

Oregon Department of Agriculture
Plant Pest Risk Assessment
for Goatsrue, *Galega officinalis*
2008 (Revised 2013)

Name: Goatsrue, *Galega officinalis* L., a.k.a., professor weed
Family: Pea, *Fabaceae* (*Leguminosae*)

Findings of This Review and Assessment: Goatsrue, *Galega officinalis*, was evaluated and determined to be a category “**A**” rated noxious weed, as defined by the Oregon Department of Agriculture (ODA) Noxious Weed Policy and Classification System. This determination was based on a literature review and analysis using two ODA evaluation forms. Using the Noxious Qualitative Weed Risk Assessment v.3.8, goatsrue scored **64** indicating a Risk Category of **A**; and a score of **18** with the Noxious Weed Rating System v.3.2, indicating an “**A**” rating.



Goatsrue flowering plant, Photo by Bob Barrett, ODA



Goatsrue plant, Photo by USDA APHIS PPQ Archive

Introduction: Goatsrue, *Galega officinalis*, is a USDA federally listed noxious weed. A member of the legume family, goats rue was introduced into Utah in 1891 as a potential forage crop. Escaping cultivation, it now occupies in excess of 60 square miles in Cache, County, Utah. Within this area, goatsrue infests cropland, fence lines, pastures, roadsides, waterways, and wet, marshy areas (Evans and Ashcroft 1982). The plant's stems and leaves contain a poisonous alkaloid, galegin, which renders the plant unpalatable to livestock, and toxic in large quantities. It is particularly lethal to sheep. Because of these issues, goatsrue invasion can reduce forage availability and quality.

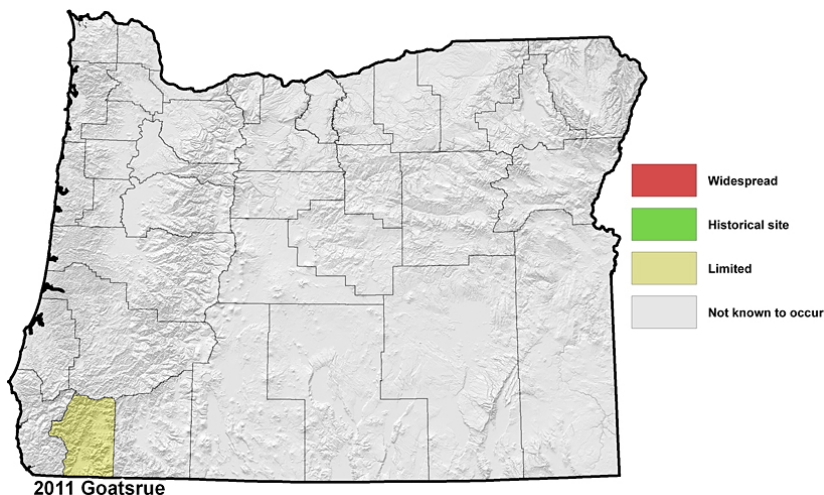
Physical Description: Goatsrue is a deep-rooted perennial, regrowing each year from a crown and taproot reaching 2 to 6 feet tall by late summer. Plants may have up to 20 hollow stems. The first seedling leaves are large, oval and dark green. The mature leaves are alternate, odd-pinnate with six to ten pairs of leaflets. The white and bluish to purplish pea-like blossoms are borne in terminal or axially racemes. Each blossom produces a straight, narrow, smooth pod, with 1 to 9 seeds per pod. A single plant may produce upwards of 15,000 pods. Goatsrue's seeds are bean-shaped, dull yellow in color, and about 2 1/2 times the size of alfalfa seeds. Seeds drop on the ground when mature and may be spread by water, equipment, or animals. Goatsrue's seeds typically remain dormant until scarified and may remain viable for ten years.

Economic Impact: Goatsrue is toxic to all ruminant animals, especially sheep. Livestock losses would be expected to increase especially during dry years when animals are grazed in infested areas. Goatsrue replaces desirable vegetation in pastures and particularly along stream banks and irrigation canals. Some of the most productive lowland pastures, irrigated fields and moist meadows would be susceptible to invasion. Though it is cultivated for forage in Eurasia, it is not clear why toxicity problems are more prevalent here. Goats may be resistant to the toxins and grazed in larger numbers there.

Additional costs associated with goats rue involve control or eradication programs. Large investments in herbicide control have not yielded satisfactory results in several states. The plant's large woody rootstock appears difficult to control. Alfalfa seed crops may become contaminated with rue seed. Seed size is larger than alfalfa seed but seed shape and coat are similar. A small amount of contaminant could serve to inoculate newly planted alfalfa fields causing economic harm to producers.

Environmental Impact: Goatsrue demonstrates the capacity to thrive in a wide diversity of habitats nationwide. Invasion can lead to the formation of monocultures in moist meadow and lowland pasture habitat. Though the species may not be as devastating to native plant communities as other noxious weeds, many plant communities are still vulnerable as long as available moisture is sufficient. Wildlife forage may be reduced though small mammals, insects and birds may benefit from the seeds and nectar source.

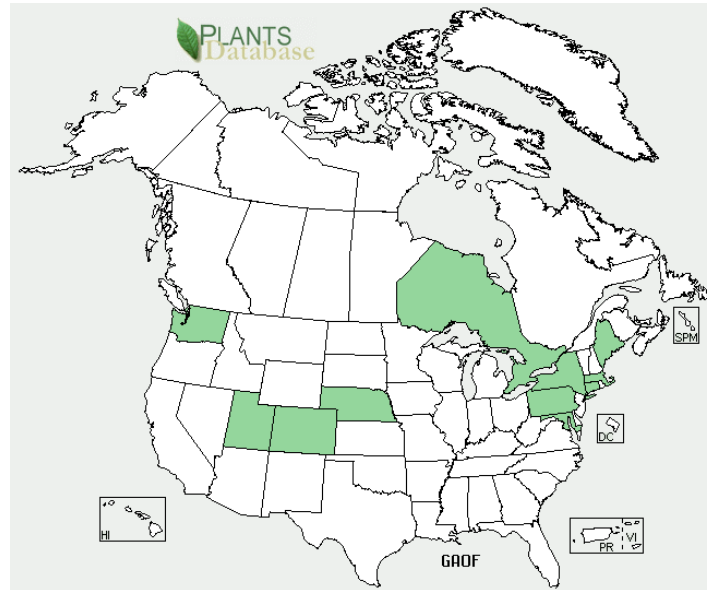
Dispersal: Long-lived seeds are produced in abundance and transported by machinery, agricultural commerce, small mammals and birdlife. Streams and irrigation canals also serve to transport the seeds into river valleys and agricultural fields.



Oregon's distribution of goatsrue on WeedMapper

Native Distribution: Goatsrue is native to the Middle East where it was cultivated for fodder and is naturalized throughout most of Europe, western Asia, and western Pakistan.

U.S. Distribution: Largest infestations occur in Cache County, Utah. Goatsrue infestations have been reported to be invasive in Pennsylvania, Colorado, Washington, and New York. Several new sites have been located in Portland Oregon.



Goatsrue's US distribution on USDA Plants Database

Hardiness Zones: Goatsrue thrives in 4-5 hardiness zones. See Attachment A.

Control: Goatsrue is controlled by herbicides such as 2,4-D plus Dicamba or glyphosate, although the crowns of treated plants may remain viable up to seven years unless retreated or removed. New herbicide chemistry may improve success rates. Tillage in row crops can suppress regrowth and break up the seed production cycle. Cache County, Utah, weed control personnel indicate that goats rue control is very difficult, requiring significant amounts of time and labor. Their experience reinforces the concept that early detection and rapid control is the most effective means of preventing large-scale establishment.

Noxious Weed Qualitative Risk Assessment Oregon Department of Agriculture

Common name: Goatsrue
Scientific name: *Galega officinalis* L.
Family: Pea, *Fabaceae* (*Leguminosae*)

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) 6 **Invasive in Other Areas**

- 0 Low- not know 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: Very invasive in environments similar to east and western Oregon.

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: Can thrive in much of non-forested areas of the state.

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

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

Comments: Occurs in the Portland area.

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

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

Comments: Limited to three known locations.

BIOLOGICAL INFORMATION

- 5) 4 **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: Highly adapted to both wet and dryer conditions.

- 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: Reproduces with seeds of moderate longevity.

- 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 is relatively immune to herbivory and diseases.

- 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: May be spread by animals or moving water.

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

IMPACT INFORMATION

- 10) 5 **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: Can invade rangeland and right-of-ways reducing forage, causing livestock death or increasing road maintenance costs.
- 11) 4 **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: Plant can be moderately competitive in natural environments.

- 12) 4 **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: Plants are poisonous to livestock though goats are somewhat resistant.

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 easily identified by botanists and weed professionals.

- 14) 5 **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: Herbicides are effective in controlling plant.

Category Scores:

22 Geographic score (Add scores 1-4)

19 Biological Score (Add lines 5-9)

13 Impact Score (Add lines 10-12)

10 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.

1/15/2013 v.3.8

Oregon Department of Agriculture
Noxious Weed Rating System

Common Name: Goatsrue
Scientific Name: *Galega Officinalis*

Points: 18 **Rating: A**

- 1) 3 **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) 4 **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) 2 **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

18 TOTAL POINTS

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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 1/15/2013 v.3.8

RA produced by Robert Barrett, ODA
Edited by Glenn Miller, ODA, 2013

References

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Chamberlain, D.F. 1970. Galega. In P.H. Davis (ed.) Flora of Turkey 3:41-42.

Evans, J.O. and M.L. Ashcroft 1982. Goatsrue. Utah Agr. Exp. Stat. Res. Report 79. 5 pp.

Tingley, D.C. 1971. Goatsrue, a potential forage crop, turned out to be a weed. Utah Sci. 32(1):25-28.

PLANTS Profile for *Galega officinalis* (Goat's rue) | USDA PLANTS
plants.usda.gov/java/profile?symbol=GAOF

Attachment A

