

Canada Thistle

Cirsium arvense (aka Creeping thistle)

Provincial Designation:
Noxious



Photo credits: Nicola Kimmel, Government of Alberta

Overview:

A colony-forming, aggressive perennial, that spreads primarily by its creeping root system. Despite its name, the plant was introduced from Europe, and is the only thistle, native or introduced, with separate male & female plants. Also called "Creeping Thistle," the roots spread both horizontally (up to 4.5 metres) and vertically (up to 6 metres) underground. It has been estimated that individual plants live about 2 years, but are continually replaced by new shoots from adventitious buds on its extensive root system. This can result in infestations composed entirely of genetically identical plants of one sex. Dense riparian infestations can impact wildlife by reducing food, and access & nesting cover for waterfowl.

Habitat:

Canada thistle thrives in a wide range of soil types but is not tolerant of waterlogged soil or complete shade. It does best in disturbed areas and overgrazed pasture/range. The extensive root system allows the plant to

survive periods of drought and access water & nutrient reserves far below the roots of native plants.

Identification:

Stems: Stems are grooved, upright, hollow and woody, branching near the top, and grow .5 m to 1.5 m tall.

Leaves: Leaves are lance-shaped, dark green, shiny on the surface and occur alternately, slightly clasping the stem. Lower leaves are largest and decrease in size upward along the stems. Leaf edges can vary from smooth with no spines to irregularly lobed with sharp spines.

Flowers: Flowers form at the ends of stems in clusters of one to several. The flower head is urn-shaped and the bracts are spineless. The colour of the flowers may vary from plant to plant, being purple, pink or white.

Seed: Seeds are borne in an achene 2 to 4 mm long which is tufted to aid in wind dispersal. Most seeds germinate within a year, but buried seed can stay dormant for up to 20 years.

Prevention:

The best preventive measure in non-crop land is to maintain healthy plant cover and to reseed disturbed areas with a desirable species as soon as possible. Canada thistle seedlings are very shade intolerant and will not establish under low light conditions. Avoid overgrazing to prevent thistle establishment in pastures/rangeland.

Control:

Most of the biomass of Canada thistle plants is below ground; therefore killing the roots is the only effective control method. An integrated management plan that uses a variety control options is the most effective long term strategy for reducing infestations.

Grazing: Sheep and goats will readily graze thistle, but not so much in the spiny stage. Occasionally livestock will randomly graze thistle, even when other forage is available, however removal of the stems by grazing only stimulates re-sprouting by the plant. Invasive plants should never be considered as forage.

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Canada Thistle

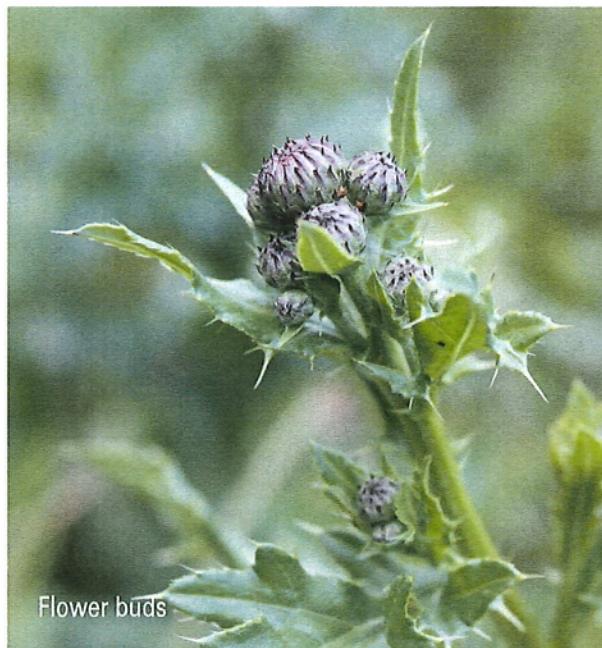
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Cultivation: Cultivation only produces small root pieces that rapidly develop into new plants, and does not reach the deeper roots.

Mechanical: Repeated mowing through the growing season gradually depletes the food energy stored in the root system. Repeated hand pulling in loose soils can also effectively stress the root system. To succeed, several years of effort must be committed.

Chemical: 2,4-D, Aminopyralid, Chlorsulfuron, Clopyralid, Dicamba, Glyphosate Hexazinone, Metsulfuron-methyl, MCPA and Picloram are some of the herbicides registered for use on Canada thistle. Always check product labels to ensure the herbicide is registered for use on the target plant in Canada by the Pest Management Regulatory Agency. Always read and follow label directions. Consult your local Agricultural Fieldman or Certified Pesticide Dispenser for more information.

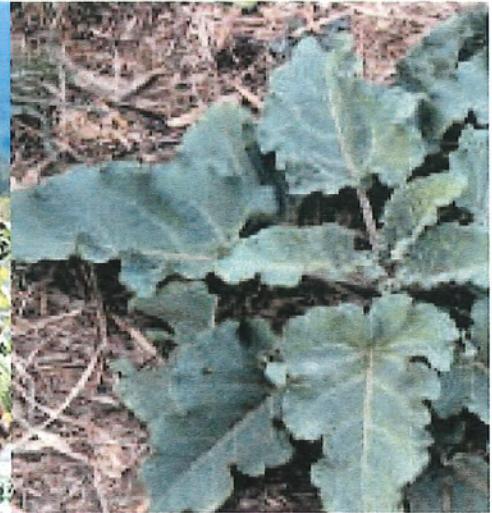
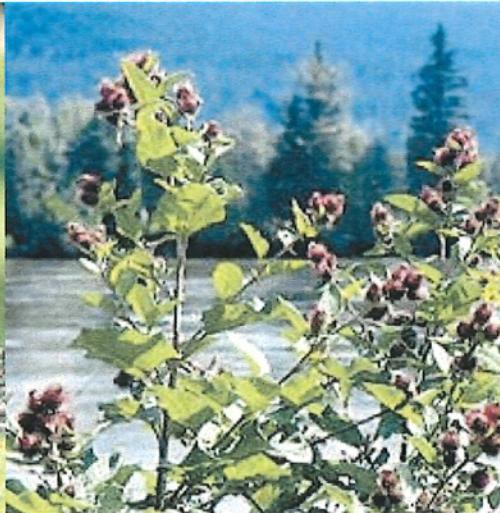
Biological: Several weevils and one fly have been imported to target Canada and other thistle species, but a few are no longer recommended due to impacts on native thistle species.



Common Burdock

Arctium minus (Aka Lesser burdock)

Provincial Designation:
Noxious



Overview:

An introduced biennial that forms a rosette of leaves the first year, and large, stout flowering bolt with many branches the second year. It prefers areas with moist fertile soils – riparian areas – and recent soil disturbance. Its prickly seed heads are designed for dispersal, readily attaching to whatever animal may brush past (Burdock was the inspiration for the invention of Velcro by George de Mestral in the early 1940's). Common Burdock produces burrs which can entangle in the manes and tails of horses and the wool of sheep and can damage and de-value the wool of sheep. Several instances have been documented where birds and bats have become entangled in the burrs and died.

Habitat:

Common burdock is found in places where the soil is not disturbed; therefore, it is not commonly found in cultivated areas. This is due to the fact that it is a biennial, so it needs areas that are not severely disturbed on an annual basis. Such areas include: farmlands,

pastures, waste places, open or disturbed woods, road sides, fence rows, barnyards, abandoned fields, and stream banks. It is found both on moist fertile soils, many with high soil nitrogen content, and on sterile clay soils. Not many other plants will be found growing around large burdock patches – most likely due to the large leaves that reduce light at ground level.

Identification:

Stems: Are erect, coarse, branched and thick, have a reddish tinge and may be grooved or angular. Mature plants grow 1 to 3 m tall.

Leaves: Rosette leaves are large, hairy, and heart-shaped and readily shade out smaller plants. Stem leaves alternate and are broadest at the stalk. Leaf edges are wavy or toothed. Leaves are woolly on their undersides, and dark green above.

Flowers: Are purple and borne in short stalked clusters along the stems. Spiny, hooked bracts surround the florets.

Seeds: Seed production starts in July and

continues into the fall. Seeds are shed continuously throughout the fall, winter and following spring. A mature plant can produce from 6,000 to 16,000 seeds.

Prevention:

Avoid soil disturbance, re-seed bare soil where possible, encourage desirable, competing vegetation, and don't let existing infestations produce seed. Preventing the production of the burred seed is a key way to prevent spread. Clean burrs off clothing and animals.

Control:

Grazing: Livestock find burdock palatable, however infestations in riparian areas will suffer damage due to trampling.

Cultivation: Tillage will kill plants in the rosette stage – burdock is intolerant of cultivation. Mowing or cutting can eliminate seed production and should be done after the plant has bolted, but before flowering.

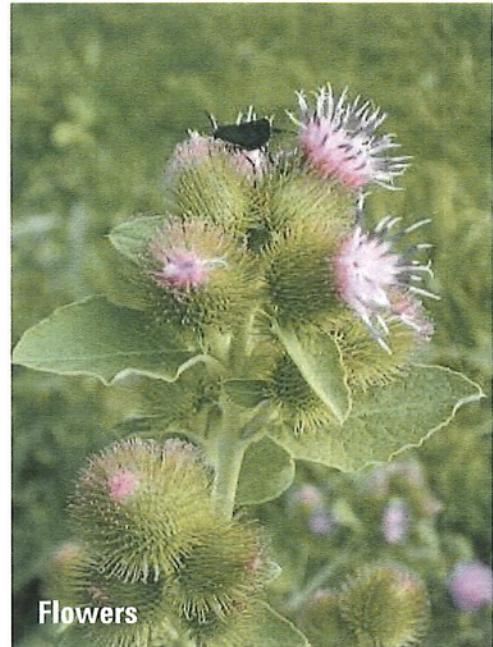
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Common Burdock

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Chemical: 2,4-D, Aminopyralid in product combination with 2,4-D, Dicamba in tank mix with 2,4-D or MCPA, Dichlorprop, Hexazinone, Imazapyr, Linuron, MCPA, Picloram in product combination with 2,4-D, and Triclopyr are registered for use on common burdock. Always check product labels to ensure the herbicide is registered for use on the target plant in Canada by the Pest Management Regulatory Agency. Always read and follow label directions. Consult your local Agricultural Fieldman or Certified Pesticide Dispenser for more information.

Biological: Currently, there are no official forms of biological control for Common Burdock. However, there has been repeated interest from various provinces in researching biological control options. There are 13 insect species which attack Common Burdock. Only one of these insects, the Burdock moth (*Metzneria lapella*), has been reported in North America. This insect greatly reduces the number of viable seeds in the plant.





Common Tansy

Tanacetum vulgare

 **Provincial Designation:**
Noxious



Pennington County website (www.co.pennington.sd.us).



Overview:

Common tansy is a perennial forb that reproduces by both seed and short rhizomes (underground horizontal roots). Introduced from Europe in the 1600's, its pungently aromatic foliage has been used medicinally, as an insect repellant, and for embalming.

Common tansy forms dense stands and the plants contain alkaloids that are toxic to both humans and livestock if consumed in large quantities. Cases of livestock poisoning are rare, though, because tansy is unpalatable to grazing animals.

Habitat:

It grows best in full sun and fertile, well-drained soil.

Identification:

Stems: Stems are branched, erect, often purplish-red, and dotted with glands. There are many stems per plant and grow up to 1.5 m tall.

Leaves: Leaves alternate on the stem and

are deeply divided into numerous narrow, individual leaflets with toothed edges.

Flowers: Flowers are yellow, numerous, and button-like, occurring in dense, flat-topped clusters at the tops of the stems.

Seeds: Seeds are yellowish brown achenes with short, five-toothed crowns.

Prevention:

Because of its long medicinal and horticultural use, Common tansy is still available in plant nurseries and from herbal remedy suppliers. Gardeners should not purchase or grow Common tansy.

Control:

Grazing: Common tansy is unpalatable to cattle and horses, but sheep and goats are reported to graze on it.

Cultivation: Since this plant is rhizomatous, flowering stems can re-grow from severed roots, therefore cultivation is not a control option.

Mechanical: Regular mowing can reduce

seed production but must be repeated to eliminate regrowth from rootstock. The most effective control method combines mowing or hand cutting with chemical control and encouraging competition from native vegetation. Repeated stem removal depletes the food energy stored in roots.

Chemical: Aminopyralid (alone in a product mix with 2,4-D), Chlorsulfuron (alone or in a product mix with Metsulfuron-methyl), Met-sulfuron-methyl (alone or in a product mix with Aminopyralid) and Tribenuron-methyl are registered for use on Common tansy. Always check product labels to ensure the herbicide is registered for use on the target plant in Canada by the Pest Management Regulatory Agency. Always read and follow label directions. Consult your local Agricultural Fieldman or Certified Pesticide Dispenser for more information.

Biological: An agent search by CABI Switzerland was initiated in 2006. Since 2007, the Common Tansy Consortium (numerous American and Canadian organizations including the Alberta Invasive Species Council) has been funding research. The chemical

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Common Tansy

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variability of common tansy populations is being investigated with respect to host plant acceptance by bio-control agent candidates. A literature review and field surveys have resulted in focus on five potential agents: the flower-feeding moth *Isophrictis striatella*; the stem-mining weevil *Microplontus millefolii*; the root-feeding beetle *Longitarsus noricus*; the leaf-feeding beetle *Cassida stigmatica*; and the stem-mining longhorn beetle *Phytoecia nigricornis*¹.

REFERENCES

¹ <http://www.for.gov.bc.ca/hra/plants/biocontrol/screenagents.htm#Commontansy>



Creeping Bellflower

Campanula rapunculoides

 **Provincial Designation:**
Noxious



Overview:

This perennial introduced from Europe as an ornamental, reproduces both by seed and creeping rhizomes. Roots can travel under fences, through lawns and even under sidewalks and concrete. It can survive periods of drought and tolerates a range of light conditions. Its creeping root system and resistance to some herbicides makes Creeping bellflower extremely difficult to eradicate.

Flowers are pollinated by insects, but in the absence of pollinators flowers can become self-fertile still produce seed.

Native harebells can be confused with creeping bellflower as the flowers are quite similar, but the native plants can be distinguished by either much shorter stems, smaller flowers and leaf size & shape.

Habitat:

Prefers light sandy to medium loamy, well-drained soils that are pH neutral. It can grow in full sun, part-shade or shade.

Identification:

Stems: The erect stems are often purplish, can be hairy or smooth, and grow to 1 metre or more.

Leaves: Leaves are alternate, 3-7 cm long. Lower leaves are long-stalked and heart-shaped with coarsely-toothed margins. Upper leaves are sessile and lance-shaped with some hairs on the lower surface.

Flowers: Nodding light purple flowers are borne in the axils of the upper leaves and occur mainly along one side of the stem. Flowers are composed of 5 united sepals, 5 united petals.

Seeds: The fruit is a round capsule, containing numerous small, elliptical, light brown seeds with small wings. Seeds may be spread by wind because of their light weight and wings. Each plant can produce 3,000 or more seeds annually.

Prevention:

Wildflower seed mixes may contain Creeping bellflower. Do not purchase wildflower

mixes that do not list the contents. This plant may also be available at some nurseries or hitch a ride with other perennials.

Control:

Grazing: As this plant is likely unpalatable, grazing is not a control option. Invasive plants should never be considered as forage.

Cultivation: Not a control option as root fragments could result in new plants.

Mechanical: Hand-pulling or cutting and bagging flower spikes pre-bloom can be an option for preventing seed production. However, the plant will re-sprout from its creeping root system. Digging out the as much of the roots system as possible can be successful, but will require several years' effort.

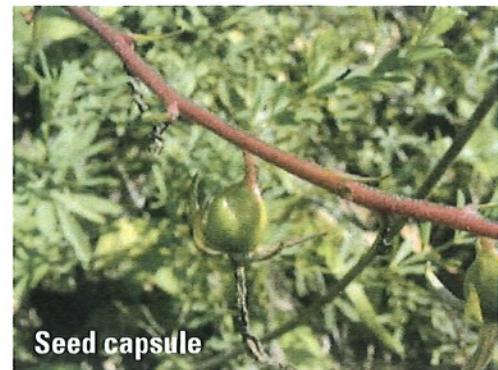
Chemical: Currently no selective herbicides are registered for use on creeping bellflower. Always check product labels to ensure the herbicide is registered for use on the target plant in Canada by the Pest Management Regulatory Agency. Always read and follow label directions. Consult your local Agricultural Fieldman or Certified Pest-
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Creeping Bellflower

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cide Dispenser for more information.

Biological: None researched to date.



Himalayan Balsam

Impatiens glandulifera (Aka Poor Man's Orchid, Policeman's Helmet, Touch-Me-Not, Indian balsam, Ornamental jewelweed)



Sarah Schumacher, Wheatland County



Nicole Kimmel, Government of Alberta

Overview:

Himalayan balsam is a beautiful but highly invasive annual species that quickly overtakes riverbanks, shorelines, and areas with wet soil. Native to the western Himalayas, today it is widely known as an invasive alien in temperate areas of Europe, Asia, North America and New Zealand.³ Several lakes and rivers in Central Alberta have significant infestations of Himalayan balsam, with sites also found in residential yards and alleys.¹

Himalayan balsam's rapid growth enables it to produce dense, even-aged stands which shade-out native riparian vegetation, disrupting the food webs of aquatic ecosystems. It then exhibits an impressive growth rate for an annual with some plants growing to 3m tall. Himalayan balsam has a shallow, fibrous root system but adventitious roots from the lower stems add support. However, in winter, erosion can occur because of Himalayan balsam's shallow roots having replaced the deep-rooted perennial native vegetation. Plants flower from July until frost. Flowers are self-compatible but the anthers release their pollen before the stigma is receptive and therefore require pollinators.⁷ Himalayan balsam attracts pollinators away from native species with its high nectar content and extended flowering.⁶ It is a late season nectar source for butterflies, bees and bumble bees.

Mature seed capsules explode when disturbed and eject the seeds over several meters, hence of the alternative common name: Touch-Me-Not. The average plants produce on average 700-800 seeds which scatter several meters from the parent plant. Heavy rains or flowing water facilitate spread by washing seeds to new locations and can germinate under water and when fully soaked – the seeds only remain viable for 2 years, which allows eradication of Himalayan balsam infestations after only a few years of sustained control efforts, as long as flowering and seed production can be prevented.

Habitat:

Requires moist soils and some soil disturbance to establish (uprooted trees, flooding). It thrives best in nutrient rich soils of disturbed riparian habitats and wet woodlands. It is tolerant of partial shade and soil pH values of 3.5 to 7.7.⁸ It is frost sensitive and intolerant of drought. In its native range it grows at elevations 1800-4000m³ – its limiting factor at high elevations is the short growing season.

Identification:

Stems: Are smooth, hairless, often 4-sided, usually hollow, tinged red-purple and are easily broken. Stems grow 1 to 3m tall and there may be some branching.

Leaves: Are lance shaped or elliptic with pointed tips and rounded bases, and 6-15cm long. The leaves are stalked and have sharply serrated edges.⁵ They occur opposite or in whorls of 3. Leaf size decreases with height on the stem.

Flowers: Are large – 2.5 to 4cm long – in shades of pink through purple, occasionally white. Flowers occur 5-10 together in racemes on long stems borne in the upper leaf axils.⁵ Flowers have 5 petals and are bilaterally symmetrical. The upper petal forms a hood over the reproductive structures (resembling a British policeman's helmet) and the lower petals form a platform for landing insects.⁷ Seed capsules are 1.5-3.5cm long and up to 1.5cm wide and contain up to 16 seeds which are 4-7mm long and 2-4mm wide. Seeds require cold stratification before germination.

Lookalikes: Two closely related native species are present in Alberta: Spotted Jewelweed, *Impatiens capensis*, and Touch Me Not Balsam, *Impatiens noli-tangere*. These species have yellow-orange flowers, often with dark orange-red spots. Their leaves are visually similar but have fewer and less sharp teeth.

Prevention:

Initial spread is mainly from ornamental plantings, Be Plantwise – do not purchase, grow, or exchange Himalayan balsam. *Re-continued next page*

Alberta Regulation:
 Weed Control Act &
 Fisheries (Alberta) Act

Himalayan Balsam

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establishment of native perennial species is key to prevent Himalayan balsam from returning, and control efforts should focus on preventing flowering/seed production. Seed can be spread by movement of riparian soil and in the sediment from the bottoms of water courses of infested areas. Remedy soil disturbance in suitable habitats. Any control work on infested stands must be done before flowering.

Control:

Manual: Repeated hand-pulling due to the shallow root system is the most effective and widely used approach. Proper disposal of Himalayan balsam through bagged plant debris should be incinerated or sent to the landfill.

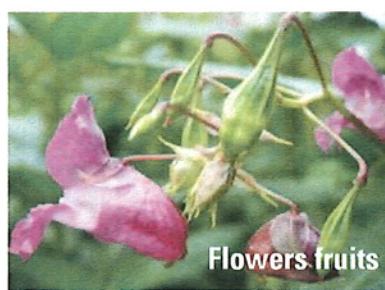
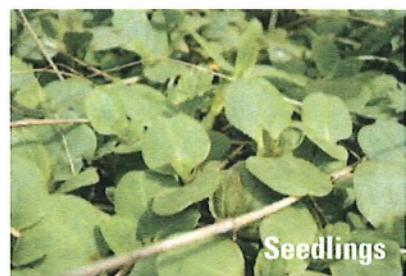
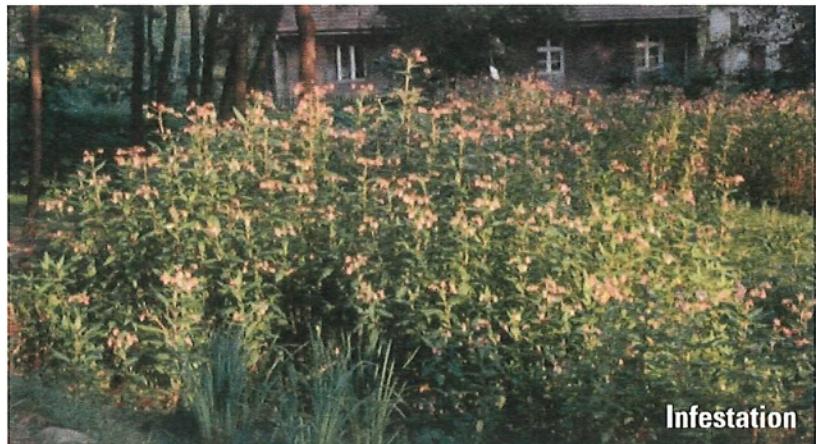
Grazing: Sheep and cattle have been known to graze the plant in Britain without ill effects. Invasive plants should never be considered as forage.

Cultivation: Likely very effective but cultivation is not practical in riparian habitats.

Mechanical: Mowing can be very effective but may need to be repeated as cut plants can grow new flowering branches and may be impractical in riparian areas. Hedge trimming or brush cutting may be an effective approach to delaying flowering/seed production.

Chemical: Currently no selective herbicides are registered for use on Himalayan balsam. Glyphosate is effective for control but is a non-selective herbicide and will kill all plants it contacts. The use of pesticides in or near aquatic environments must follow strict rules and requires Alberta-specific applicator certification and permits. Always check product labels to ensure the herbicide is registered for use on the target plant in Canada by the Pest Management Regulatory Agency. Always read and follow label directions. Consult your local Agricultural Fieldman or Certified Pesticide Dispenser for more information.

Biological: CABI began biocontrol research in 2006. In 2014, the European Union approved the release of a rust fungus specific to Himalayan balsam, which has since been deployed extensively in the UK.



REFERENCES

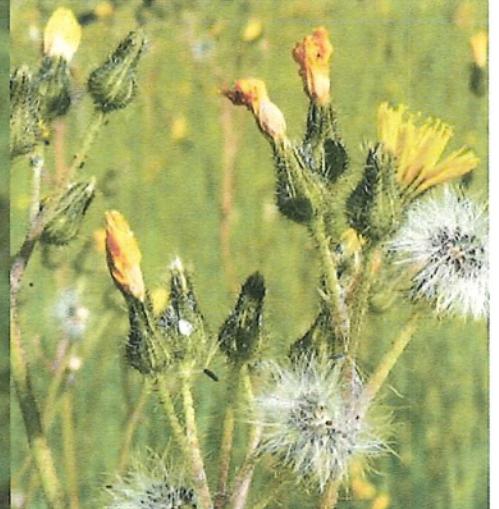
- 1 McClay, A. 2008. Risk assessment fact sheet for Himalayan balsam, *Impatiens glandulifera*.
- 2 Hejda, M. 2006. *Impatiens glandulifera*. Delivering Alien Invasive Species Inventories for Europe.
- 3 Helmsaari, H. 2006. NOBANIS – Invasive Alien Species Fact Sheet – *Impatiens glandulifera*. Online database of the Northern European and Baltic Network on Invasive Alien Species – www.nobanis.org
- 4 Down Garden Services, for County Down, Northern Ireland. <http://www.dgsgardening.blinternet.co.uk/himalbals.htm>
- 5 Ecological Flora of the British Isles. <http://www.ecoflora.co.uk>
- 6 The Biological Control of Himalayan Balsam. www.cabi.org
- 7 Nienhuis, C. and Stout, J. 2009. Effectiveness of native Bumblebees as Pollinators of the Alien Invasive Plant *Impatiens glandulifera*. *Journal of Pollination ecology*, 1(1), 2009, pp 1-11 (ISSN 1920-7603) 8 Beerling, D.J., and J.M. Perrins. 1993. Biological Flora of the British Isles. *Impatiens glandulifera* Royle (*Impatiens roylei* Walp.), *Journal of Ecology* 81: 367-382.

Meadow Hawkweed

Hieracium caespitosum



Kalo Jonker



commaster.eu

Overview:

Meadow hawkweed is a member of the Aster Family native to Europe. It is a fibrous rooted, perennial herb with a milky latex in the stems and leaves. Hawkweeds reproduce by seeds and vegetatively by numerous horizontal stolons, and rhizomes underground.¹ Seeds are produced by apomixis - asexually - as non-native hawkweeds are polyploids ($n=9$), as opposed to the native diploid hawkweeds.¹ Occasional sexual reproduction occurs.¹

Hawkweeds develop a low rosette of basal leaves before producing a flowering stem. Dandelion-like flowers are borne at the ends of stems.

Non-native hawkweeds exhibit many characteristics of an invasive plant: high seed production and germination rates, asexual seed production, wind-dispersed seed, vegetative reproduction via rhizomes, stolons, and root fragments, and rapid growth.¹ A few invasive hawkweed species are popular ornamentals. All of these characteristics facilitate rapid colonization and monopolizing of resources. An undetected patch of hawk-

weed has great potential to become an uneradicable infestation.

Habitat:

Hawkweeds prefer well drained, coarse textured soils, moderately low in organic matter, in mesic habitats.¹ It can successfully grow under coniferous forest canopy.

Identification:

Stems: Are erect, solitary, and bear simple, glandular and stellate hairs.² Plants grow 20-70 cm.¹ Stolons are sometimes short and inconspicuous.¹

Leaves: Basal leaves are oblong/lance-shaped to spoon-shaped, and 5-25 cm long 1-3 cm wide. Basal leaves are persistent and have petioles.² The upper leaf surfaces bear long simple hairs and few to none stellate hairs. The lower surfaces bear moderately dense stellate and long simple hairs.¹ Leaf margins may be entire or minutely toothed.²

Flowers: Yellow ray flowers are borne in compact, flat-topped clusters of 20-50.¹ In-

volucral bracts are lance-shaped, 5-9 mm tall, not graduated, and bear many simple and glandular hairs, and a few stellate hairs.² Achenes are 1.5-2 mm long, with a dirty-white pappus.²

Prevention:

Learning to recognize hawkweeds from the many yellow-flowered members of the Aster Family is key to prevention. Hairs are an important characteristic of non-native hawkweeds and also in distinguishing between species. Stolons facilitate rapid colonization of a patch of ground. Long term management of hawkweeds requires maintaining healthy forbs and grasses - fertilization of desirable vegetation can result in out-competition of hawkweeds. Re-seed disturbance in areas susceptible to hawkweed invasion.

Control:

Grazing: Unknown. Invasive plants should never be considered as forage.

Mechanical: Mowing before flowering will prevent seed production of taller plants

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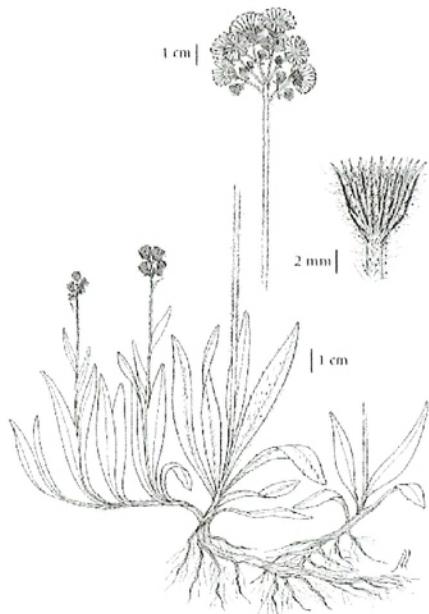
Meadow Hawkweed

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but will not inhibit reproduction via stolons and rhizomes. Hand digging of small infestations where all stolons and root can be removed may be effective. Root fragments can generate new plants, therefore any mechanical tilling/cultivation would be ineffective.

Chemical: Hexazinone, 2,4-D, and glyphosate are registered for use on *Hieracium* spp./hawkweeds. Always check product labels to ensure the herbicide is registered for use on the target plant in Canada by the Pest Management Regulatory Agency. Consult your local Agricultural Fieldman or Certified Pesticide Dispenser for more information.

Biological: None researched to date.



The Illustrated Flora of British Columbia

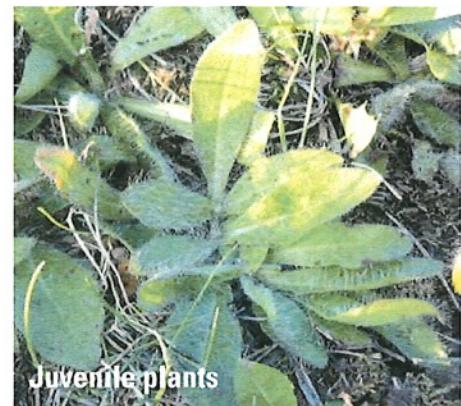
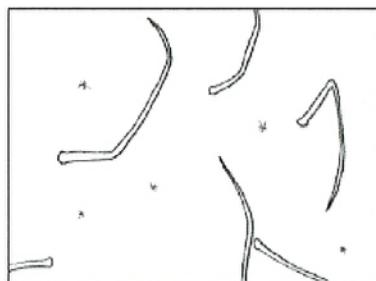


Alberta Sustainable Resource Development



Leaves

Alberta Sustainable Resource Development



Juvenile plants

helen Anderson

REFERENCES

- 1 Wilson, Linda. Key to Identification of Invasive and Native Hawkweeds in the Pacific Northwest. British Columbia Ministry of Forests and Range, Forest Practices Branch, Invasive Alien Plant Program.
- 2 *Hieracium caespitosum*. Electronic Atlas of the Flora of British Columbia. <http://ibis.geog.ubc.ca/biodiversity/ellora/> Accessed October 26, 2014.

Orange Hawkweed

Hieracium aurantiacum


Alberta Regulation:
 Prohibited Noxious


Overview:

Orange hawkweed is a member of the Aster Family native to Europe. It is a fibrous rooted, perennial herb with a milky latex in the stems and leaves. Hawkweeds reproduce by seeds and vegetatively by numerous horizontal stolons, and rhizomes underground.² Seeds are produced by apomixis - asexually - as non-native hawkweeds are polyploids ($n=9$), as opposed to the native diploid hawkweeds.¹ Occasional sexual reproduction occurs.¹

Hawkweeds develop a low rosette of basal leaves before producing a flowering stem. Dandelion-like flowers are borne at the ends of stems. Orange hawkweed is unique among both native and introduced hawkweeds in that flowers are a fiery orange colour. All other hawkweed are yellow flowered and there is one white flowered species.

Non-native hawkweeds exhibit many characteristics of an invasive plant: high seed production and germination rates, asexual seed production, wind-dispersed seed, vegetative reproduction via rhizomes, stolons, and root fragments, and rapid growth.¹ A

few invasive hawkweed species are popular ornamentals. All of these characteristics facilitate rapid colonization and monopolizing of resources. An undetected patch of hawkweed has great potential to become an uneradicable infestation.

Habitat:

Hawkweeds prefer well drained, coarse textured soils, moderately low in organic matter, in mesic habitats.¹ It can successfully grow under coniferous forest canopy.

Identification:

Stems: Are erect, usually solitary, and leafless or with leaves or with just 1 or 2 greatly reduced leaves.² Stems bear numerous stellate, glandular, and simple hairs. Plants grow 10-60 cm.¹ Stolons are present and hairy.²

Leaves: Basal leaves are oblong/lance-shaped to elliptic, and narrow to a petiole, and 4-20 cm long 1-3.5 cm wide. The upper leaf surfaces bear numerous simple hairs and the lower surfaces bear both simple and

stellate hairs. Leaf margins may be entire or slightly toothed.²

Flowers: Red-orange ray flowers are borne in open, rounded clusters of 20-50.¹ Involucral bracts are lance-shaped, 5-8 mm tall², with numerous stellate, blackish glandular, and simple hairs.¹ Achenes are narrowed at the base, 1.5-2 mm long, with a brownish pappus.²

Prevention:

Learning to recognize hawkweeds from the many yellow-flowered members of the Aster Family is key to prevention. Hairs are an important characteristic of non-native hawkweeds and also in distinguishing between species. Stolons facilitate rapid colonization of a patch of ground. Long term management of hawkweeds requires maintaining healthy forbs and grasses - fertilization of desirable vegetation can result in out-competition of hawkweeds. Re-seed disturbance in areas susceptible to hawkweed invasion.

Control:

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Orange Hawkweed

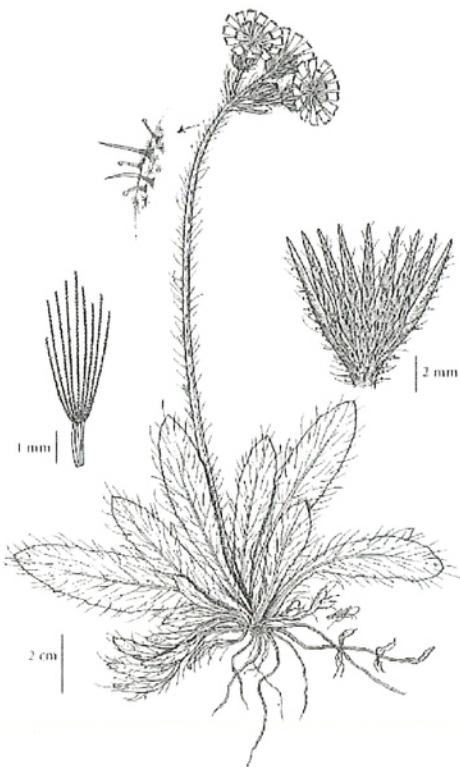
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Grazing: Unknown. Invasive plants should never be considered as forage.

Mechanical: Mowing before flowering will prevent seed production of taller plants but will not inhibit reproduction via stolons and rhizomes. Hand digging of small infestations where all stolons and root can be removed may be effective. Root fragments can generate new plants, therefore any mechanical tilling/cultivation would be ineffective.

Chemical: Hexazinone, 2,4-D, and glyphosate are registered for use on *Hieracium* spp./hawkweeds. Always check product labels to ensure the herbicide is registered for use on the target plant in Canada by the Pesticide Management Regulatory Agency. Consult your local Agricultural Fieldman or Certified Pesticide Dispenser for more information.

Biological: The stolon-tip gall wasp *Aulacidea subterminalis* was first released in BC in 2011. Results are pending.³



Leaf & Stem



Leaves



Seeds

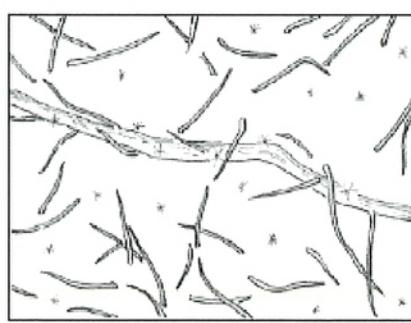
Alberta Sustainable Resource Development



Seed head



Seeds



C Roche



Stem

REFERENCES

- 1 Wilson, Linda. Key to Identification of Invasive and Native Hawkweeds in the Pacific Northwest. British Columbia Ministry of Forests and Range, Forest Practices Branch, Invasive Alien Plant Program.
- 2 *Hieracium aurantiacum*. Electronic Atlas of the Flora of British Columbia. <http://ibis.geog.ubc.ca/biodiversity/eflora/> Accessed October 26, 2014.
- 3 Target Invasive Plants and Biocontrol Agents Undergoing Screening. BC Ministry of Forests, Lands and Natural Resource Operations. <http://www.for.gov.bc.ca/hra/plants/biocontrol/screenagents.htm#Hawkweedcomplex>. Accessed June 10, 2014.

Oxeye Daisy

Leucanthemum vulgare, Chrysanthemum leucanthemum

Provincial Designation:
Noxious



Overview:

Native to southern Europe, Oxeye Daisy was first reported in Canada in 1862. Oxeye Daisy and the very similarly flowered Scentless Chamomile can be considered conspicuous, as there are no native white-flowered daisies in Alberta. Often perceived to be a 'pretty' wildflower, this non-native is an aggressive invader. Oxeye daisy is a perennial that spreads primarily by seed, but also by shallow, creeping roots (rhizomes). Individual flowers can produce over 500 seeds, but an individual plant can produce up to 26,000 seeds that are viable in the soil for 2-3 years or more.

The greatest impact of oxeye daisy is on forage production in pastures and meadows. Cattle avoid oxeye daisy and therefore any pasture infested with dense stands of oxeye daisy will decrease forage available for grazing. Dense stands of oxeye daisy can decrease plant diversity and increase the amount of bare soil in an area.

Habitat:

It grows in a wide variety of habitats, and flourishes in disturbed areas with nutrient poor soils. Tolerant of light frost and survives well under drought conditions.

Identification:

Stems: Grow up to 1m tall and are smooth, frequently grooved and sometimes branch near the top (although more frequently unbranched).

Leaves: Progressively decrease in size upward on the stem. Basal and lower leaves are lance-shaped with "toothed" margins and petioles that may be as long as the leaves. The upper leaves are alternately arranged, narrow and often clasp the stem with wavy margins.

Flowers: Are borne singly at the end of stems and can be up to 5 cm in diameter, with yellow centers, and 20 to 30 white petals radiating from the center. The petals are slightly notched at the tip.

Prevention:

The availability of closely related plants through the nursery and seed trade contradicts the perception of Oxeye Daisy as an invasive plant, and subsequent control. Shasta daisy is a cultivar (originated from) of Oxeye sold through nurseries and as seed in wildflower mixes. This fact makes public awareness critical to prevention and control. The two plants can cross breed, resulting in an invasive hybrid that is extremely difficult to distinguish

from either parent. Invasive ornamentals can be very difficult to contain and should be avoided. Consumers should carefully read the contents of so-called 'wildflower' seed mixes and avoid those containing invasive ornamentals.

Control:

Grazing: Oxeye Daisy is avoided by cattle and therefore capable of dominating pastures and rangeland. Horses, sheep and goats, however, will readily graze oxeye daisy and can be used in companion grazing situations to control oxeye daisy. Switching to higher stock densities and shorter grazing periods does encourage cattle to eat and trample more of the plant. Intensive grazing and trampling slightly reduces the number of seeds produced, and presumably injures younger rootstalks. Trampling also brings dormant seeds to the surface and removes the canopy cover so those seeds will germinate with mid-summer rain showers. In normal years, those seedlings will dry-out and die before becoming established, further reducing the number of seeds in the seed bank. It should be noted, however, that intensive grazing in wet summers may increase the number of successful seedlings. As many as 40% of the seeds consumed by cattle may remain

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Oxeye Daisy

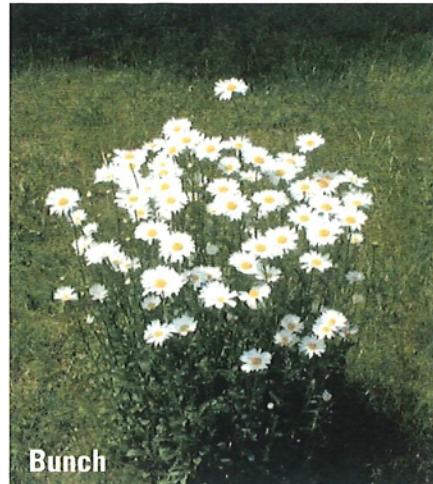
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viable after passing through the digestive tract, so care should be taken to avoid spreading the seeds when moving stock.

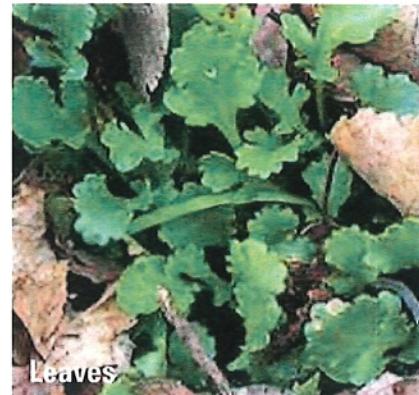
Mechanical: Repeated mowing prevents seed production, but also can stimulate re-sprouting of stems. Hand-pulling or digging before seed production is effective, but it is important to remove as much of the fibrous roots and rhizomes as possible. Ground disturbance while digging should be kept to a minimum. Hand removal will have to be continued for several years because seeds may remain viable in the soil for a long time. Because of its shallow root system, oxeye daisy is easily killed by intensive cultivation.

Chemical: Aminopyralid alone or in a product mix with Metsulfuron-methyl or 2,4-D is registered for use on oxeye daisy. Always check product labels to ensure the herbicide is registered for use on the target plant in Canada by the Pest Management Regulatory Agency. Always read and follow label directions. Consult your local Agricultural Fieldman or Certified Pesticide Dispenser for more information.

Biological: In 2008, a literature study was conducted to investigate European insect species that feed on oxeye daisy. Studies on ploidy analysis, to be conducted by CABI, and molecular analysis, to be conducted by USDA-ARS, are underway with field collected and commercially available Shasta daisy cultivars to determine the relationship with the target oxeye daisy and assist in host range understanding of potential biocontrol agents. An international consortium, including the Alberta Invasive Species Council, is funding research at CABI.



Bunch



Leaves



Stem

REFERENCES

¹ <https://www.agric.gov.ab.ca/app107/loadPest?action=display&id=41>



Perennial Sow-thistle

Sonchus arvensis

Provincial Designation:
Noxious



Overview:

Perennial sow-thistle has long been an aggressive agricultural weed, but can invade both natural and disturbed sites. It is a perennial plant that reproduces both by seed and creeping roots (rhizomes). Above ground portions of mature plants die in winter and new shoots sprout from root buds in spring. Many native lettuces closely resemble perennial sow-thistle, but they either do not have the extensive root system or their flowers are a different color. Annual sow thistle is very similar but reproduces only by seed and its flowers are smaller. Native to western Asia and Europe and was probably introduced as a seed contaminant.

Habitat:

Adapted to a wide range of conditions (including saline soils), perennial sow-thistle does best in moist, fertile soils with full sunlight. It can become a serious problem in riparian areas, and chemicals from decaying sow-thistle inhibit the seed germination of other species.

Identification:

Stems: Stems are upright, leafy at the base, branched in the tops and grow up to 2m tall. Cut stems exude a milky juice.

Leaves: Leaves are alternate and waxy, with weakly prickled edges and the shape is variable. Lower leaves are stalked, but clasp the stem higher up. Leaf color varies from light to dark green and they can be up to 20cm long.

Flowers: Flowers are small, yellow and dandelion-like. They are grouped in loose clusters at the ends of stems. The bracts of the flower heads are often covered with sticky hairs. One plant may have up to 20 flower heads, but with only few in bloom at a time. Flowers have both male & female organs but are generally self-incompatible, and are pollinated by insects.

Seeds: Seeds are tufted to aid in wind dispersal. Seeds can germinate in spring or fall – fall seedlings overwinter as rosettes. Seed production is highly variable and seeds are relatively short-lived.

Prevention:

New infestations must be controlled before the extensive root system develops.

Control:

Grazing: Perennial sow-thistle is not especially palatable to livestock. Invasive plants should never be considered as forage.

Cultivation: Seedlings are easily controlled by cultivation. Intense cultivation over long periods can exhaust root reserves of mature plants, but root pieces as small as 1 cm can produce new plants.

Mechanical: Mowing can prevent seed production, but the plant's long flowering period would necessitate many cuts. Seedlings can be easily hand-pulled.

Chemical: 2,4-D, Aminopyralid, Bromoxynil, Clopyralid, Chlorsulfuron, Dicamba, Dichlorprop in a product mix with 2,4-D, Florasulam, Glyphosate, Glufosinate ammonium, MCPA, MCPB and Quinclorac are registered for use on perennial sow-thistle. Always check product labels to ensure the

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Perennial Sow-thistle

(Continued)

herbicide is registered for use on the target plant in Canada by the Pest Management Regulatory Agency. Always read and follow label directions. Consult your local Agricultural Fieldman or Certified Pesticide Dispenser for more information.

Biological: The possibilities of using the natural enemies of *S. arvensis* for biological control have been studied (Schroeder, 1973). Introductions were made into Canada, starting in 1979. *Tephritis dilacerata* did not become established despite an extensive release program. *Cystiphora sonchi* is established but suffers heavy parasitism and is not effective. *Liriomyza sonchi* was established in Nova Scotia in 1987 and was under evaluation in 1990 (Julien, 1992)¹.



REFERENCES

1 <http://www.cabi.org/isc/?compid=5&dsid=50583&loadmodule=datasheet&page=481&site=144>

Scentless Chamomile

Tripleurospermum perforatum syn. *T. inodorum*



Overview:

Scentless Chamomile can behave as an annual, biennial, or sometimes a perennial, but reproduces by seed only. Plants are usually very bushy and have a fibrous root system. It continually blooms, forms seed, and seeds germinate throughout the growing season: fall seedlings overwinter and are usually first to flower in spring. Native to Europe, it was introduced as an ornamental and/or a contaminant in crop seed. This is not the chamomile used for tea as it is scent-less. A single, robust plant can occupy one full square metre and produce up to one million seeds. Scentless Chamomile and Oxeye daisy are often mistaken for each other as the flowers are nearly identical, but the leaves are very different. Both plants are weeds - there are no native white-flowered daisies in Alberta. It can also be confused with stinking mayweed or pineapple weed, but the foliage of these two plants has an odour.

Habitat:

Scentless chamomile is well adapted to

heavy clay soils and tolerates both periodic flooding and dry sites. It is a poor competitor but establishes quickly on disturbed sites. The seeds float on water and are widely dispersed this way.

Identification:

Stems: Stems are erect to semi-erect, highly branched, may be reddish in color, and can grow up to 1 m tall. There can be a few to many stems per plant.

Leaves: Leaves are alternate and very finely divided into short segments (carrot-like) and odorless when crushed. Basal leaves disappear by flowering time.

Flowers: Flowers are composed of a yellow central disk surrounded by white petals. The flowers are borne singly at the end of stems and have numerous bracts, arranged in overlapping rows.

Seeds: Seeds are tiny (about 2 mm), ribbed and dark brown. Seeds develop and become viable quickly.

Prevention:

Scentless Chamomile does not compete well with vigorous, healthy plant communities. Dispersal by weed seed contamination in crop/grass seed and livestock forage is common. It can be very difficult to eradicate in crop situations.

Control:

Grazing: Scentless chamomile is generally unpalatable to grazers and its seeds can survive digestion. Invasive plants should never be considered as forage.

Cultivation: Late fall and early spring tillage will control rosettes. Frequent, shallow tillage can help exhaust the seed bank by repeatedly destroying germinating seedlings. Equipment must be cleaned after.

Mechanical: Mowing can prevent seed production but plants will re-bloom below the cutting height. Hand-pulling can prevent spread into new areas and is effective on small infestations. Pulled plants should be burned or bagged and sent to the landfill. Burning infestations that have finished blooming can prevent seed spread.

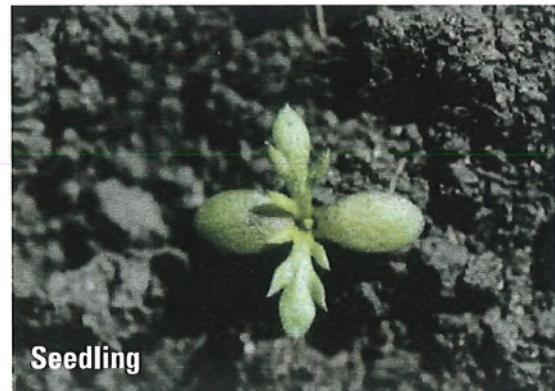
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Scentless Chamomile

(Continued)

Chemical: Aminopyralid (alone or in a product mix with 2,4-D or Metsulfuron-methyl), Chlorsulfuron, Clopyralid (alone or in a product mix with MCPA), Dichamba, Glufosinate ammonium, Hexazinone, Picloram, MCPA (in a product mix with Bromoxynil), Metsulfuron-methyl and Tribenuron-methyl (in a product mix with Thifensulfuron-methyl) are registered for use on scentless chamomile. Always check product labels to ensure the herbicide is registered for use on the target plant in Canada by the Pest Management Regulatory Agency. Always read and follow label directions. Consult your local Agricultural Fieldman or Certified Pesticide Dispenser for more information.

Biological: A seed-head feeding weevil, *Omphalapion hookeri*, and a gall midge, *Rhopalomyia tripleurospermi*, have been released in Alberta.



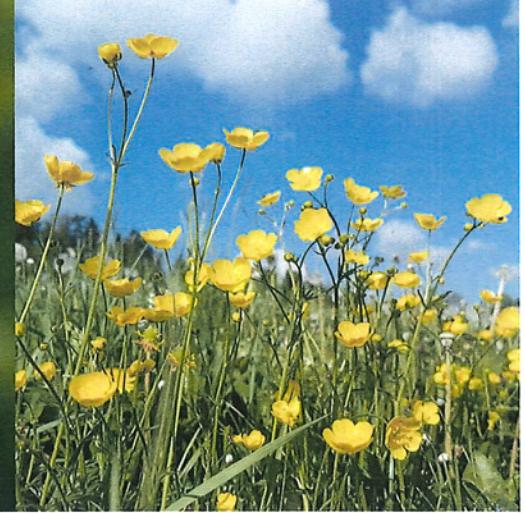
Seedling

Tall Buttercup

Ranunculus acris (Aka Tall Crowfoot, Meadow Buttercup, Blister Plant, Field Buttercup)



Provincial Designation:
Noxious



Overview:

Perennial that spreads only by seed. Tall buttercup contains a bitter, irritating oil called protoanemonin that is toxic to livestock (especially cattle) and other grazing animals. While generally avoided by grazers, poisonings can occur when fresh stems and leaves are consumed. Dried plants are no hazard as the toxic oil evaporates quickly. In mild cases, tall buttercup causes irritation or blistering of the skin, mouth and digestive tract. In more severe cases, it can cause paralysis, convulsions and death. Fresh tall buttercup, or hay in some cases, consumed by lactating animals can result in the production of less milk and may turn the milk a tinted red color and give it a bitter taste. Animals tend to avoid grazing tall buttercup if given a choice, but this may also allow it to dominate. Tall buttercup is an alternate host for Anemone Mosaic and Tomato Spotted Wilt virus.

Habitat:

Tall buttercup prefers moist to well-drained humus soils but can survive coarse, gravelly

soils given sufficient moisture. Infestations will decrease dramatically in very dry years, but rebound and expand in wet years.

Identification:

Stems: Are erect, hollow, and sometimes hairy, highly branched in the upper part of the plant, and grow to 90 cm tall.

Leaves: On the lower stem are 3-8 cm long, on long stalks and deeply divided into 3-5 lobes. The upper leaves are smaller, hairy and are divided into 3-4 narrow segments. Basal leaves have no stalks, 3 simple lobes and are 1-2 cm long. The amount and depth of the leaf lobes is highly variable.

Flowers: Are bright yellow, on long stalks, and have 5 petals, each 10-14 mm long. The upper surface of the petals is waxy, giving them a shiny, lacquered appearance.

Seeds: Each plant produces about 250 seeds which can remain viable for 2-4 years. The tiny, brown/black seeds are carried easily by water. Seed clusters are prickly and can attach to hair and clothing.

Prevention:

Use only certified weed-free grass and forage seed. Do not sell or purchase contaminated hay. Good pasture management will help prevent spread.

Control:

Grazing: Maintaining a vigorous grass stand in pasture and rangeland will provide good competition and help control tall buttercup and reduce the likelihood of an invasion. Grazing to control tall buttercup is not recommended as the plant is toxic. Tall buttercup thrives with fertilizer use in a poorly managed pasture.

Cultivation: Pastures severely infested with tall buttercup can be ploughed and re-seeded to an annual crop for several years to reduce infestations. Tall buttercup does not persist under cultivation.

Mechanical: Mowing prior to seed set can assist in reducing the infestation; however it needs to be timely in order to prevent the further spread of seed. Hand picking is suitable

continued next page

Tall Buttercup

(Continued)

for individual plants or small infestations. Be sure to wear gloves and long sleeves as the plant's juices can cause blistering and redness.

Chemical: Aminopyralid alone (or in a product mix with Metsulfuron-methyl or 2,4-D), MCPB and MCPA (alone or combined in a product mix), Mecoprop-p, and Tribenuron-methyl are registered for use on tall buttercup. Always check product labels to ensure the herbicide is registered for use on the target plant in Canada by the Pest Management Regulatory Agency. Always read and follow label directions. Always read and follow label directions. Consult your local Agricultural Fieldman or Certified Pesticide Dispenser for more information.

Biological: A literature survey completed in 2012 indicated that a couple of very closely related native *Ranunculus* species in BC and the US would make finding a host-specific agent difficult.



White Cockle

Lychnis alba syn. *Silene alba* *S. latifolia*

Alberta Regulation:
Weed Act



Overview:

White cockle was introduced from Eurasia and is often confused with bladder campion (not hairy, not sticky) or night-flowering catchfly (hairy, upper stems sticky). White cockle is not sticky on any part of the plant. It is a short-lived perennial (sometimes biennial) native to Europe. Plants are either male or female, so not all plants produce seed.

Habitat:

White cockle prefers full-sun and rich, well-drained soils. Hayfields are a frequent habitat of this invasive plant – compounding the problem as weed seed gets distributed in baled forage.

Identification:

Stems: Stems are hairy, grow 30 to 120cm tall, and can be erect or spread laterally. There can be several stems per plant – crowded plants branch in the upper stems. Stems are swollen at the nodes.

Leaves: Leaves are opposite, hairy, and

lance or slightly oval-shaped with pointed tips. Basal leaves and upper stem leaves are smaller.

Flowers: Flowers are numerous, fragrant and arranged in spreading clusters. The white (or pinkish) flowers have 5 notched petals and only open in the evening. The tubular calyx surrounds the flower's base. The calyx of the male flower has 10 veins, and the female's 20 veins are longer, and inflate with ripening.

Seeds: The calyx matures into a fruit with 10 teeth at the tip containing many tiny, grayish seeds.

Prevention:

White cockle seeds are similar in size to clover and so is often a contaminant of forage seed.

Control:

White cockle can be a serious economic problem as its seeds are difficult to separate from alfalfa, clover and some grass crop seeds – and this invader is an extremely

heavy seed producer. This plant emerges early spring, initially forms a taproot, and next spreading lateral roots.

Grazing: Not grazed. Invasive plants should never be considered as forage.

Cultivation: Stem and root pieces can sprout to form new plants; therefore cultivation will usually spread an infestation.

Mechanical: Frequent mowing will reduce seed production.

Chemical: Mecoprop (in a product mix with 2,4-D and Dicamba) and Tribenuron-methyl (alone or in a product mix with Metsulfuron-methyl and quinclorac) are registered for use on white cockle. Always check product labels to ensure the herbicide is registered for use on the target plant in Canada by the Pest Management Regulatory Agency. Always read and follow label directions. Consult your local Agricultural Fieldman or Certified Pesticide Dispenser for more information.

Biological: None researched to date.

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White Cockle

(Continued)



Flowers



Leaves



Seed Pod

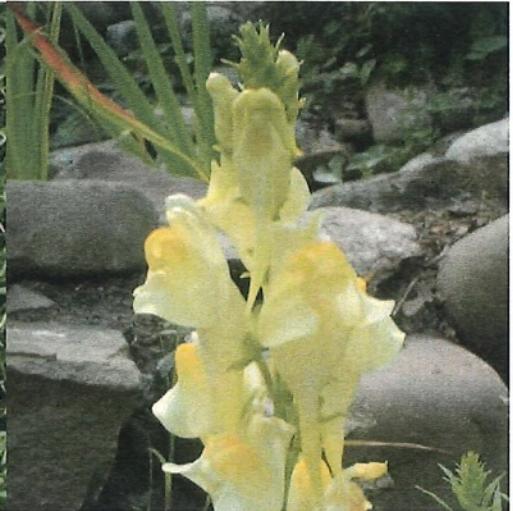


Seedling

Yellow Toadflax

Linaria vulgaris (Aka Common toadflax, Butter-and-Eggs, Spurred Snapdragon)

Provincial Designation:
Noxious



Overview:

Brought from Europe over 100 years ago as an ornamental plant, Common toadflax has escaped and has now become a serious problem to rangeland and mountain meadows all over North America. This perennial plant makes seed, but reproduction is primarily by sprouting from its extensive, creeping root system (rhizomes) – 2-3 week old seedlings can produce creeping roots. The ability of this plant to form large colonies allows it to crowd out other vegetation.

Common toadflax is easily confused with Leafy spurge before flowering, but toadflax stems do not contain the milky latex that spurge does.

Habitat:

Native to nearly all parts of Europe and Asia, toadflax prefers sandy-gravelly soils, but is adapted to a wide range of growing conditions.

Identification:

Stems: Stems are erect, hairless, generally un-branched and can be as short as 15cm or grow to 1 m tall. Mature plants may have 1 to 25 stems.

Leaves: Leaves are soft, lance-shaped, pale green, and very numerous. Leaves are mainly alternate but may appear opposite on the lower stem due to crowding. Leaves can be up to 10 cm long and are attached directly to the stem. The most distinctive difference between Yellow and Dalmatian toadflax is that Dalmatian toadflax has broad, heart-shaped leaves that clasp a woody stem; whereas, yellow toadflax has narrow, linear leaves with a narrow stem¹.

Flowers: Flowers are bright yellow, arranged alternately in dense spikes at the ends of stems and have a long spur extending from the base that is usually as long as the flower itself – in all, 2 to 3.5 cm long. The snapdragon-like flowers can have orange colouring on the throat. They flower at different times depending on site conditions. In high elevations they could flower as late as July. Flowers are identical to Dalmatian toadflax, but leaf shape differs between the

two plants.

Seeds: The seeds are winged, disk-shaped, and dark brown to black. Despite its prolific seed production (5000 seeds/stem) and long viability (up to 10 years), germination rates are often very low – less than 10%.

Prevention:

Spurred snapdragon, another common name for this plant, often appears in wildflower seed mixes. Do not purchase seed mixes unless all contents are listed.

Control:

Once present, it establishes dense patches that are extremely difficult to control, let alone eradicate. Multiple control methods and several years of commitment provide the best success.

Grazing: Pasture invasions flourish because the plant is not palatable to livestock.

Cultivation: Repeated cultivation can effectively destroy the root system. Equipment should be thoroughly cleaned after.

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Yellow Toadflax

(Continued)

Mechanical: Thorough hand-pulling can be effective in soft soils where the roots can be removed easily. Repetition is required to deplete the seed bank and all root pieces. Mowing can assist by starving the roots.

Chemical: Acetic acid, Amitrole, Dichlorprop, Diuron, Glyphosate, Hexazinone, Imazapyr, MCPA, Metsulfuron-methyl, Picloram and Tribenuron-methyl & Thifensulfuron-methyl (in a product mix) are registered for use on toadflax. Always check product labels to ensure the herbicide is registered for use on the target plant in Canada by the Pest Management Regulatory Agency. Always read and follow label directions. Consult your local Agricultural Fieldman or Certified Pesticide Dispenser for more information.

Biological: Several biological control agents have been imported to control Common toadflax. New Alberta research shows a stem mining weevil, *Mecinus janthinus*, successfully established and providing effective control.

REFERENCES

1 <http://www.ag.ndsu.edu/pubs/plantsci/weeds/w1239.pdf>