

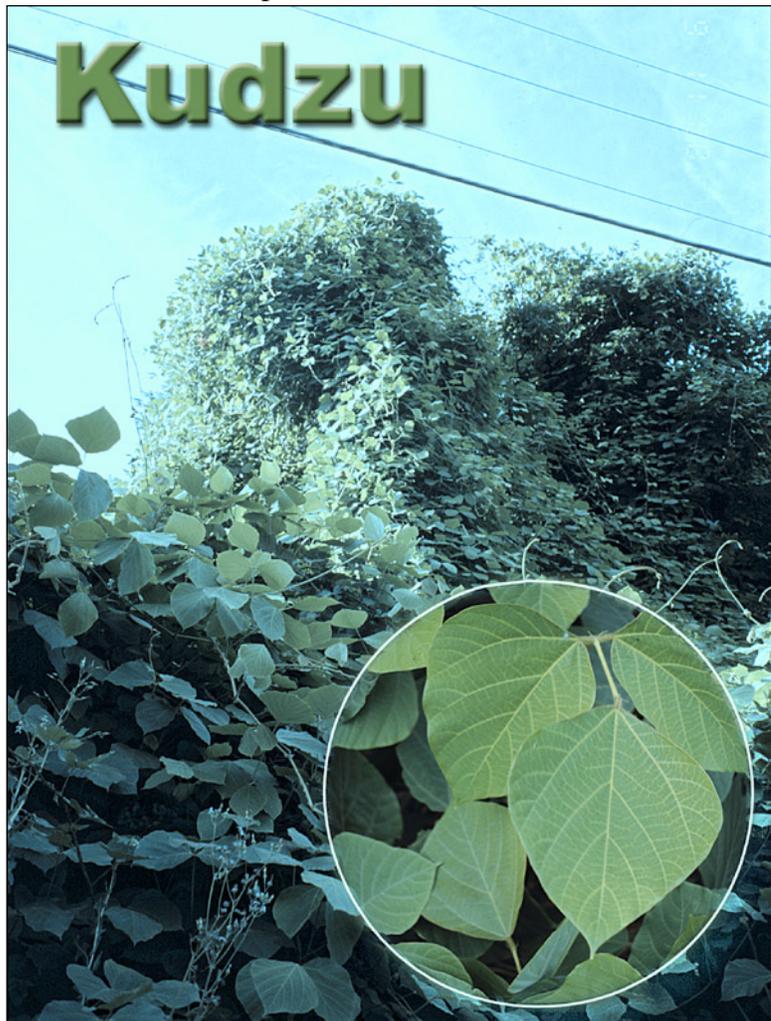
**Oregon Department of Agriculture**  
**Plant Pest Risk Assessment for Kudzu**  
*Pueraria montana*  
**July 2010**

**Name:** Kudzu (*Pueraria montana*); aka. Japanese arrowroot, Porch-vine, telephone vine; Synonym: (*Pueraria lobata*)

**Family:** Leguminosae (Fabaceae)

**Findings of this Review and Assessment:** *Pueraria montana* has been determined to be an “A” listed noxious weed as defined by the Oregon Department of Agriculture (ODA) Noxious Weed Policy and Classification System. This determination is based on two independent risk assessments supported by a literature review. Using a rating system adapted from United States Department of Agriculture, Animal and Plant Health Inspection Services, Plant Protection and Quarantine (USDA-APHIS PPQ) Weed Risk Assessment Guidelines, kudzu scored 35 out of a potential score of 48. Using the ODA Noxious Weed Rating system, kudzu scored 17.

**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 U.S. 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 1991 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 for all practical purposes are eradicated.

*Photo by Tom Forney, ODA*

Kudzu was introduced to North America in 1876 for the U.S. 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 U.S. to promote its use as forage. During the 1930s and 1940s, it was promoted by the Soil Conservation Service (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. 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 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". In 1997, kudzu was listed by the U.S. 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 and 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.

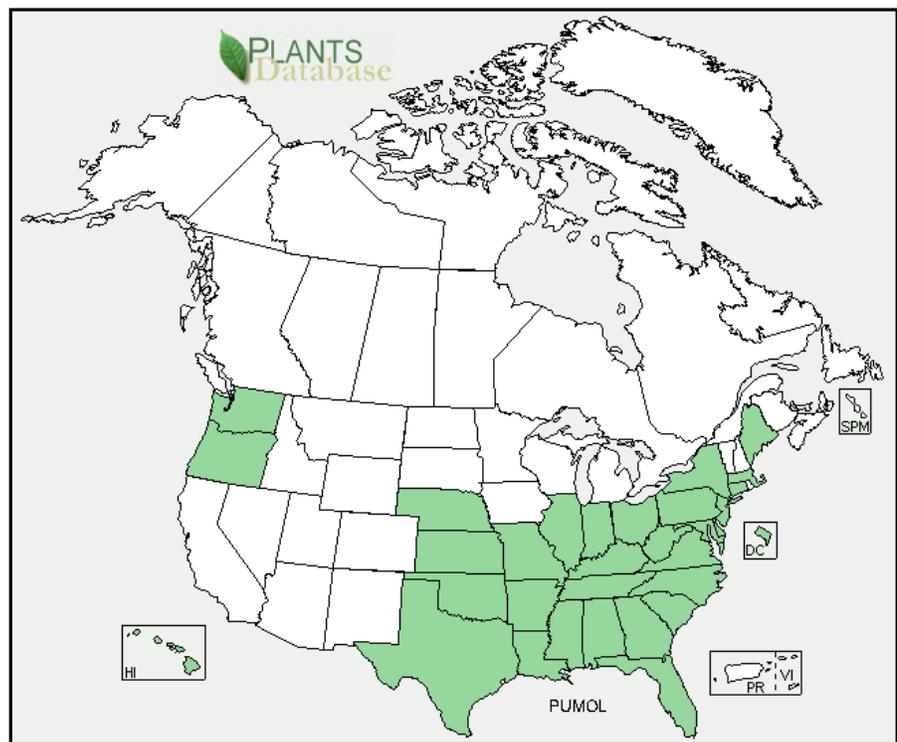
**Native Range:** Twelve species of *Puerari* are known from Asia. The native distribution is Japan, China, and Indonesia. One species, *Puerari montana*, and three varieties (var. *montana*, *lobata*, and *thomsoni*) are present in North America.

**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 PNW populations have been controlled.

USDA 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 U.S. and promoted as forage and for erosion control until it fell out of favor in the 1950s. 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 and is grazed 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 U.S. In the Southeast there is an industry of folklore and novelty and kudzu is used for basket weaving, jelly, regional foods and 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 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.

*Oregon's Kudzu Infestations WeedMapper*



**Control:** Kudzu can be controlled with persistent application of the right control measures. Control of a moderate sized infestation can take up to 10 years. The biggest hindrance of control is the sheer size of most infestations and gaining adequate access for the method used. There are several effective control options, but the best approach is often determined by accessibility. Regardless of the control method, complete control requires persistent follow-up and treatment of re-growth. The large tuberous roots can make control difficult. Carbohydrate reserves of the tubers can produce persistent growth of new vines and the large roots can be difficult to kill with herbicides.

Herbicides are a common control option and several products are effective (e.g., Glyphosate, Clopyralid, Triclopyr, Picloram). Most treatments take two years with follow-up monitoring and applications to control all plants. Digging is effective on small infestation and equipment such as skid steers or dozers can be effective on large sites. 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. This method requires frequent defoliation throughout the growing season to be effective.

## 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 noxious weeds and to help prioritize target species for control.

### ODA Modified USDA - Qualitative Risk Assessment

#### *Kudzu Pueraria Montana*

(Intermediate scoring may be used e.g. =4.5)

#### 1. **Habitat availability:**

Does habitat availability restrict a plant's ability to survive and establish in the analysis area? How much susceptible habitat is available and are their physical or environmental factors that would favor or restrict the ability of the plant to thrive in the available habitats in Oregon? If plant is parasitic, do suitable host plants exist for establishment?

- High (5) Susceptible habitat 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.
- **Medium (3) Susceptible habitat encompasses 1/4 or less of the analysis area. Plant only moderately confined by environmental factors such as certain soil types, moisture holding capacity, competing vegetation, and human intervention.**
- Low (1) Susceptible habitat is very limited usually restricted to a small watershed or part of a watershed. Plant is severely confined by certain soil types, moisture holding capacity, competing vegetation, human intervention.

#### **SCORE: 4**

Explanation: The Willamette Valley is the most suitable region in the State having adequate soils moisture hold capacities, daytime and evening temperatures, and occasional summer rain for growth and spread. Southwest Oregon is also susceptible but lacks adequate soil moisture or summer rains for widespread establishment. The Oregon Coast has ideal soils and moisture but lacks adequate temperatures for rapid growth and spread.

## 2. Spread Potential after establishment:

Dispersal potential (speed and distance)

- High (5) Plant has potential for rapid natural spread throughout its susceptible range. Have high reproductive potential and highly mobile propagules. (e.g. Seeds can be wind dispersed over long distance.)
- Medium (3) Plant has a moderate potential for natural spread with *either* high reproductive potential *or* highly mobile propagules. Propagules spread by moving water or animals.
- **Low (1) Plant has potential for *local* spread within a year. Moderate reproductive potential or some mobility of propagules. Animals may move propagules locally, also wind and wave action in lakes.**
- Negligible (0) Plant has no potential for natural spread in the analysis area.

### SCORE: 1

Explanation: Plant has low potential for natural spread by seeds and would only spread locally vegetatively.

## 3. Economic impact:

Should consider human health and livestock losses in the HIGH section.

- High (5) Plant has *potential* to cause or *demonstrates* potential to cause *significant* 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 high (larger) financial impacts to recreation, livestock losses, fishing and hunting and property values. **Control costs to manage infestations would become significant.** 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).
- **Medium (2) Plant has *potential* to cause or *demonstrates* 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.**
- Low (1) Plant has potential to cause or demonstrates moderate to low potential impacts throughout analysis area in one or few of the above categories.
- Negligible (0) Plant causes none of the above impacts.

### SCORE: 4

Explanation: If kudzu were to become widely established, it has the potential to impact agriculture and forestry, right of way maintenance, and cause loss of recreational opportunities. The costs of controlling kudzu would be substantially high.

## 4. Environmental impact:

Descriptions of environmental harm: Causes impacts on ecosystem processes; causes changes in plant community composition; in plant community structure 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.

- **High (5) 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.**
- Medium (2) Plant has *potential* to cause, or *demonstrates* moderate impacts throughout analysis area or impacts occur in less critical habitats.
- Low (1) Plant has *potential* to cause, or *demonstrates* few or minor environmental impacts throughout analysis area or impacts occur in degraded or highly disturbed habitats.
- Negligible (0) None of the above impacts probable.

**SCORE: 5**

Explanation: Plant has a potential to out-compete native flora in critical habitats.

**5. Likelihood of introduction and spread:**

Entry Potential: The likelihood that an exotic plant will be introduced and spread depends on the number of associated factors, some physical, some biological, some social/economic.

For this analysis, consider the following five factors:

**5a. Weed is a pest in similar 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.
- **3= Plant demonstrates weedy characteristics in non-place of origin areas only. Plant limited to a few climactic zones.**
- 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.

**SCORE: 3**

Explanation: Kudzu is dependant on a warm moist climate zones to be weedy and is not a pest in its native place of origin.

**5b. Current distribution:**

- **6= Plant population limited to 1 or a few infestations in state or not known to occur but with weedy populations *directly* adjacent to Oregon border.**
- 3= Plant regionally established (eastern/western Oregon) with eradication impossible, or weedy populations found in Western US regions but not *directly* adjacent to Oregon border.
- 1= Plant widespread, occurs throughout the state with containment improbable or weedy populations mostly found in more distant US regions or foreign country only.

**SCORE: 6**

Explanation: One weedy population found in Washington State and three in Oregon. Score is reduced because the populations have been effectively controlled and are not spreading.

#### 5c. **Probability of detection at introduction point:**

- 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.
- 2= Plant easy to identify by weed professionals, ranchers, botanists, some survey and detection infrastructure in place.
- **1= Plants growing where probability of rapid detection high, plants showy, public easily recognizes plant, access not limited.**

#### **SCORE: 1**

Explanation: Kudzu's climbing growth makes it easy to recognize. Plants may become established and escape detection for years. The public recognizes the plant and there is an awareness campaign in place.

#### 5d. **Probability of weed import or movement to suitable habitat through *human* activities:**

Does not consider transport by recreation, equipment and vehicles; you may choose to address that here.

- 3= 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 recreation.
- **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.**
- 1= low probability of introduction or movement. Plant not traded or sold or plant not found in agricultural commodities, gravel or other commercial products.

#### **SCORE: 2**

Explanation: There is some novelty interest in the plant and it may be planted as an ornamental. Kudzu is sold and has a limited use as a medicinal herb. There has been documented interest in importation and use for forage.

#### 5e. **Environment and reproductive potential:**

- 5= Environment possesses ideal conditions for growth and reproduction. Plant expresses full growth and reproductive potential in environment. If dioecious then both sexes present and plant is self-fertile.
- **2= Environmental factors restrict full growth and reproductive potential and plant is poorly or clearly not self-fertile.**
- 1= Environmental factors damage plant growth and/or prevent reproduction. Obligate pollinator not present.

**SCORE: 3**

Explanation: Environment is ideal in the Willamette Valley and good growing conditions occur in a large part of western Oregon. Kudzu would most likely express moderate to full growth potential in the Willamette but not all of western Oregon. Seed viability is low due to a lack of natural pollinators in North America.

**SCORE = Subtotal of 5a-e = 15**

**6. Current Distribution in Oregon:**

- 6= Not known to occur, or limited to 1 or a few infestations in the state.
- 3= Regionally abundant (eastern/western Oregon).
- 1= Widespread, occurs throughout the state.

**SCORE: 6**

The total assessment score for *Puerari montana* (out of a possible 48) with the modified ODA-USDA Risk Assessment is: **35**

**“A”** 35 - 48 “A” Weed 25 - 34 “B” Weed Below 24: unlisted

# Oregon Department of Agriculture

## Noxious Weed Rating System

**Kudzu**  
Common Name

*Pueraria montana*  
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) **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 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) **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

**TOTAL POINTS: 17**

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**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: 16+ = A, 15 – 11= B**

## **Acknowledgments:**

Author: Thomas Forney, Oregon Dept. Agriculture

Photo: By Oregon Department of Agriculture staff

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