

10. 10 **Economic Impact**: What impact does/can the species have on Oregon's agriculture and economy?

0 *Negligible* – Causes few, if any, economic impacts.

1 *Low* - Potential to, or causes low economic impact to agriculture; may impact urban areas (e.g., puncture vine, pokeweed).

5 *Medium* – Potential to, or causes moderate impacts to urban areas, right-of-way maintenance, property values, recreational activities, reduces rangeland productivity (e.g., English ivy, Himalayan blackberry, cheatgrass).

10 *High* – Potential to, or causes high impacts in agricultural, livestock, fisheries, or timber production by reducing yield, commodity value, or increasing production costs (e.g., gorse, rush skeleton weed, leafy spurge).

Comments: Will cause serious economic impact to juvenile fish, crab and commercial shellfish populations.

11. 6 **Environmental Impact**: What risks or harm to the environment does this species pose? Plant may cause negative impacts on ecosystem function, structure, and biodiversity of plant or fish and wildlife habitat; may put desired species at risk.

0 *Negligible* – None of the above impacts probable.

1 *Low* – Can or does cause few or minor environmental impacts, or impacts occur in degraded or highly disturbed habitats.

4 *Medium* – Species can or does cause moderate impacts in less critical habitats (e.g., urban areas, sagebrush/ juniper stands).

6 *High* – Species can or does cause significant impacts in several of the above categories. Plant causes severe impacts to limited or priority habitats (e.g., aquatic, riparian zones, salt marsh; or T&E species sites).

Comments: Will cause complete alteration of west coast mudflat environments impacting a wide range of fauna.

12. 0 **Impact on Health:** What is the impact of this species on human, animal, and livestock health? (e.g., poisonous if ingested, contact dermatitis, acute and chronic toxicity to livestock, toxic sap, injurious spines or prickles, causes allergy symptoms

0 *Negligible* – Has no impact on human or animal health.

2 *Low* – May cause minor health problems of short duration, minor allergy symptoms (e.g., leafy spurge)

4 *Medium* – May cause severe allergy problems, death or severe health problems through chronic toxicity, spines or toxic sap may cause significant injury. (e.g., giant hogweed, tansy ragwort).

6 *High* – Causes death from ingestion of small amounts, acute toxicity (e.g. poison hemlock)

Comments: No impacts identified.

CONTROL INFORMATION

13. 5 **Probability of Detection at Point of Introduction**: How likely is detection of species after introduction and naturalization in Oregon?

1 *Low* – Grows where probability of early detection is high, showy and easily recognized by public; access to habitat not restricted (e.g., giant hogweed).

5 *Medium* – Easily identified by weed professionals, ranchers, botanists; some survey and detection infrastructure in place. General public may not recognize or report species (e.g., leafy spurge).

10 *High* – Probability of initial detection by weed professionals low. Plant shape and form obscure, not showy for much of growing season, introduction probable at remote locations with limited access (e.g., weedy grasses, hawkweeds, skeletonweed).

Comments: Active survey programs in place. Chances of early detection are high.

14. 2 **Control efficacy:** What level of control of this species can be expected with proper timing, herbicides, equipment, and biological control agents?

1 *Negligible* – Easily controlled by common non-chemical control measures (e.g., mowing, tillage, pulling, and cutting; biocontrol is very effective at reducing seed production and plant density) (e.g., tansy ragwort).

2 *Low* – Somewhat difficult to control, generally requires herbicide treatment (e.g., mechanical control measures effective at preventing flowering and but not reducing plant density; herbicide applications provide a high rate of control in a single application; biocontrol provides partial control).

4 *Medium* – Treatment options marginally effective or costly. Tillage and mowing increase plant density (e.g., causes tillering, rapid regrowth, spread from root fragments). Chemical control is marginally effective. Crop damage occurs or significant non-target impacts result from maximum control rates. Biocontrol agents are ineffective.

6 *High* – No effective treatments known or control costs very expensive. Species may occur in large water bodies or river systems where containment and complete control are not achievable. Political or legal issues may prevent effective control.

Comments: Control requires herbicides. Control success variable depending on conditions. Access difficulties increase control costs.

Category Scores:
15 Geographic score (Add scores 1-4) **17** Biological Score (Add lines 5-9)
16 Impact Score (Add lines 10-12) **07** Control Score (Add Lines 13-14)

55 Total Score (Add scores 1-14 and list on front of form)

Risk Category: 55-89+ = **A** 24-54 = **B** < 24 = unlisted.

This Risk Assessment was modified by ODA from the USDA-APHIS Risk Assessment for the introduction of new plant species
2013 v.3.8

Noxious Weed Qualitative Risk Assessment
Oregon Department of Agriculture

Common name: Common cordgrass
Scientific name: *Spartina alterniflora*
Family: Grass, *Poaceae*

For use with plant species that occur or may occur in Oregon and to determine their potential to become serious noxious weeds. For each of the following categories, select the number that best applies. Numerical values are weighted to increase priority categories over less important ones. Choose the best number that applies, intermediate scores can be used.

Total Score: 61 **Risk Category: A**

GEOGRAPHICAL INFORMATION

1. 6 Invasive in Other Areas
0 Low- not known to be invasive elsewhere
2 Known to be invasive in climates dissimilar to Oregon's current climates.
6 Known to be invasive in geographically similar areas.
Comments: Known to be invasive in geographically similar areas.

2. 6 Habitat Availability: Are there susceptible habitats for this species and how common or widespread are they in Oregon?
1 *Low* – Habitat is very limited, usually restricted to a small watershed or part of a watershed (e.g., tree fern in southern Curry County).
3 *Medium* – Habitat encompasses 1/4 or less of Oregon (e.g., oak woodlands, coastal dunes, eastern Oregon wetlands, Columbia Gorge).
6 *High* – Habitat covers large regions or multiple counties, or is limited to a few locations of high economic or ecological value (e.g., threatened and endangered species habitat).
Comments: Known to invade habitat of high economic and ecological value.

3. 6 Proximity to Oregon: What is the current distribution of the species?
0 *Present* – Occurs within Oregon.
1 *Distant* – Occurs only in distant US regions or foreign countries.
3 *Regional* – Occurs in Western regions of US but not adjacent to Oregon border.
6 *Adjacent* – Weedy populations occur adjacent (<50 miles) to Oregon border.
Comments: *S. alterniflora* occurs just north of Oregon, Washington border.

4. 0 Current Distribution: What is the current distribution of escaped populations in Oregon?
0 *Not present* – Not known to occur in Oregon.
1 *Widespread* – Throughout much of Oregon (e.g., cheatgrass).
5 *Regional* – Abundant (i.e., occurs in eastern, western, central, coastal, areas of Oregon) (e.g., gorse, tansy ragwort).
10 *Limited* – Limited to one or a few infestations in state (e.g., kudzu).
Comments: Eradicated from Oregon

BIOLOGICAL INFORMATION

5. 2 Environmental Factors: Do abiotic (non-living) factors in the environment effect establishment and spread of the species? (e.g., precipitation, drought, temperature, nutrient availability, soil type, slope, aspect, soil moisture, standing or moving water).

1 *Low* – Severely confined by abiotic factors.
2 *Medium* – Moderately confined by environmental factors
4 *High* – Highly adapted to a variety of environmental conditions (e.g., tansy ragwort, Scotch broom).

Comments: Constricted by salinity levels and tidal inundation duration.

6. 6 Reproductive Traits: How does this species reproduce? Traits that may allow rapid population increase both on and off site.

0 *Negligible* – Not self-fertile, or is dioecious and opposite sex not present.
1 *Low* – Reproduction is only by seed, produces few seeds, or seed viability and longevity are low.
3 *Medium* – Reproduction is vegetative (e.g., by root fragments, rhizomes, bulbs, stolons).
3 *Medium* – Produces many seeds, and/or seeds of short longevity (< 5 years).
5 *High* – Produces many seeds and/or seeds of moderate longevity (5-10 years) (e.g., tansy ragwort).
6 *Very high* – Has two or more reproductive traits (e.g., seeds are long-lived >10 years and spreads by rhizomes).

Comments: Reproduces by roots and seeds.

7. 4 Biological Factors: Do biotic (living) factors restrict or aid establishment and spread of the species? (What is the interaction of plant competition, natural enemies, native herbivores, pollinators, and pathogens with species?)

0 *Negligible* – Host plant not present for parasitic species.
1 *Low* – Biotic factors highly suppress reproduction or heavily damage plant for an extended period (e.g., biocontrol agent on tansy ragwort).
2 *Medium* – Biotic factors partially restrict or moderately impact growth and reproduction, impacts sporadic or short-lived.
4 *High* – Few biotic interactions restrict growth and reproduction. Species expresses full growth and reproductive potential.

Comments: No biological factors limit growth or reproduction.

8. 4 Reproductive Potential and Spread After Establishment - Non-human Factors: How well can the species spread by natural means?

0 *Negligible* – No potential for natural spread in Oregon (e.g., ornamental plants outside of climate zone).
1 *Low* – Low potential for local spread within a year, has moderate reproductive potential or some mobility of propagules (e.g., propagules transported locally by animals, water movement in lakes or ponds, not wind blown).
3 *Medium* - Moderate potential for natural spread with either high reproductive potential or highly mobile propagules (e.g., propagules spread by moving water, or dispersed over longer distances by animals) (e.g., perennial pepperweed)
5 *High* – Potential for rapid natural spread throughout the susceptible range, high reproductive capacity and highly mobile propagules. Seeds are wind dispersed over large areas (e.g., rush skeletonweed).

Comments: Low potential for long distant dispersal, high local dispersal potential by water.

9. 3 **Potential of Species to be Spread by Humans**. What human activities contribute to spread of species? Examples include: interstate or international commerce; contaminated commodities; packing materials or products; vehicles, boats, or equipment movement; logging or farming; road maintenance; intentional introductions of ornamental and horticultural species, or biofuel production.

1 *Low* – Potential for introduction or movement minimal (e.g., species not traded or sold, or species not found in agricultural commodities, gravel or other commercial products).

3 *Medium* – Potential for introduction or off-site movement moderate (e.g., not widely propagated, not highly popular, with limited market potential; may be a localized contaminant of gravel, landscape products, or other commercial products) (e.g., lesser celandine, Canada thistle).

5 *High* – Potential to be introduced or moved within state high (e.g., species widely propagated and sold; propagules common contaminant of agricultural commodities or commercial products; high potential for movement by contaminated vehicles and equipment, or by recreational activities) (e.g., butterfly bush, spotted knapweed, Eurasian watermilfoil).

Comments: Historically moved by humans. Likelihood of human transport is low and mostly accidental.

IMPACT INFORMATION

10. 10 **Economic Impact**: What impact does/can the species have on Oregon's agriculture and economy?

0 *Negligible* – Causes few, if any, economic impacts.

1 *Low* - Potential to, or causes low economic impact to agriculture; may impact urban areas (e.g., puncture vine, pokeweed).

5 *Medium* – Potential to, or causes moderate impacts to urban areas, right-of-way maintenance, property values, recreational activities, reduces rangeland productivity (e.g., English ivy, Himalayan blackberry, cheatgrass).

10 *High* – Potential to, or causes high impacts in agricultural, livestock, fisheries, or timber production by reducing yield, commodity value, or increasing production costs (e.g., gorse, rush skeleton weed, leafy spurge).

Comments: Proven to be a significant threat to shellfish production.

11. 6 **Environmental Impact**: What risks or harm to the environment does this species pose? Plant may cause negative impacts on ecosystem function, structure, and biodiversity of plant or fish and wildlife habitat; may put desired species at risk.

0 *Negligible* – None of the above impacts probable.

1 *Low* – Can or does cause few or minor environmental impacts, or impacts occur in degraded or highly disturbed habitats.

4 *Medium* – Species can or does cause moderate impacts in less critical habitats (e.g., urban areas, sagebrush/ juniper stands).

6 *High* – Species can or does cause significant impacts in several of the above categories. Plant causes severe impacts to limited or priority habitats (e.g., aquatic, riparian zones, salt marsh; or T&E species sites).

Comments: Will cause complete alteration of west coast mudflat environments impacting a wide range of fauna.

12. 0 **Impact on Health:** What is the impact of this species on human, animal, and livestock health? (e.g., poisonous if ingested, contact dermatitis, acute and chronic toxicity to livestock, toxic sap, injurious spines or prickles, causes allergy symptoms

0 *Negligible* – Has no impact on human or animal health.

2 *Low* – May cause minor health problems of short duration, minor allergy symptoms (e.g., leafy spurge)

4 *Medium* – May cause severe allergy problems, death or severe health problems through chronic toxicity, spines or toxic sap may cause significant injury. (e.g., giant hogweed, tansy ragwort).

6 *High* – Causes death from ingestion of small amounts, acute toxicity (e.g. poison hemlock)

Comments: None identified.

CONTROL INFORMATION

13. 5 **Probability of Detection at Point of Introduction**: How likely is detection of species after introduction and naturalization in Oregon?

1 *Low* – Grows where probability of early detection is high, showy and easily recognized by public; access to habitat not restricted (e.g., giant hogweed).

5 *Medium* – Easily identified by weed professionals, ranchers, botanists; some survey and detection infrastructure in place. General public may not recognize or report species (e.g., leafy spurge).

10 *High* – Probability of initial detection by weed professionals low. Plant shape and form obscure, not showy for much of growing season, introduction probable at remote locations with limited access (e.g., weedy grasses, hawkweeds, skeletonweed).

Comments: Active early detection surveys and infrastructure in place.

14. 3 **Control Efficacy:** What level of control of this species can be expected with proper timing, herbicides, equipment, and biological control agents?

1 *Negligible* – Easily controlled by common non-chemical control measures (e.g., mowing, tillage, pulling, and cutting; biocontrol is very effective at reducing seed production and plant density) (e.g., tansy ragwort).

2 *Low* – Somewhat difficult to control, generally requires herbicide treatment (e.g., mechanical control measures effective at preventing flowering and but not reducing plant density; herbicide applications provide a high rate of control in a single application; biocontrol provides partial control).

4 *Medium* – Treatment options marginally effective or costly. Tillage and mowing increase plant density (e.g., causes tillering, rapid regrowth, spread from root fragments). Chemical control is marginally effective. Crop damage occurs or significant non-target impacts result from maximum control rates. Biocontrol agents are ineffective.

6 *High* – No effective treatments known or control costs very expensive. Species may occur in large water bodies or river systems where containment and complete control are not achievable. Political or legal issues may prevent effective control.

Comments: Herbicides generally required. Access greatly increases control costs.

Category Scores:
18 Geographic score (Add scores 1-4) **19** Biological Score (Add lines 5-9)
16 Impact Score (Add lines 10-12) **08** Control Score (Add Lines 13-14)

61 Total Score (Add scores 1-14 and list on front of form)

Risk Category: 55-89+ = **A** 24-54 = **B** < 24 = unlisted.

This Risk Assessment was modified by ODA from the USDA-APHIS Risk Assessment for the introduction of new plant species
2013 v.3.8

Noxious Weed Qualitative Risk Assessment
Oregon Department of Agriculture

Common name: Saltmeadow cordgrass
Scientific name: *Spartina patens*
Family: Grass, *Poaceae*

For use with plant species that occur or may occur in Oregon and to determine their potential to become serious noxious weeds. For each of the following categories, select the number that best applies. Numerical values are weighted to increase priority categories over less important ones. Choose the best number that applies, intermediate scores can be used.

Total Score: 52 **Risk Category: A- B**

GEOGRAPHICAL INFORMATION

1. 6 Invasive in Other Areas

0 Low- not known to be invasive elsewhere
2 Known to be invasive in climates dissimilar to Oregon's current climates.
6 Known to be invasive in geographically similar areas.

Comments: Known to be invasive in geographically similar areas.

2. 6 Habitat Availability: Are there susceptible habitats for this species and how common or widespread are they in Oregon?

1 *Low* – Habitat is very limited, usually restricted to a small watershed or part of a watershed (e.g., tree fern in southern Curry County).
3 *Medium* – Habitat encompasses 1/4 or less of Oregon (e.g., oak woodlands, coastal dunes, eastern Oregon wetlands, Columbia Gorge).
6 *High* – Habitat covers large regions or multiple counties, or is limited to a few locations of high economic or ecological value (e.g., threatened and endangered species habitat).

Comments: Limited to a few locations of high economic or ecological value (e.g., threatened and endangered species habitat).

3. 0 Proximity to Oregon: What is the current distribution of the species?

0 *Present* – Occurs within Oregon.
1 *Distant* – Occurs only in distant US regions or foreign countries.
3 *Regional* – Occurs in Western regions of US but not adjacent to Oregon border.
6 *Adjacent* – Weedy populations occur adjacent (<50 miles) to Oregon border.

Comments: Occurs within Oregon

4. 10 Current Distribution: What is the current distribution of escaped populations in Oregon?

0 *Not present* – Not known to occur in Oregon.
1 *Widespread* – Throughout much of Oregon (e.g., cheatgrass).
5 *Regional* – Abundant (i.e., occurs in eastern, western, central, coastal, areas of Oregon) (e.g., gorse, tansy ragwort).

10 *Limited* – Limited to one or a few infestations in state (e.g., kudzu).

Comments: Limited to one infestation in the state.

BIOLOGICAL INFORMATION

5. 1 **Environmental Factors**: Do abiotic (non-living) factors in the environment effect establishment and spread of the species? (e.g., precipitation, drought, temperature, nutrient availability, soil type, slope, aspect, soil moisture, standing or moving water).

1 *Low* – Severely confined by abiotic factors.

2 *Medium* – Moderately confined by environmental factors

4 *High* – Highly adapted to a variety of environmental conditions (e.g., tansy ragwort, Scotch broom).

Comments: Salinity levels and inundation duration limits distribution.

6. 6 **Reproductive Traits:** How does this species reproduce? Traits that may allow rapid population increase both on and off site.

0 *Negligible* – Not self-fertile, or is dioecious and opposite sex not present.

1 *Low* – Reproduction is only by seed, produces few seeds, or seed viability and longevity are low.

3 *Medium* – Reproduction is vegetative (e.g., by root fragments, rhizomes, bulbs, stolons).

3 *Medium* – Produces many seeds, and/or seeds of short longevity (< 5 years).

5 *High* – Produces many seeds and/or seeds of moderate longevity (5-10 years) (e.g., tansy ragwort).

6 *Very high* – Has two or more reproductive traits (e.g., seeds are long-lived >10 years and spreads by rhizomes).

Comments: Reproduces by seed and rhizomes.

7. 4 **Biological Factors:** Do biotic (living) factors restrict or aid establishment and spread of the species? (What is the interaction of plant competition, natural enemies, native herbivores, pollinators, and pathogens with species?)

0 *Negligible* – Host plant not present for parasitic species.

1 *Low* – Biotic factors highly suppress reproduction or heavily damage plant for an extended period (e.g., biocontrol agent on tansy ragwort).

2 *Medium* – Biotic factors partially restrict or moderately impact growth and reproduction, impacts sporadic or short-lived.

4 *High* – Few biotic interactions restrict growth and reproduction. Species expresses full growth and reproductive potential.

Comments: Species expresses full growth and reproductive potential.

8. 3 **Reproductive Potential and Spread After Establishment - Non-human Factors:** How well can the species spread by natural means?

0 *Negligible* – No potential for natural spread in Oregon (e.g., ornamental plants outside of climate zone).

1 *Low* – Low potential for local spread within a year, has moderate reproductive potential or some mobility of propagules (e.g., propagules transported locally by animals, water movement in lakes or ponds, not wind blown).

3 *Medium* - Moderate potential for natural spread with either high reproductive potential or highly mobile propagules (e.g., propagules spread by moving water, or dispersed over longer distances by animals) (e.g., perennial pepperweed)
5 *High* – Potential for rapid natural spread throughout the susceptible range, high reproductive capacity and highly mobile propagules. Seeds are wind dispersed over large areas (e.g., rush skeletonweed).

Comments: Moderate potential for localized natural spread by water.

9. 1 **Potential of species to be spread by humans**. What human activities contribute to spread of species? Examples include: interstate or international commerce; contaminated commodities; packing materials or products; vehicles, boats, or equipment movement; logging or farming; road maintenance; intentional introductions of ornamental and horticultural species, or biofuel production.
1 *Low* – Potential for introduction or movement minimal (e.g., species not traded or sold, or species not found in agricultural commodities, gravel or other commercial products).
3 *Medium* – Potential for introduction or off-site movement moderate (e.g., not widely propagated, not highly popular, with limited market potential; may be a localized contaminant of gravel, landscape products, or other commercial products) (e.g., lesser celandine, Canada thistle).
5 *High* – Potential to be introduced or moved within state high (e.g., species widely propagated and sold; propagules common contaminant of agricultural commodities or commercial products; high potential for movement by contaminated vehicles and equipment, or by recreational activities) (e.g., butterfly bush, spotted knapweed, Eurasian watermilfoil).

Comments: Potential for human spread minimal.

IMPACT INFORMATION

10. 0 **Economic Impact**: What impact does/can the species have on Oregon's agriculture and economy?
0 *Negligible* – Causes few, if any, economic impacts.
1 *Low* - Potential to, or causes low economic impact to agriculture; may impact urban areas (e.g., puncture vine, pokeweed).
5 *Medium* – Potential to, or causes moderate impacts to urban areas, right-of-way maintenance, property values, recreational activities, reduces rangeland productivity (e.g., English ivy, Himalayan blackberry, cheatgrass).
10 *High* – Potential to, or causes high impacts in agricultural, livestock, fisheries, or timber production by reducing yield, commodity value, or increasing production costs (e.g., gorse, rush skeleton weed, leafy spurge).

Comments: Causes no economic impacts.

11. 5 **Environmental Impact**: What risks or harm to the environment does this species pose? Plant may cause negative impacts on ecosystem function, structure, and biodiversity of plant or fish and wildlife habitat; may put desired species at risk.
0 *Negligible* – None of the above impacts probable.
1 *Low* – Can or does cause few or minor environmental impacts, or impacts occur in degraded or highly disturbed habitats.
4 *Medium* – Species can or does cause moderate impacts in less critical habitats (e.g., urban areas, sagebrush/ juniper stands).

6 *High* – Species can or does cause significant impacts in several of the above categories. Plant causes severe impacts to limited or priority habitats (e.g., aquatic, riparian zones, salt marsh; or T&E species sites).

Comments: Can cause significant impact in high salt marshes. Not as impacting as other Spartina species.

12. 0 Impact on Health: What is the impact of this species on human, animal, and livestock health? (e.g., poisonous if ingested, contact dermatitis, acute and chronic toxicity to livestock, toxic sap, injurious spines or prickles, causes allergy symptoms.

0 *Negligible* – Has no impact on human or animal health.

2 *Low* – May cause minor health problems of short duration, minor allergy symptoms (e.g., leafy spurge)

4 *Medium* – May cause severe allergy problems, death or severe health problems through chronic toxicity, spines or toxic sap may cause significant injury. (e.g., giant hogweed, tansy ragwort).

6 *High* – Causes death from ingestion of small amounts, acute toxicity (e.g. poison hemlock).

Comments: No impacts identified.

CONTROL INFORMATION

13. 7 Probability of Detection at Point of Introduction: How likely is detection of species after introduction and naturalization in Oregon?

1 *Low* – Grows where probability of early detection is high, showy and easily recognized by public; access to habitat not restricted (e.g., giant hogweed).

5 *Medium* – Easily identified by weed professionals, ranchers, botanists; some survey and detection infrastructure in place. General public may not recognize or report species (e.g., leafy spurge).

10 *High* – Probability of initial detection by weed professionals low. Plant shape and form obscure, not showy for much of growing season, introduction probable at remote locations with limited access (e.g., weedy grasses, hawkweeds, skeletonweed).

Comments: Recognized by weed professionals. Access significantly increases difficulty in locating new plants.

14. 3 Control Efficacy: What level of control of this species can be expected with proper timing, herbicides, equipment, and biological control agents?

1 *Negligible* – Easily controlled by common non-chemical control measures (e.g., mowing, tillage, pulling, and cutting; biocontrol is very effective at reducing seed production and plant density) (e.g., tansy ragwort).

2 *Low* – Somewhat difficult to control, generally requires herbicide treatment (e.g., mechanical control measures effective at preventing flowering and but not reducing plant density; herbicide applications provide a high rate of control in a single application; biocontrol provides partial control).

4 *Medium* – Treatment options marginally effective or costly. Tillage and mowing increase plant density (e.g., causes tillering, rapid regrowth, spread from root fragments). Chemical control is marginally effective. Crop damage occurs or significant non-target impacts result from maximum control rates. Biocontrol are agents ineffective.

6 *High* – No effective treatments known or control costs very expensive. Species may occur in large water bodies or river systems where containment and complete control are not achievable. Political or legal issues may prevent effective control.

Comments: Control requires coverings or herbicides. Access and application costs high. Treatment success is generally good.

Category Scores:

22 Geographic score (Add scores 1-4) **15** Biological Score (Add lines 5-9)

05 Impact Score (Add lines 10-12) **10** Control Score (Add Lines 13-14)

---

52 Total Score (Add scores 1-14 and list on front of form)

Risk Category: 55-89+ = **A** 24-54 = **B** < 24 = unlisted.

This Risk Assessment was modified by ODA from the USDA-APHIS Risk Assessment for the introduction of new plant species

2013 v.3.8

Oregon Department of Agriculture
Noxious Weed Rating System

Common Name: Cordgrass, Spartina
Scientific Name: *Spartina spp*.

Points: 20 **Rating: A**

1) 2 **Detrimental Effects:** Circle all that apply, enter number of circles.
1. *Health*: causes poisoning or injury to humans or animals
2. *Competition:* strongly competitive with crops, forage, or native flora
3. *Host*: host of pathogens and/or pests of crops or forage
4. *Contamination*: causes economic loss as a contaminate in seeds and/or feeds
5. *Interference*: interferes with recreation, transportation, harvest, land value, or wildlife and livestock movement

2) 5 **Reproduction & Capacity for Spread:** Circle the number that best describes, enter that number.
1. Few seeds, not wind blown, spreads slowly
2. Many seeds, slow spread
3. Many seeds, spreads quickly by vehicles or animals
4. Windblown seed, or spreading rhizomes, or water borne
5. Many wind-blown seeds, high seed longevity, spreading rhizomes, perennials

3) 3 **Difficulty to Control:** Circle the number that best describes, enter that number.
1. Easily controlled with tillage or by competitive plants
2. Requires moderate control, tillage, competition or herbicides
3. Herbicides generally required, or intensive management practices
4. Intensive management generally gives marginal control
5. No management works well, spreading out of control

4) 6 **Distribution:** Circle the number that best describes, enter that number.
1. Widely distributed throughout the state in susceptible habitat
2. Regionally abundant, 5 or more counties, more than 1/2 of a county
3. Abundant throughout 1- 4 counties, or 1/4 of a county, or several watersheds
4. Contained in only 1 watershed, or less than 5 square miles gross infestation
5. Isolated infestation less than 640 acres, more than 10 acres
6. Occurs in less than 10 acres, or not present, but imminent from adjacent state

5) 4 **Ecological Impact:** Circle the number that best describes, enter that number.
1. Occurs in most disturbed habitats with little competition
2. Occurs in disturbed habitats with competition
3. Invades undisturbed habitats and crowds out native species
4. Invades restricted habitats (i.e. riparian) and crowds out native species

20 TOTAL POINTS

Note: Noxious weeds are non-native plants with scores of 11 points or higher. Any plants in 4.1, 4.2, and 4.3 should not be classified as "A" rated weeds. *Ratings:* 16 + = A, 15 – 11= B
ODA Weed Rating System 8/30/2012 v.3.2

RA by Alex Park, ODA Edited by: Glenn Miller, ODA 2013

References:

Ayres, D., Smith, D., Zaremba, K. et al. "Spread of exotic cordgrasses & hybrids (Spartina sp.) In the tidal marshes of San Francisco Bay, CA, USA." *Biological Invasions*. 6 (2004): 221-231. Print.

Blackwood, J., Hastings, A., Costello, C., "Cost-effective management of invasive species using linear-quadratic control." *Ecological Economics*. 69 (2010): 519-527. Print.

Hacker, S., Dethier, M. "Community modification by a grass invader has differing impacts for marine habitats." *OIKOS*. 113 (2006): 279-286. Print.

Hacker, S., Dethier M. "Physical Factors vs. Biotic Resistance in Controlling the Invasion of an Estuarine Marsh Grass." *Ecological Applications*. 15.4 (2005): 1273-1283. Print.

Isaacson, D., Pfauth M., Sytsma, M. USA. *Oregon Spartina Response Plan*. Portland: Portland State University, 2003. Print.

Mateos-Naranjo, E. "Effectiveness of glysophate & imazamox on the control of the invasive cordgrass Spartina densiflora." *Ecotoxicology & environmental safety*. 72.6 (2009): 1694-1700. Print.

Qan, S et al. "Spartina invasion in China: implications for invasive species management & future research." *European Weed Research Society Weed Research*. 47 (2007): 183-191. Print.

Washington. *Common Cordgrass*, Web. 02/28/11 //www.nwcb.wa.gov/weed_info/Spartina_anglica.html

Sytsma, M., Morgan, V., USA. *Alaska Spartina Prevention, Detection and Response Plan*. Portland: Portland State University, 2010. Print.

USA. *Smooth Cordgrass*, Web. 02/28/11 //www.dnr.sc.gov/marine/mrri/acechar/specgal/smoothgr.htm#top

Wang, R., Lin Yuan, Liquan Zhang. "Impacts of Spartina alterniflora invasion on the benthic communities of salt marshes in the Yangtze Estuary, China." *Ecological Engineering*. 36 (2010): 799-806. Print.

Attachment A