Oregon Department of Agriculture
Plant Pest Risk Assessment for
Common Reed (*Phragmites australis) subsp. australis*
January 2009

Common Name: Common reed
Family: Poaceae

Findings of This Review: *Phragmites australis* subsp. *australis* has been determined to be in the category of an **"A"** listed noxious weed as defined by the Oregon Department of Agriculture (ODA) Noxious Weed Policy and Classification System. Using a rating system adapted from United States Department of Agriculture, Animal Plant Health Inspection Services, Plant Protection, and Quarantine (USDA APHIS PPQ) Weed Risk Assessment Guidelines*, P. australis* subsp. *Australis* scored **42** out of a potential score of **46**. Using the ODA Noxious Weed Rating system, *P. australis* subsp. *Australis* scored **19.**

Description: *Phragmites australis* is a large, perennial grass with creeping rhizomes and stolons, and terminal, plume-like flowering stalks. Common reed has woody hollow stems that can grow to 1-4 meters tall with stem diameters of 0.5-1.5 cm. Leaves are 15-40 cm long with an open leaf sheath. Recent genetic studies indicate there are various lineages of common reed present in the United States; one of these is native to the Pacific Northwest while another is introduced and has recently begun to spread (Saltonstall 2003, Saltonstall et al. 2004). Accurately distinguishing these from one another is important for the purposes of habitat conservation and/or restoration as well as reducing the impact and spread of invasive species. The focus of this risk assessment is on the introduced Eurasian *Phragmites australis* subsp. *australis*, which has become highly invasive in other regions of the United States.

Summary: Botanical records indicate that *Phragmites* was present though uncommon on the eastern seaboard during the 1800's, but the distribution and density expanded rapidly during the 1900's. Although it often occurs in areas of human disturbances (i.e., roadside ditches, water treatment ponds, etc.), the range expansion of common reed cannot be attributed to anthropogenic forces alone. East coast *Phragmites* populations historically consisted of 11 different genotypes – comprising the native lineage of *P. australis* subsp*. americanus*.

These native stands are now largely dominated by the introduced Eurasian lineage of *P. australis* subsp. *australis* (Saltonstall 2003, Saltonstall et al. 2004). The introduced genotype has competitive advantages over the native including increased salinity tolerances, greater rate of above ground growth, higher growth rates along salinity gradients, and lower water content in its shoots, allowing for osmotic regulation (Vaquez et al. 2005). It is evident that the continued spread and domination of the plant in freshwater marshes will occur throughout the rest of the country. Note: For the purposes of this risk assessment, unless otherwise specified "*Phragmites*" and "common reed" will refer to both the native and introduced lineages. A third distinct lineage, native to the Gulf Coast region (described as *P. australis* var. *berlandieri* in Saltonstall et al. 2004) has not been found outside its native range and will not be discussed here.

Growth and Development: *Phragmites* is a clonal grass species that reproduces both vegetatively and by seed dispersal. Seeds are shed from November through January and are dispersed by wind, water, and animals. Once seeds germinate and become established, young plants usually persist for at least two years in a small, inconspicuous stage where they resemble many other grass species. When seedlings establish in inland or low salinity areas, the infestation will typically expand radially, resulting in distinct circular patches. In higher salinity areas, infestations established at the water's edge expand inward toward the center of the marsh. Plants tend to grow taller and exhibit fewer dead leaves the further from shore they grow (down the salinity gradient) (Adams and Bate, 1999). Reproduction is primarily vegetative, through an extensive network of rhizomes, which can grow horizontally up to 1.8 m per year depending on the climate. Stolons are produced in young stands or over open water, growing up to 11cm per day, and further aid in rapid stand expansion and dispersal during storm events.

Limitations to Growth: Salinity and depth to the water table are two factors that control the distribution and vigor of *Phragmites*. Conversion from native plant communities to *Phragmites* dominated ones can occur three times as fast in low salinity areas compared to those with higher salinity (Warren et al. 2001). It should be noted, however, that *Phragmites* has proven to be a "pseudo-halophyte" in that it can tolerate areas of higher salinity as long as its active root system is located in deeper, less saline soils (Adams and Bate 1999). Salinity tolerances are variable throughout different populations though it does thrive in stagnant waters with poor aeration. *Phragmites* has a low tolerance for wave and current action, which can break its stems and impede bud formation in the rhizomes.

Distinguishing Native from Non-native Stands: Differences between the two subspecies can be subtle and may partially depend on ecological conditions. Morphological work has focused on ligule's length, lower glume length and stem characteristics such as sheath persistence and internode color. The native has a reddish-purple lower internode color as opposed to yellow-brown for the non-native *P. australi*s subsp. *australis*. Native plants have longer lower glumes as well as longer ligules (on middle leaves) compared to non-native plants. For specifics on these and other characteristics, see the table below (modified from Saltonstall 2008 and Blossey 2002)

Table 1. Morphological characteristics used to distinguish native and non-native Phragmites stands

Characteristics	**Native** (*P. australis* subsp. *americanus*)	**Non-native** (*P. australis* subsp. *australis*)
Stand Density	Less dense	More dense
Leaf Sheaths	Mostly absent or easily removed	Tightly clasped; difficult to remove, even on dead stems
Leaf color	Yellow green	Blue green typically; yellow-green in brackish water
Ligule length	1.0-1.7 mm	0.4-0.9 mm
Flower	Less dense, possibly blooming and senescing earlier	More dense, larger plumes, blooming and senescing later
Lower glume length	3.0-6.5 mm	2.5-5.0 mm
Upper glume length	5.5-11.0 mm	4.5-7.5 mm
Stem Spots	Often present in summer on dead stems	Absent or rare
Stem Color		
Spring/Summer	Green to maroon	Green w/ yellow nodes
Winter	Yellow to brown	Yellow

Environmental Importance:
Detrimental: Non-native *Phragmites* is frequently regarded as an aggressive, unwanted invader. Studies have shown *Phragmites* dominated areas exclude large wading birds; exhibit decreased overall species richness of birds (Chambers et al. 1999) and reduces feeding grounds for birds through increased bank steepness (Teal and Peterson 2005). *Phragmites* increases land elevation, reducing habitat for important fish species and disrupts trophic transfers within the marsh itself as well as the greater estuary. Both small and large fish suffer from low biomass and decreased body lengths as a result of *Phragmites* infestations (Hagan et al. 2007). *Phragmites* can block fish passage by bridging marsh creeks and reduce refuge by steepening creek banks (Teal and Peterson 2005). Native decomposition rates are slowed because of the high concentration of lignin in *Phragmites* stems yet the fast rates of leaf decomposition can alter soil invertebrate communities. Marsh specialists are often replaced with generalists in *Phragmites* dominated areas (Chambers et al. 1999) and native plant diversity is dramatically reduced. In addition, *Phragmites* can have adverse impacts on waterfront property values and recreation such as hunting and fishing. Disturbances or stresses such as pollution, dredging, and increased sedimentation favor invasion, and spread of non-native *Phragmites*.

Beneficial: *Phragmites* is a useful plant with a long association with humans. Ethnobotanical sources reveal that the native *Phragmites* was used for food, sweeteners, decoration, weapons, weaving material and for making musical instruments. Across the world, people have used *Phragmites* to make boats, sleeping mats, baskets, harpoons, arrow shafts, and in the construction of houses. Native Americans used it to treat digestive ailments and headaches. Various Western, Native American groups have used the reed as a fiber plant, pipe stems and arrow shafts, and basketry materials. *Phragmites* is also thought to be the sole known host plant for the Yuma Skipper butterfly (*Ochlodes yuma*). This skipper is the largest most conspicuous of the tawny, grass–feeding Hesperiine skippers. The skipper is distributed in the Great Basin area ranging from Arizona to south-central Washington. The occurrence of this obligate herbivore indicates the potential presence of a native *Phragmites* species. It is not known if the introduced genotype also serves as a host for the insect.

Habitat: *Phragmites* grows in a wide range of sites that hold shallow water, including roadside ditches, marshes, swamps, brackish estuaries, and alkaline wetlands. *Phragmites* will inhabit any slight depression that has an ability to hold water. It has become increasingly common along railroad tracks, roadsides, and dredge spoils.

Reproduction and Dispersal: Long distance seed dispersal is accomplished by water, wind, and wildlife. Seed fecundity is low though and variable from season to season. Asexual reproduction occurs during flood events and tidal exchanges, which undercut root masses dispersing the root fragments downstream and onto flood plains. In rivers systems, this tends to be the dominant means of expansion and dispersal. There is no evidence of hybridization between native and introduced lineages (Saltonstall et al. 2004).

Geographic Distribution: *Phragmites australis* subsp. *australis* is native to Africa, temperate portions of Asia and Europe; it has been widely introduced and is naturalized in New Zealand, United States, Canada, Melanesia, and Polynesia. *P. australis* subsp. *americanus* is native to much of North America, including Canada, New England south through Mid-Atlantic States and west to Oregon and Washington.

Oregon Distribution: Historic reports of what is presumably the native *Phragmites australis* subsp. *americanus* have primarily come from inland marshes and wetland areas of the west coast, with few known in tidal marshes (Chambers et al. 1999). Large populations of *Phragmites* can be observed at Klamath Lake, Summer Lake, Garrison Lake, John Day River, in North Portland adjacent to Smith and Bybee Lakes, and along the Columbia River, but no determination has yet been made regarding native or introduced lineages. Morphological characteristics from populations in the Columbia White-tailed Deer National Wildlife Refuge in Fort Stevens State Park along the lower Columbia River suggest these dense stands are non-native (V. Morgan, pers comm 2008). Additional populations along the Columbia River (multiple sites on Puget Island and near the mouth of the Clatskanie River) have also been noted as growing in large dense stands and appear to be spreading (T. Butler, pers. Comm. 2008). These possible non-natives *Phragmites* stands may have come from propagules washed down from infestations on the Lower Snake river and near Moses Lake, Washington (M. Systma pers. comm. January 24, 2008).

As mentioned previously, there is little evidence to suggest any hybridization between native and non-native *Phragmites*. Efforts to map east coast distributions using remote sensing have been thwarted due to common signatures of *Phragmites australis* with *Spartina cynosuroides* and *Zizania aquatica* (Chambers et al. 1999). It is currently unknown if remote sensing is feasible with local flora present in Oregon.

Phragmites population, Clatskanie River, Columbia County, OR

Control: Early detection and treatment is crucial to prevent massive stands from developing. Small patches can be manually removed by digging, but this is an extremely labor intensive method and requires every rhizome fragment be removed to prevent spread. Repeated mowing or cutting could reduce stand vigor, but would require yearly treatments and would not be expected to kill the roots. Spraying with Imazapyr early in the season (June) has been shown most effective, but concerns of high water levels and non-target effects are warranted (Mozdzer et al. 2008). The aquatic formulations Habitat™ (active ingredient Imazapyr) or Rodeo™ (active ingredient Glyphosate) are very effective in mid to late summer when water levels are lower. Mowing, disking, and goats have proved ineffective unless used in conjunction with herbicide (Teal and Peterson 2005). No active biological control program is currently available for treatment of non-native *Phragmites*. However, host specificity screening is underway and, of four stem-borers studied, *Archanara geminipuncta* shows promise in its impact, field abundance, and distribution in its native range (Häfliger et al. 2006).

Assessing Pest Risk

The ODA-USDA modified risk assessment identifies several dominant factors that influence plant establishment, reproduction, dispersal, and impacts, and then applies numerical value to these factors. The choices taken by reviewers on each topic can often be very subjective and variable based on the knowledge, observations, and experience of the reviewer. Every effort was made by the authors to be inclusive in the descriptions as reasonably possible with the expectation that some weeds will not fit well in every category. It is intended that the risk assessment serve as a logical process for governmental agencies and weed control professionals for listing plant species as weeds and to help prioritize target species for control. Numerical values are often different for the various factors. This is done to add "weight" or increased value to certain factors over others.

Noxious Weed Qualitative Risk Assessment

Common Reed Grass	*Phragmites australis*
Common Name	Scientific Name

POINT CATEGORIES
Intermediate scores apply: (e.g. = 4)

1) Habitat Availability: Habitat availability restrictive/non-restrictive on a plant's ability to survive and establish in the analysis area. *Abiotic* factors favor or restrict the ability of the plant to thrive in the available habitats. Choose the number that best applies and enter that number.

1. (Low) Susceptible habitat is very limited usually restricted to a small watershed or part of a watershed. Plant is severely confined by certain soil types, soil moisture holding capacity; freeze events, drought, and precipitation.

2. (Medium) Susceptible habitat encompasses 1/4 or less of the analysis area. Plant only moderately confined by environmental factors such as certain soil types, soil moisture holding capacity, weather.

4. (High) Susceptible habitats is enormous covering large regions or multiple counties in the analysis area or limited to a restricted habitat of high economic/ecological value. Plant may demonstrate great adaptability to a variety of environmental conditions.

Score: 4
Explanation: Plant invades restricted habitats of great ecological value, and demonstrates great adaptability to various environmental conditions.

2) Probability of Further Expansion in the State: *Biotic* factors may restrict establishment or expansion of weed in state. If plant is parasitic, do suitable host plants exist for establishment? Choose the number that best applies and enter.

1. Biotic factors *damage* plant growth and/or prevent reproduction. Obligate pollinator not present. Plant not self-fertile. Competing vegetation, and human intervention may restrict establishment. Biocontrol agents already present on related species.

2. Biotic factors *restrict* or moderately impact growth and reproductive potential or plant is poorly or clearly not self-fertile and opposite sex not present or only male plants present.

4. Environment possesses ideal conditions for growth and reproduction. Plant expresses full growth and reproductive potential in environment. If dioecious then either sexes present or plant is self-fertile.

Score: 4
Explanation: Environment possesses ideal conditions for growth and reproduction

3) **Dispersal Potential After Establishment:** Choose the number that best applies and enter.

0. (Negligible) Weed has no *potential* for natural spread in the analysis area

1. (Low) Weed has *potentia*l for local spread within a year. Moderate reproductive potential or some mobility of propagules. Propagules may be moved locally by animals, wave action in lakes.

2. (Medium) Weed has moderate *potentia*l for natural spread with either high reproductive potential or highly mobile propagules. Propagules spread by moving water, humans or animals. Movement possible through long distance commerce.

5. (High) Weed has *potentia*l for rapid natural spread throughout its potential range. Weed has high reproductive potential and highly mobile propagules. Seeds are wind dispersed.

Score: 4
Explanation: Plant has moderate dispersal capability mostly through water movement and some limited air movement.

4) Economic Impact: Plant has potential to cause or demonstrates negative impacts throughout analysis area resulting in reduced crop yield, lowered commodity value, increased cost of production or a loss of markets due to contamination or weed also may cause financial impacts to recreation, livestock health, fishing and hunting and property values. Control costs to manage infestations also considered. Choose the number that best applies and enter.

0. (Negligible) Weed causes none of the above impacts.

1. (Low) Plant has *potential* to cause or *demonstrates* moderate to low impacts throughout analysis area in one or few of the above categories.

2. (Medium) Plant has *potential* to cause or *demonstrate*s moderate impacts in few of the above economic categories or moderate to low impacts over a wide range (over 5 types) of economic plants, recreation, products or livestock throughout analysis area.

5. (High) Plant has *potential* to cause or *demonstrate*s significant impacts in many of the above categories throughout analysis area. Plant directly linked to human health concerns (e.g. poisoning, burns or contribute to increases in vertebrate or invertebrate pests which serve as infectious disease carriers). Control costs would be significant.

Score: 2
Explanation: Plant has the capacity to create moderate economic impacts. Recreation, fishing, waterfowl hunting could be impacted.

5) Environmental Impact: Descriptions of environmental harm: Causes impacts on ecosystem processes; causes changes in plant community composition and function; causes indirect impacts that are measured by a reduction in aesthetic value, reduced opportunities for recreation and reductions in other non-monetary values.

0. (Negligible) None of the above impacts probable.

1. (Low) Plant has potential to cause, or demonstrates few or minor environmental impacts throughout analysis area or impacts occur in degraded or highly disturbed habitats.

3. (Medium) Plant has potential to cause, or demonstrates moderate impacts throughout analysis area or impacts occur in less critical habitats.

5. (High) Plant has potential to cause, or demonstrates significant impacts in several of the above categories. Or plant causes impacts in select priority habitats such as aquatic, riparian, salt marsh, T&E plant sites and other sites deemed critical.

Score: 5
Explanation: Plant has potential to cause serious environmental impacts in wetland environments. These would include competition to native plants and organisms, alterations in water flow and silt accumulation. Reductions in waterfowl feed and habitat.

6) Weed is a Pest in Similar Climactic Zones: Choose the number that best applies and enter.

1. Plant is strictly limited to one minor climactic area or zone. Plants exhibit little adaptability to new environments or complete information is lacking on plant distribution in climate zones.

3. Plant demonstrates weedy characteristics in non-place of origin areas only. Plant limited to a few climactic zones.

5. Plant is known to be a significant pest in similar climactic zones at place of origin or demonstrates significant adaptation to multiple climactic zones wherever it is found.

Score: 5
Explanation: Plant is known to be a pest in similar climate zones.

7) Proximity to the State: Choose the number that best applies and enter.

1. Weedy populations found in more distant US regions or foreign country only.

3. Weedy populations found in Western US regions but not directly adjacent to Oregon border.

6. Weedy populations directly adjacent to Oregon border.

Score: 5
Explanation: Plant very rare in lower to mid Columbia River system

8) Probability of Detection at Introduction Point: Choose the number that best applies and enter.

1. Plants growing where probability of rapid detection high, plants showy, public easily recognizes plant, access not limited.

2. Plant easy to identify by weed professionals, ranchers, botanists, and some survey and detection infrastructure in place.

3. Plant populations growing with high probability of no initial detection, plant shape and form obscure/not showy for much of growing season, introduction probable on lands remote or with limited access to weed professionals.

Score: 3
Explanation: Plant often in poorly accessible locations, easy to identify by land managers and weed professionals.

9) Probability of Weed Imported or Moved to Suitable Habitat by *Human Factors:* Choose the number that best applies and enter.

1. Low probability of introduction or movement. Plant not traded or sold or plant not found in agricultural commodities, gravel, or other commercial products.

2. Moderate probability of introduction or off-site movement. Plant not widely propagated, not highly popular with limited market potential or may be a localized contaminant of gravel or landscape products.

5. High probability that weed will be introduced or moved within state annually. Plant widely propagated, highly popular and widely sold or traded or plant propagules are a common contaminant of agricultural commodities. Or, high potential exists for movement by contaminated vehicles and equipment or by recreational activities.

Score: 3
Explanation: Plant not economically important and not utilized in the floral trade. Weed movement primarily through natural causes or on contaminated boats or dirt fill.

10) Current Distribution: Circle the numbers that best applies and enter.

1. Widespread occurrence throughout the state.

3. Regionally abundant (eastern/western Oregon, coastal area, Willamette Valley, central Oregon, etc.)

6. Not known to occur, rare or uncommon in state.

Score: 6
Explanation: Plant limited in it statewide distribution to a few (known) infestations.

The total risk score for *Phragmites australis* (out of a possible 46) with the USDA-APHIS Risk Assessment is: **42**

36-46 "A" Weed 24-35 "B" Weed Below 24: Unlisted

Oregon Department of Agriculture
Noxious Weed Rating System

Common Reed Grass	*Phragmites australis* subsp. *australis*
Common Name	**Scientific Name**

Points Category

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) 4 Reproduction & Capacity for Spread: Circle the number that best describes, enter 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 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 number

1. Widely distributed throughout the state in susceptible habitat
2. Regionally abundant in part of the state, 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 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

TOTAL POINTS: **19**

Note: Noxious weeds are those non-native plants with total 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: A = 16+, B = 11–15

Phragmites australis scored **19** points placing it strongly as an **"A"** rated weed.

Special thanks: Production of this document was completed with the assistance of Mark Sytsma and Vanessa Howard-Morgan of Portland State University.

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