

Oregon Department of Agriculture
Pest Risk Assessment for Goatsrue
Galega officinalis L.
January 2008

Goatsrue (*Galega officinalis* L.,) aka. goat's rue, professor weed
Family: Fabaceae [*Leguminosae*]

Findings of this review and assessment: *Galega officinalis*, has been determined to be 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 following a literature review. Using a rating system adapted from USDA-APHIS Weed Risk Assessment Guidelines, goatsrue scored **68** out of a potential score of **90**. Using the ODA Noxious Weed Rating system, goatsrue scored **18**.

Photo by Bob Barrett, ODA

Introduction: Goatsrue, *Galega officinalis*, L. is a USDA federally listed noxious weed. A member of the legume family, goatsrue 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 is toxic in large quantities. It is particularly lethal to sheep. Because of these issues, goatsrue invasion can reduce forage availability and quality.

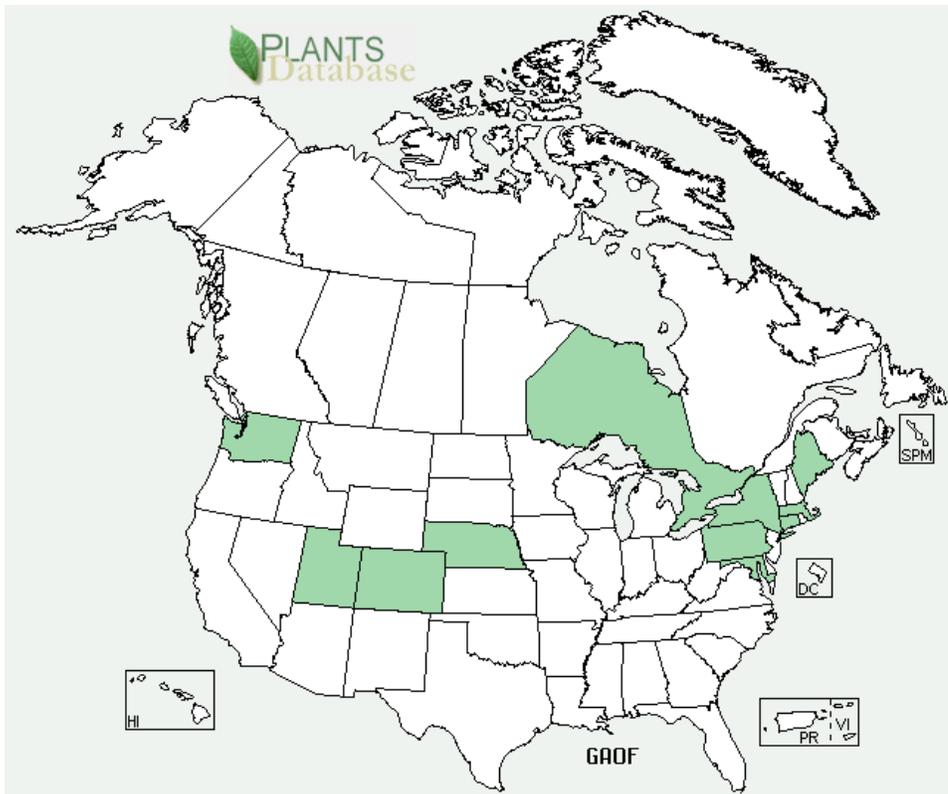


Physical Description: Goatsrue is a deep-rooted perennial, regrows each year from a crown and taproot and reaches 2 to 6 feet tall by late summer. Plants may have up to 20 hollow stems. The first seedling leaves are large, oval and dark green. Mature leaves are alternate, odd-pinnate with six to ten 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 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 seeds typically remain dormant until scarified and may remain viable for ten years.

Economic impact: Goatsrue is toxic to ruminant animals, especially sheep. Livestock losses would be expected to increase, especially during dry years when animals graze 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 are susceptible to invasion. It is cultivated for forage in Eurasia and it is not clear why toxicity problems are more prevalent in the US.

Additional costs associated with goatsrue involve control or eradication programs. Large investments in herbicide control have not yielded satisfactory results in several states. The plants' large woody rootstock appears difficult to control. Alfalfa seed crops can be contaminated. Seed size is larger than alfalfa but the shape and coat are similar.

Environmental impact: Goatsrue demonstrates the capacity to thrive in a wide diversity of habitats throughout North America. Invasion can lead to the formation of monocultures in moist meadow and lowland pasture. Though the species may not be as devastating to native plant communities as some 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 seeds and the nectar source.



USDA Plants Database

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

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.

Control: Goatsrue is difficult to control and often regrows following treatment. Tillage can suppress growth, but herbicides such as 2,4-D, Dicamba or glyphosate are most commonly used. The crowns of treated plants can 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 seed production cycle.

Cache County, Utah, weed control personnel indicate that goatsrue 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

Family: Fabaceae [*Leguminosae*]

Scientific name: *Galega officinalis* L.

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: 68

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: Utah has the most significant populations in the west. Populations are also found in Washington, Colorado, Pennsylvania, and New York.

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: Would grow freely through most of western Oregon. Moisture would be a limiting factor in east Oregon where it would likely be a weed of riparian areas and irrigated pasture sites.

3. 6 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: Weedy populations found in Washington State.

- 4. 0** **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: One historic Oregon site in Southwest Oregon.

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 adaptable

- 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: Many seeds are produced. Goatsrue is a hard seeded legume with 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:

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: Environment possesses ideal conditions for reproduction and spread. Seeds are not wind blown, plant has a moderate potential for natural local spread by animals and birds.

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: Long-distance transport by contaminated seed crops.

IMPACT INFORMATION

10. 9 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: Impacts agriculture through competition and contamination. Can reduce value of hay and forage crops, and is a contaminant of seed crops. Livestock production is impacted by animal losses.

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 has potential to out-compete native flora in critical habitats.

12. 6 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 alkaloids cause livestock poisoning.

CONTROL INFORMATION

13. 9 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: Weed form not showy, similar to native licorice and other common legumes, i.e., sweet clover. Plants may become established and escape detection for many years at points of introduction. The public may not recognize the plant initially.

- 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 are 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: Difficult to control and often regrows following treatment. Tillage can suppress growth and seed production. Herbicides are most commonly used. The crowns of treated plants can remain viable for up to seven years and require repeat treatment for complete control.

Category Scores:

18 Geographic score (Add scores 1-4)

18 Biological Score (Add lines 5-9)

19 Impact Score (Add lines 10-12)

13 Control Score (Add Lines 13-14)

68 **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

Vers. 3.7 5/16/2011

**OREGON DEPARTMENT OF AGRICULTURE
NOXIOUS WEED RATING SYSTEM**

Goatsrue
Common Name

Galega Officinalis
Scientific Name

Points Category

- 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 situation.
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
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
1. Widely distributed throughout the state in susceptible habitat
 2. Regionally abundant in a 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. 2 Ecological Impact** Circle the number that best describes, enter
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

Note: Noxious weeds are those non-native plants with total scores of 11 points or higher. Any plants in 4.1, 4.2, 4.3 should not be classified as "A" rated weeds. Ratings: 16+ = A, 15 – 11= B

References:

Allen, O.N. and E.K. Allen. 1981. The Leguminosae: A source book of characteristics, uses, and nodulation. University of Wisconsin Press. P. 812.

Cache County, Utah, Noxious Weed Department.

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