

Oregon Department of Agriculture
Plant Pest Risk Assessment for
Kudzu, *Pueraria montana*
2010 (Revised 2013)

Name: Kudzu, *Pueraria montana*; a.k.a. Japanese arrowroot, porch-vine, telephone vine;
Synonym: *Pueraria lobata*
Family: Pea, *Fabaceae*

Findings of This Review and Assessment: Kudzu has been determined to be a category **A** noxious weed as defined by the Oregon Department of Agriculture (ODA) Noxious Weed Policy and Classification System. This determination is based on a literature review and analysis using two ODA evaluation forms. Using the Qualitative Noxious Weed Risk Assessment v.3.8, kudzu scored **63** indicating an **A** listing and score **17** with the ODA Noxious Weed Rating system, v.3.2.

Introduction: Kudzu, *Pueraria montana* is a fast growing vine native to China and Japan. It was introduced and has become a major pest of the southeastern US where an estimated seven million acres are infested. Kudzu is a federally listed noxious weed and was placed on the ODA Noxious Weed List in 1995. Prior to the Oregon listing, the species was not known to occur in the Pacific Northwest. In 1990 an inquiry was received by ODA to approve the importation and use of kudzu for forage. This inquiry prompted a review by ODA and ultimately a quarantine listing of kudzu in 1993 to prevent import, transport, or sale in the state. The first weedy infestation in the Pacific Northwest was found near Aurora, Oregon in 2001 and two additional sites were found in southwest Portland the following year. It was not determined how the plants were introduced, but was most likely intentionally planted as ornamental or for erosion control. The Oregon sites have received intensive treatment and monitoring and may be eradicated though rarely new sprouts have been found.

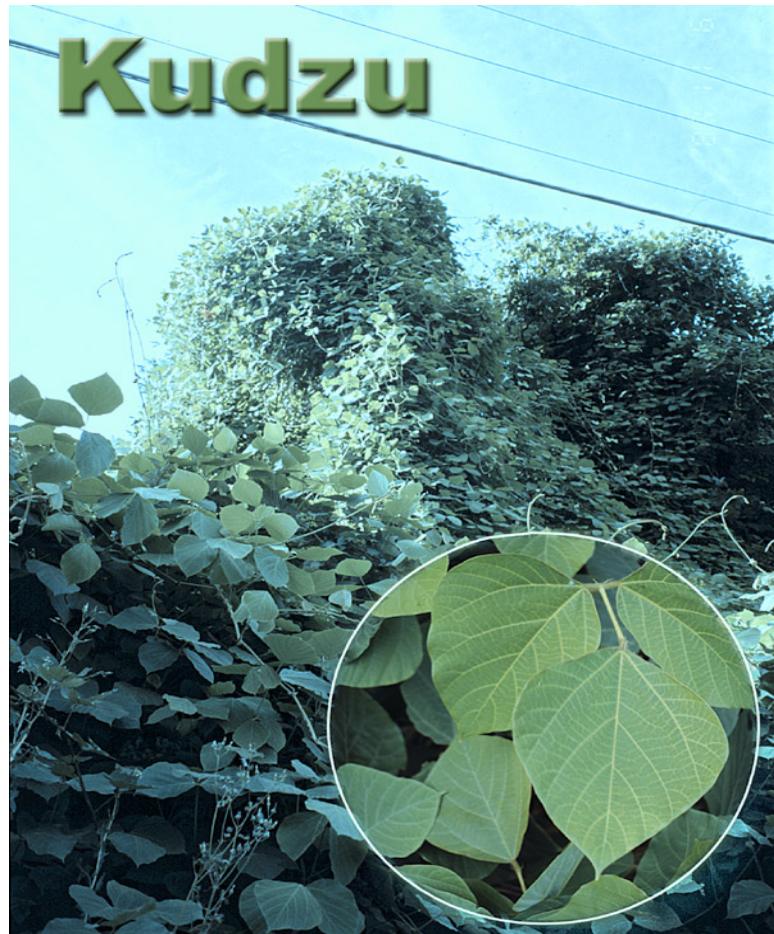


Photo by Tom Forney, ODA

Kudzu was introduced to North America in 1876 for the US Centennial Exposition held in Philadelphia. The Japanese government constructed a beautiful garden exhibit filled with plants native to their homeland. The exhibit captured the interest of American gardeners and kudzu's large leaves and sweet smelling blooms became popular as an ornamental. In 1902, David Fairchild observed the use of kudzu for pasture in Japan and returned to the US to promote its use as forage. During 1930s and 1940s, it was promoted by the Soil Conservation Services (SCS) as an erosion control in the southeast, especially in Mississippi and Alabama. Farmers were paid \$8.00 per acre to plant kudzu on degraded pastures and forestland. In 1938, Fairchild was no longer promoting its use and wrote "it grows all over the bushes and climbs pines smothering them with a mass of vegetation which bends them to the ground in a tangled nuisance". By 1942, over 1.2 million acres were planted with kudzu. Kudzu began falling out of favor in the 1950s as its weedy nature became apparent. As early as the 1940s kudzu was recognized as a concern. In 1997, kudzu was listed by the US Congress as a Federal Noxious Weed.

Growth Habits, Reproduction, and Spread: Kudzu is a warm season, semi-woody climbing perennial vine. Kudzu grows best in full sun on well-drained soils and prefers loamy-sand but will tolerate heavier soils if drained. It becomes drought tolerant once established but does not tolerate wet soils. Kudzu can survive and persist in shade. Most aggressive growth occurs in areas with high daytime and nighttime temperatures with periodic summer rain. Seeds are produced, but viability is low due to a lack of natural pollinators in North America. Reproduction is primarily vegetative. Plants produce long runners that root at nodes to develop new crowns. Several vines grow from a single mature crown. Large tuberous taproots develop and can become massive, weighing up to several hundred pounds. Vines are fast growing, producing up to sixty feet of growth per season. Climbing vines readily cover trees and shrubs forming what is referred to in the south as "kudzu sculptures". Trifoliate leaves are alternate, six to eight inches long, and have fuzzy pubescence on the undersides. Leaf shape varies from oval, lobed, or nearly heart shaped. Purple to deep-red flowers are pea-shaped hanging in large clusters and appear in midsummer through fall.

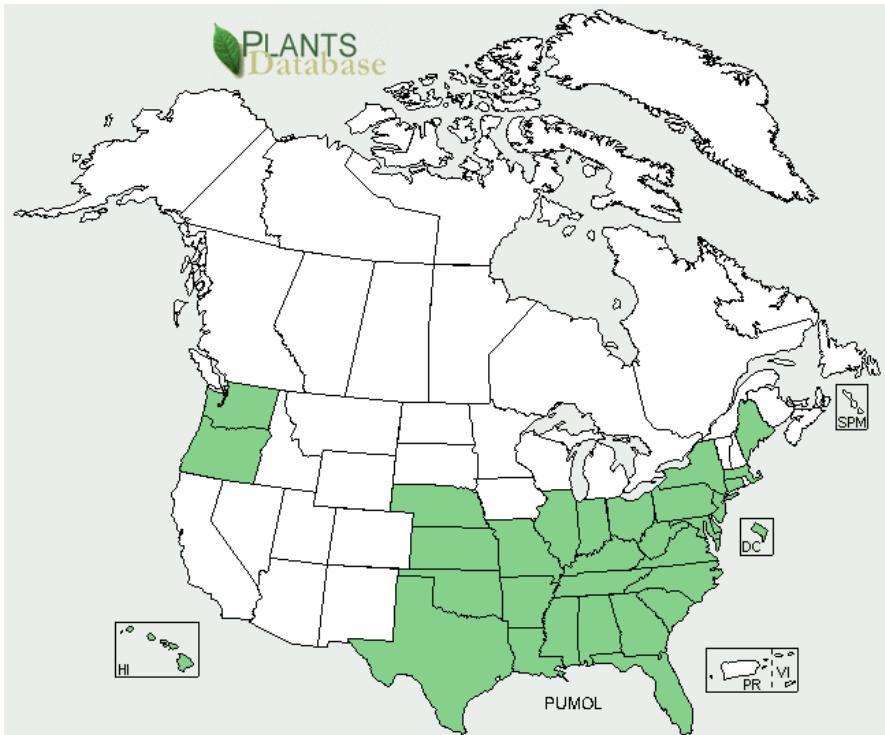
A grape-like fragrance is apparent when in bloom. Stems are velvety with brown fuzzy hairs. Vines may reach four inches in diameter and older stems become woody and turn from green to brown with age. Six to twelve seeds are produced in each pod. Pods are flattened and pea-like, dark brown when ripe and mature in the fall. Seed viability is as low as one percent with only one or two fertile seeds produced in each cluster of pods.



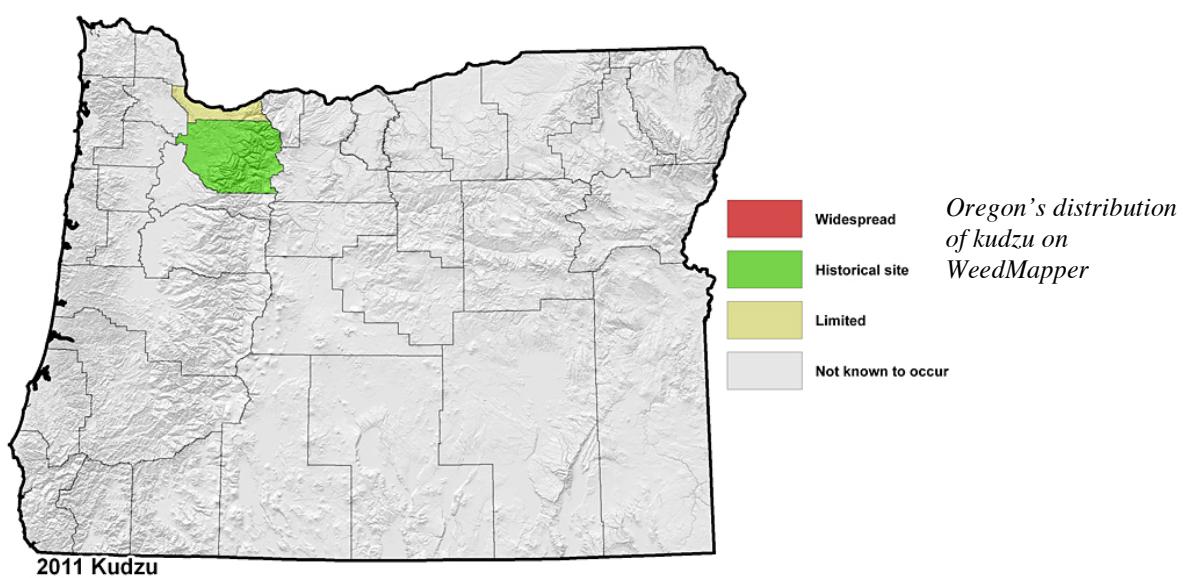
Kudzu flower, photo by Tom Forney, ODA

Native Range: Twelve species of *Puerari* are known from Asia. The native distribution is Japan, China, and Indonesia. One species, *Puerari montana*, and three varieties, *P. montana*, *P. lobata*, and *P. thomsoni* are present in North America.

Distribution in North America: Kudzu is prevalent throughout the southeast ranging north from Maine, south to Florida, and west to Texas. Four populations are documented in the Pacific Northwest, three in Oregon and one in Washington. All four populations have been controlled.



Kudzu US distribution on
Plants Database



Positive Economic Impact: Kudzu is grown in Asia for forage, as a starch crop, and for medicinal uses. It was introduced to the US and promoted as forage and for erosion control until it fell out of favor. Kudzu is nearly equal to alfalfa in nutritive value and palatability, both as pasture and cured as hay. It is particularly useful for covering rough ground and slopes where it can provide both pasture and erosion control. It is still grazed, but is not considered a commercial crop or commonly planted as forage today. It has little commercial value outside of Asian agriculture where its primary value is the harvest of the roots to produce starch for flour. It also provides some grazing forage in Japan. Records of medicinal uses date back to as early as 1500s in China. It has some minor use as a medicinal plant in the US. In the Southeast there is an industry of folk arts and crafts where kudzu is used for basket weaving, jelly, additions to regional foods and is sometimes celebrated in festivals. There is interest in using kudzu as a source of plant material for producing cellulosic ethanol biofuel and may have some future value if this technology advances to a commercial enterprise. Studies are also looking into the use of kudzu extracts to reduce hypertension.

Negative Economic Impact: By the 1950s, kudzu had become a nuisance in most areas where it was planted and spread rapidly throughout the South. Kudzu flourished because of the ideal growing conditions, warm climate, rainfall, and lack of natural enemies. Impacts are estimated at eight million per year with kudzu plaguing agriculture and reducing timber growth. Structures and power poles are weighed down by kudzu. Excessive growth increases the costs of rights of way and roadside maintenance and is generally a nuisance to landowners.

Ecological Impacts: Rapid aggressive growth and the ability of kudzu to climb over trees and shrubs and form heavy carpets of vines on open ground are the main impacts. Few plants can survive once covered by kudzu. Infestations form large monocultures that are void of other vegetation. Natives and desirable plants die from smothering and shading by overtopping vines. Established vines can crush and topple trees and shrubs.



ODA staff treats kudzu in Portland

Probability of Early Detection: Kudzu vines are large and showy and easily identified by professionals and an informed public. In Oregon, surveys have been conducted by watershed councils and Soil and Water Conservation Districts and have yielded no discoveries. The probability of early detection is high.

Factors Affecting Invasiveness: The few original sites of kudzu in Oregon appeared to be unaffected by insect herbivory or fungal pathogens. They grew to full vigor and reproductive potential. In the mild climate of the Pacific Northwest, plants were not subjected to temperature extremes and were deep rooted enough to weather long summer drying patterns. Seed pods were not observed indicating perhaps a too-short of growing season. Limitations on seed production may have been a limiting factor on spread.

Potential for Spread by Humans: Humans were the cause for introduction in Oregon. All sites were on steep cut-banks and planted with kudzu to prevent bank erosion. Public awareness of the potential for a kudzu plague is very high and has no doubt prevented the public from attempting to introduce it again. Strong public information programs will continue to be the best means of preventing new introductions.

Hardiness Zones: Kudzu grows best in the South with its wet warm summers but it is highly adaptable and can be found across many hardiness zones from the South to New England.

Control: Kudzu can be controlled with persistent application of integrated control measures; mechanical tools to reduce the biomass, herbicides to kill the roots. Control of a moderate sized infestation can take up to 10 years though new herbicide products are quite effective and can shorten that time frame. The biggest hindrance to control is often the extensive size of many infestations and gaining adequate access in restricted habitats. Manual cutting at the base of trees followed by chemical applications is an effective method that also reduces the amount of product needed for control. Any project requires annual follow-up treatments on re-growth and to exhaust seed stocks. The large tuberous roots can make complete control difficult. Herbicides are a common control option and several products are effective (e.g., Glyphosate, Clopyralid, Tryclopyr, imazapyr). Most treatments take two years with follow-up monitoring and applications to control all plants. Heavy grazing or mowing can control younger infestations (25 years of age or less). This method is slow, taking many years, and requires open level ground for adequate access by livestock or equipment. Successful control requires frequent defoliation throughout the growing season to be effective.

Noxious Weed Qualitative Risk Assessment

Oregon Department of Agriculture

Common Name: Kudzu

Scientific Name: *Pueraria montana*

Family: Pea, *Fabaceae*

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: 63

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 similar climates.

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: There is extensive susceptible acreage throughout the Pacific Northwest.

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: Occurred at one known site in 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: Found at one location in Oregon. May be eradicated.

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: Very adaptable but may be near northern range of invasiveness.

- 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: Produces many long-lived 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: 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 natural spread. Seeds heavy, moved by water or animals.

- 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: Moderate potential for spread. Can be purchased in herbal market on Internet. If established, may be spread in gravel, soils or vehicles and machinery.

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: Economic impacts have been huge in kudzu-infested areas. Control costs are very high due to the amount of biomass to be treated.

- 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: Environmental impacts are very high in kudzu-infested regions. Entire plant communities are easily choked out. Native fauna are excluded.

- 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: There are no known health threats.

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: Plant robust and highly visible but may not always be reported by public.

- 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 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: Can be controlled with herbicides though treatment costs are high due to large amount of biomass.

Category Scores:

22 Geographic score (Add scores 1-4)

16 Impact Score (Add lines 10-12)

18 Biological Score (Add lines 5-9)

07 Control Score (Add Lines 13-14)

63 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.

1/15/2013 v.3.8

Oregon Department of Agriculture
Noxious Weed Rating System

Common Name: Kudzu

Scientific Name: *Pueraria montana*

Point Total: 17

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 contaminant in seeds and/or feeds
5. *Interference:* interferes with recreation, transportation, harvest, land value, or wildlife and livestock movement

2) 3

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) 3

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

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 8/30/2012 v.3.2

RA produced by Thomas Forney, ODA
Updated by Glenn Miller, 2013

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Attachment A

