

Oregon Department of Agriculture
Noxious Weed Pest Risk Assessment for
Hoary Alyssum
Berteroa incana
Brassicaceae
December 2014

Findings of Review and Assessment: Hoary alyssum meets the criteria of an “A” Listed Noxious Weed as defined by the ODA Noxious Weed Policy and Classification System. This determination is based on two independent risk assessments and a review of the literature. Using a rating system as outlined by the USDA-APHIS Weed Risk Assessment Guidelines, garlic mustard received a score of 64 out of a potential score of 89. Using the ODA Noxious Weed Rating system, garlic mustard received a score of 17 supporting an “A” listing.

Introduction: Hoary alyssum is a snowy white flowered upright forb native to Europe. It is an annual or a short-lived perennial that reproduces only by seed. It has a slender taproot, star-shaped hairs on the stems, leaves, sepals, and seedpods. Four white, notched petals on clumps of flowers are clustered at the stem tips. It is in the mustard family and shares the *Berteroa* genus (“false madworts”) with four other plants but hoary alyssum is the only one currently known to be present in the United States. *Alyssum incana* is a taxonomic synonym for this plant. Hoary alyssum is known to be weedy in much of its range and is a listed noxious weed in Michigan, Idaho, California, Washington, Montana, Minnesota, and British Columbia. It has since spread steadily across the west and is now found in scattered populations Washington, Idaho, and Nevada and is present at one site in northeastern Oregon near the town of Wallowa. The proximity of sites in Washington, Idaho, and Nevada along with what seems to be a slow march westward across the country makes its repeated arrival seem certain.



Hoary alyssum flowering plant
Photo by: John M. Randall, The Nature Conservancy, Bugwood.org

Hoary alyssum is reported to be native to east central Europe and West Asia although the precise native range of hoary alyssum is hard to determine because it has spread through much of the Eurasian continent; its range in Europe is still increasing in Germany, Central Europe, Slovakia and through Central Asia to China. It was first documented in Ontario, Canada in 1893 and in the United States, it was recorded as an established weed from Maine to Missouri in 1897 (Warwick and Francis, 2006). Hoary alyssum now has a wide distribution across the continental US and Canada and is apparently extending its range in the Pacific Northwest. Washington State has several sites of the plant with the Clark and Klickitat Counties being in close to our border. Nature Serve (2014) notes that approximately 38 Eco regions – more than 50% of the existing regions in the US - are invaded, based on visual comparison to The Nature Conservancy's 2001 generalized range and eco regions map.

Reproduction:

Hoary alyssum has bisexual flowers that require pollination. Seeds can germinate from early spring to late fall, limited mainly by open space and water. Seedlings that establish in early July or sooner can flower and produce seed by early fall. Seedlings establishing in late July or later will remain as rosettes and produce flowers and seeds the following year (Jacobs and Mangold, 2008). The plant can continue to flower and produce seed throughout the entire growing season. It is a prolific seeder that can produce up to 2,640 seeds per plant in open growing conditions but only 1/20th of that amount in vegetated areas (Reichman, 1988). No information on seed viability was found in the literature though it is known that hoary alyssum forms a persistent seed bank and that seeds can remain dormant for several years. It is observed in Ontario, Canada that while size and density of patches may change, they persist in approximately the same areas year to year (Warwick and Francis, 2006).

No information was found regarding natural seed dispersal vectors like wind, water or animals but agricultural, construction and lawn equipment are suspected to be common vectors (Warwick and Francis, 2006). It is possible that people would move the plant as a ground cover or as an ornamental due to its season long flowering with bright white flowers.

The woody stem and deep taproot allow hoary alyssum to compete well in dry summers. It has a low water requirement. Hoary alyssum can resprout, flower, and seed after multiple mowing but severing the plant from the roots below the root crown will kill the plant (Warwick and Francis, 2006).

Factors Effecting Establishment: Hoary alyssum is capable of invading and dominating open habitats but persists in vegetated areas as well. In non-vegetated areas, hoary alyssum produces a great amount of seed and can be 10 times the weight of plants grown in vegetated areas; however plants in vegetated areas moved through their phenological stages faster and produced larger seeds (Reichman, 1988). Multiple researchers in the Midwest document that hoary alyssum is common in sandy gravelly or poorer soils. In Quebec it is primarily found on limestone/calcareous soils and apparently not seen on acidic soils (Warwick and Francis, 2006). It has been documented to inhabit flood plains, meadows, waste places, railroad embankments, woodlands, grasslands, roadsides, fields, stream banks, pastures, hillsides, and forest floors between 0-2800 meters in elevation (eFloras, 2015).

To date hoary alyssum mainly occurs in the temperate continental climates with cold winters and hot dry summers and is noticeably absent in the southern US (Warwick and Francis, 2006).

Probability of Detection: Hoary alyssum is not a showy plant and so may not be seen until population levels are high enough that monocultures become obvious. It is usually less than two feet tall and vegetatively inconspicuous. The plant itself would be obvious to botanists and range scientists but will likely go unnoticed by many as another weedy mustard.

Professionals may easily distinguish hoary alyssum from other mustards by its snow white deeply notched petals, small white clump of flowers at the tip of each stem, the hoary appearance of the stems, leaves and pods (caused by star shaped hairs), as well as the non clasping stem leaves with entire margins (Warwick and Francis, 2006).

Distribution in Oregon: One historic site in Multnomah County was found on ballast in Portland in 1911 and is listed in the Invader Database (Rice, 2015). There is one active site in Wallowa County near the town of Wallowa.

Environmental Impacts: The assessment of hoary alyssum's potential as a competitor with native plants varies in the literature and even within articles. Warwick and Francis (2006) note hoary alyssum is a xeric species that is very persistent in dry conditions and produces abundant seed throughout the growing season and these factors can make it an aggressive competitor with native plants in certain habitats. They further noted hoary alyssum has recently spread into in upland and dry areas of the Great Lakes and the western foothills of Canada and the US. They also state that hoary alyssum is perhaps best considered a borderline case of an invasive species in Canada and North America, or one that, at least at present, seemingly has limited ecological impacts within natural areas.

Nature Serve (2014) notes that it invades some natural habitats such as prairies, open woods, and marshes, and is apparently increasing in woodland habitats in Michigan and locally in a number of other parts of its range (Nature Serve. 2014). However, they go on to state that hoary alyssum predominantly invades disturbed, open habitats such as roadsides, railroad rights-of-way, waste places, pastures, and agricultural fields, where it poses a minimal threat to native biodiversity. It is not a strong competitor with native species in many scenarios; it cannot establish in intact native grasslands and declines as native species become established on prairie restoration sites. In Wallowa County, it is competitive in flood irrigated alfalfa fields, grazed bunchgrass pastures, roadsides and ditch banks.

Hoary alyssum was not found to attract a large number of pollinators where it had invaded restored prairies in Minnesota and may therefore contribute to lower species richness of pollinators on those sites (Reed 1993).

Warwick and Francis (2006) give a caveat regarding predicting its future spread in North America: "it should be noted that in Europe lag times of one to two centuries were observed from time of introduction to its becoming an invasive problem. Perhaps additional time is required for a further-build-up of populations in North America, before greater ecological impacts will be noted in natural areas generally or specific natural habitat types. Climate warming is likely to increase perennation success and may assist in its establishment and spread."

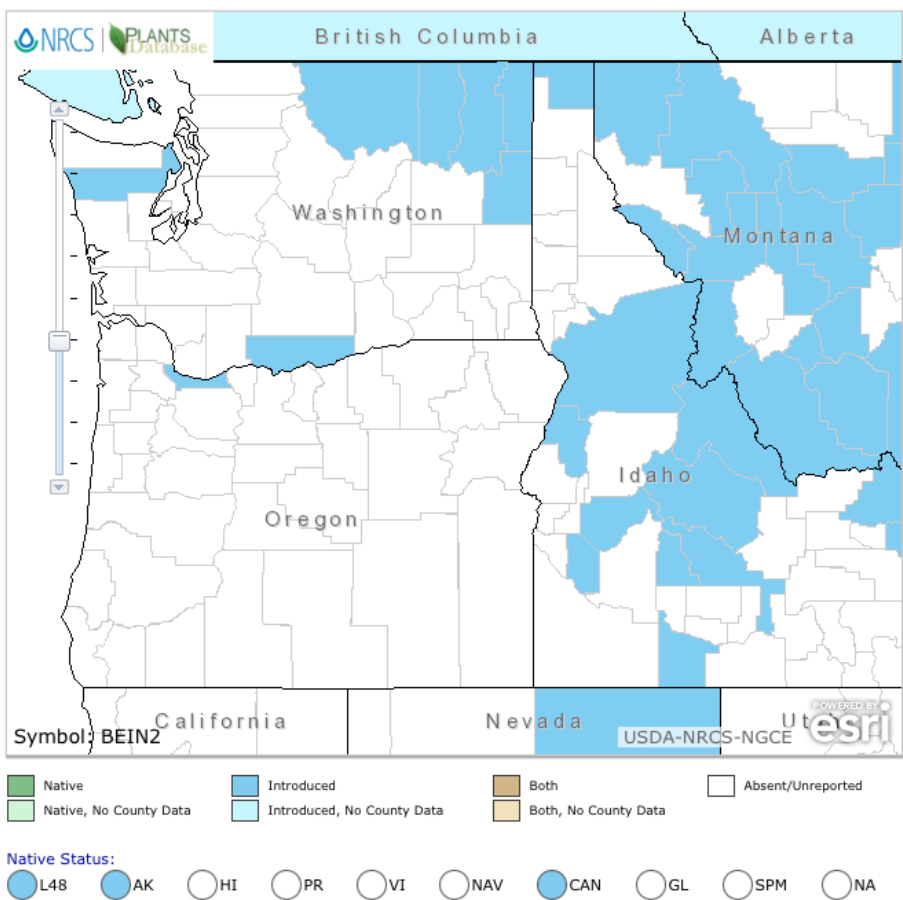
Economic Impacts: Hoary alyssum is toxic to horses, usually encountered in hay (Penn Vet, 2015). It lowers production, nutritive characteristics and palatability of alfalfa hay (Gilles 1985). Goats and sheep were found to select against or reject hay with hoary alyssum in it. It can reduce productivity of grazing lands. It recently became known as a significant pest in Fraser fir Christmas tree farms in Michigan. Hoary alyssum is also known to invade clover and birdsfoot trefoil crops and has few easy herbicide choices in broadleaf crop scenarios. The plant spreads readily with soil movement and transportation system management (Warwick and Francis, 2006).

Control: Mechanical control by grubbing below the root crown or multiple tillage events works well for small sites and some agricultural scenarios but is limited in application to larger sites and in many crops due to high labor investments. Hoary alyssum can resprout and flower after multiple mowing and mowing may increase the plant by spreading seed and removing shade and other competitive plants (Warwick and Francis, 2006).

Chemical controls with sulfonylureas (chlorsulfuron, metsulfuron and sulfameturon) were generally better than 95% control but aminopyralid and clopyralid had poor control (DiTomaso, Kyser et al, 2013). Terbacil @ 1.1 kg/haA has been used in dormant alfalfa to successfully treat the weed (Gilles, 1985). Triclopyr, 2,4-D, MCPA, and glyphosate all provided good immediate control of growing plants but no residual for seeds; multiple other herbicide with crop labels have been tested and have some activity but herbicides that are effective in mixed grass alfalfa stands are not to be found as of 2006 (Warwick and Francis, 2006). Allen Schnetzky, Vegetation Manager in Wallowa County, has found that tank mixed chlorsulfuron and 2,4-d provided good control in roadside and pasture scenarios (personal communication, 2015). Brian Clapp, past Custer County Idaho Weed Supervisor, treated the plant successfully with Chlorsulfuron, Metsulfuron and Aminocyclopyrachlor (4.5 oz. /ac) in roadside scenarios (personal communication, 2015).

No biocontrol agents are available for hoary alyssum. Hoary alyssum has almost no natural enemies in North America (Warwick and Francis, 2006). There are no native members of the genus or beneficial introduced members of its genus in the US, suggesting that biological control measures may offer control possibilities in the future.

Pacific Northwest distribution of hoary alyssum. Wallowa County site not shown here.



Noxious Weed Qualitative Risk Assessment 3.8
Oregon Department of Agriculture

Common Name: Hoary alyssum, hoary false alyssum, hoary false madwort
Scientific Name: *Berteroa incana*, syn (*Alyssum incanum* L.)
Family: Brassicaceae

For use with plant species that occur or may occur in Oregon 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: **64** Risk Category: **A**

GEOGRAPHICAL INFORMATION

1) **4** **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: Locally invasive in across the Northern US and Canada, a variety of habitats are invaded but especially adept at invading where disturbance opens sites, current area occupied is seasonally colder and drier.

2) **4** **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: Bunchgrass systems may be more susceptible than the sod prairies types where it is more common due to natural bare ground that could favor this plant, appears to grow well in NE Oregon in moderately cold and dry site, high elevation natural/wilderness areas may be susceptible, drought tolerance may increase habitat parameters with climate change.

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: In one small site in Oregon only. Present in immediately nearby Washington, and close in Idaho and Nevada.

- 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: Known to be in one small site in Oregon only. May have been in Portland area in 1911 but no documentation has been found since.

BIOLOGICAL INFORMATION

- 5) **3** **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: Oregon's climate – especially the Eastern areas – impact on this plant is not known. It may thrive here or not.

- 6) **5** **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: Prolific seed producer longevity unknown but suspected to be substantial, no vegetative reproduction.

- 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: Not palatable to goats and sheep and toxic to horse – not likely to be palatable to wildlife, no known natural enemies here, does not attract many pollinators, and pathogens known to attack it. Moderately competitive.

- 8) **2** **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: Propagules mostly mobile through human activity – they do not appear to move far on their own nor have obvious associations with animals.

- 9) **4** **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: Likely contaminant of alfalfa seed and forage crops, soil and roadside materials.

IMPACT INFORMATION

- 10) **6** **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: Likely contaminant of hay, can reduce production and value of hay and pasture, and potentially dryland wheat.

- 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: Known invader of disturbed habitats, may decrease forage value of moderate and highly disturbed rangelands, may deter native pollinators if it displaces native species.

- 12) **5** **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: Toxic to horses and unpalatable to goats and sheep.

CONTROL INFORMATION

- 13) **8** **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: Not a showy plant, similar to other mustards to the untrained eye but easily distinguishable by professionals once the population is noticed.

14) 4

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 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: Sulfonylureas likely provide good control in rangelands but no good options were found for mixed hay crops (grass alfalfa) and annual and potentially multiple treatments would be required. No biocontrol agents. Mowing not effective control but tillage and handpulling or severing below the root crown is on small patches.

Category Scores:

18 Geographic score (Add scores 1-4)

18 Biological Score (Add lines 5-9)

16 Impact Score (Add lines 10-12)

12 Control Score (Add Lines 13-14)

64 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.

V3.8 2/19/2016

Oregon Department of Agriculture
Noxious Weed Rating System

Common Name: Hoary alyssum
Scientific Name: *Berteroa incana*

Point Total: **17**

Rating: **A**

1) Detrimental Effects: Check all that apply, add number of checks

- 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) Reproduction & Capacity for Spread: Check 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) Difficulty to Control: Check 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) Distribution: Check 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

5) Ecological Impact: Check 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

17

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 2/22/16 V3.8

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Reported by:Mark Porter, ODA

USDA Plant Hardiness zone

