



PEACE RIVER REGIONAL DISTRICT

Profile of Invasive Plant Species Within the Peace River Regional District (Current as of March 2018)



The Profile of Invasive Plant Species within the Peace River Regional District has been created to assist individuals with the identification and management of invasive species found in our region. If you have any questions or would like further assistance with the identification and management of invasive plants, please contact the Peace River Regional District (PRRD) Invasive Plant Program at: 250-784-3200 or 1-800-670-7773.

diverse. vast. abundant.

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Regional Early Detection Rapid Response (REDRR)

Regional EDRR species are a significant threat and are new to the area under consideration. The achievable management objective is eradication. This list includes brand new incursions and high risk invasive plant species that are extremely limited in extent (i.e. have less than 10 very small sites) in the area under consideration. Some of these species may not be present within the PRRD but are found in adjacent areas and are at risk of being introduced.

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Education and Awareness

These plants can spread easily but requirements to contain are site specific. This list includes native plants that are weedy in nature and cause damage to environment, social and economic values and invasive plants under successful biological control.

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Baby's breath (*Gypsophila paniculata*)

Description:

Baby's breath is an herbaceous perennial plant that invades grazing land and out-competes native and agronomic perennial grasses. Plants flourish in well-drained sandy or gravelly soils of vacant lots and along fence lines, establishing unsightly infestations. Baby's breath mixed with hay reduces the protein value of the crop, making it a less valuable forage for livestock and wildlife. The delicate white/pink blooms and bushy stalks are used extensively in the floral industry for dried and fresh flower arrangements. Seeds often continue to develop in floral arrangements and a single plant can produce more than 10,000 seeds that can travel long distances on a tumbling weed stalk in the wind.



Photo Credit: J. Hallworth
Plant Name: Baby's breath
Plant Part: Branching Stems / Opposite
Leaves



Photo Credit: J. Hallworth
Plant Name: Baby's breath



Photo Credit: B. Stewart
Plant Name: Baby's breath.

Management:

Prevent invasions by restoring degraded areas like old fields or roadsides with a diversity of native plants. Be cautious if using wildflower mixes, as many contain baby's breath seeds. Control of baby's breath is most successful early in the spring when the plant's leaves and tap roots are small. Baby's breath can be dug up as long as the **caudex** is severed. Baby's breath can be successfully managed with the application of glyphosate or by several residual herbicides throughout the season before mature seeds develop.



Photo Credit: R. Mueller
Plant Name: Baby's breath

Bighead knapweed (*Centaurea macrocephala*)

Description:

Bighead knapweed is a long-lived perennial herb native to the Caucasus region of Eastern Europe. It requires extensive soil disturbances to establish but then is difficult to control. It competes with native vegetation for nutrients and light and requires loamy, well drained soils with neutral pH and full sun, as it is also drought tolerant. Bighead knapweed flowers from July to September. Mature seed heads open to disperse the seed. Although seeds are **plumed**, they are too heavy to be wind dispersed but can attach to animal hair or fur. Many infestations result from garden escapes. Do not grow as an ornamental. Bighead knapweed used in dried flower arrangements facilitates seed dispersal.



Photo Credit: R. Old
Plant Name: Bighead knapweed

Management:

Knapweeds are all very palatable to livestock and therefore intensive grazing is a control option to consider. Cultivation can be effective as long as it is deep enough to cut the roots off below the root **crown** and must be repeated for at least two seasons. Care must be taken not to transport root pieces that could start new infestations elsewhere. Repeated mowing will suppress seed production but plants will regrow. Repeated cultivation, where suitable, is an effective control method. Small patches can be hand pulled or dug out but the entire tap root must be removed to prevent re-sprouting. Currently, there is no herbicide registered for use or biocontrol agents that are effective on bighead knapweed. Although no herbicides are registered, several herbicide options are available and effective. Herbicides are best applied while plants are in the **rosette** stage, before any mature seeds have developed or manual removal of the root and all seed heads.



Photo Credit: D. Hayman
Plant Name: Bighead knapweed

Black henbane (*Hyoscyamus niger*)

Description:

Black henbane is a member of the nightshade family. It is an annual or biennial plant that reproduces by seed only. A single plant can produce half a million seeds in one season. Seeds are viable for about 4 years. It grows in a wide range of soils, but does require well drained soil. It does not tolerate shade. The entire plant is covered with greasy hairs and has a thick fleshy **taproot**. Stems are upright, thick, and almost woody. Plants can grow up to 1 m tall and may be branched or unbranched. Leaves are alternate and large. Leaf edges are shallowly lobed and veins are conspicuous. The leaves have a heavy, foul scent. Flowers are **hermaphroditic**. They are pale yellow with deep purple veins and throats, and are borne on spikes. The flower base forms a 2.5 cm urn shaped fruit, with a thickened lid that pops off at maturity to spill all the tiny, black-brown seeds. All parts of the plant are poisonous to humans and animals when ingested,



Photo Credit: invasive.org
Plant Name: Black henbane

Management:

Prevention works best for Black henbane. It is not a strong competitor. Livestock will avoid grazing the plant unless no other forage is available. Dried plant material will retain its toxic properties in forage. Mowing is effective, but difficult because it is thick. Hand pulling also effective, but ensure you wear gloves and protective clothing. Care should be taken with mature plants to avoid spreading seed. Currently no selective herbicides are registered for use on black henbane. No biological control has been researched to date.



Photo Credit: missouristate.edu
Plant Name: Black henbane
Plant Part: Long Sticky Hairs / Bell Shaped Flower



Photo Credit: invasive.org
Plant Name: Black henbane

Blueweed (*Echium vulgare*)

Description:

Blueweed has bright blue blossoms found on the upper side of short, rough stems. It grows 30 to 80 cm in height at maturity. Hairy stems are painful to the touch, and hairs often have swollen dark bases that form noticeable flecks. Leaves become progressively smaller as they approach the top of the plant. Blueweed reproduces up to 2800 seeds per plant. Seeds are generally dropped in the immediate vicinity of the parent plant, but can be distributed further by animals as the rough seeds stick to clothing, hair and feathers. Blueweed invades pastures and rangelands; thus, infestations are associated with some economic losses.



Photo Credit: A. Messina
Plant Name: Blueweed
Plant Part: Rosette



Photo Credit: umass.edu
Plant Name: Blueweed



Photo Credit: A. Tal
Plant Name: Blueweed

Management:

Management can combine cultural, mechanical, and chemical treatments. New infestations can often be managed with hand pulling. Prevent spread by practicing proper grazing management techniques of animals and seeding of disturbed areas to perennial grasses and forbs. The plant can be hand pulled but it has a tremendous **taproot** with an elongated **crow** so care must be taken to pull the entire root as well as **rosettes**. Several herbicides are available to control blueweed. All attempts possible should be made to treat Blueweed sites while in **rosette** form which is typically in the spring, although they can produce new germinates all season long.

Bohemian knotweed (*Fallopia x bohemica*)

Description:

Plants are usually 2 to 3 m tall (shorter in dry areas). Stems are stout, **cane-like**, hollow between the **nodes**, somewhat reddish-brown, and usually branched. The plants die back above ground at the end of the growing season; however, the dead reddish brown **canes** often persist throughout the winter. The stem **nodes** are swollen and surrounded by thin papery **sheaths**. Leaves can be either spade or heart-shaped. They are usually more heart-shaped lower down on the stems and more spade-shaped near the branch ends. This variability in leaf shape is one identifying character since the parent species generally have either heart-shaped or spade-shaped leaves. The leaves are also intermediate in texture between the parent species. They are thicker and rougher than giant knotweed but less so than Japanese knotweed. On flowering stems, leaf tips are characteristically long and gradually tapered. A key identifying feature are the short, broad-based hairs on the leaf undersides especially along the mid vein.



Photo Credit: vitalsignsme.org
Plant Name: Bohemian knotweed
Plant Part: Cane-like Stems



Photo Credit: bcinvasives.ca
Plant Name: Bohemian knotweed

Management:

Mowing or cutting plant shoots is ineffective alone; however, mowing followed by herbicide treatments will provide some control. Best treated early in spring before root systems start developing, and mature seeds are established. Methods must be repeated if infestations are large. Care must be taken not to produce new plants therefore all plant material should be removed, bagged for disposal or dried and burned if possible. The entire root system must be removed since re-sprouting can occur from **rhizomes**. There are currently no registered biological control agents for use on any of these *Polygonum* species. Grazing may be an effective strategy to prevent establishment however, should be carefully controlled to prevent damage in riparian areas.



Photo Credit: bcinvasives.ca
Plant Name: Bohemian knotweed

Brown knapweed (*Centaurea jacea*)

Description:

Brown knapweed is an annual with a perennial biotype that can reach 30 to 150 cm in height. **Basal** leaves are up to 15 cm long, tapering at both ends with the broadest part above the middle of the leaf. Stem leaves are lance-shaped, shallowly-lobed and stalk less. Flowers are rose-purple in colour, rarely white, up to 2.5 cm wide. This plant was introduced from Eurasia, common in the south western portion of BC. Heads are solitary at the ends of the upper branches. The **bracts** of brown knapweed are light to dark brown, with a papery, translucent **margin**.



Photo Credit: J. Lehmuskalli
Plant Name: Brown knapweed



Photo Credit: J. Lehmuskalli, Plant
Name: Brown knapweed
Plant Part: Lance-shaped Leaves



Photo Credit: J. Lehmuskallio
Plant Name: Brown knapweed

Management:

Germination happens all season because it is triggered by temperature. It has a short maturation period and produces viable seeds a few days after pollination. The first line of control should be preventing the spread of these plants to non-infested areas. Prevention measures include cleaning clothing and equipment after entering infested areas. Plants may be manually removed from the ground, ideally when the ground is wet, so long as care is taken to remove the entire plant, including the deep **taproot**. Mowing will reduce the number of flowers and seeds but will not eliminate the plants. Plants are best treated early in the season before mature seeds have developed. Digging out all, of the root mass and or the application of several different herbicides are both effective control methods. Early in the season allows for smaller roots to dig and an easier kill with herbicides as plants are actively growing and more susceptible. Knapweeds are all very palatable to livestock and therefore intensive grazing is a control option to consider.

Cheat grass / Downy brome (*Bromus tectorum*)

Description:

Readily invades tame pastures, native rangelands, forestry openings, and riparian areas. This annual or winter annual grass has a fine, feathery appearance overall, with slender light-green stems drooping at the tips where the seeds form. Mature grass grows up to 75 cm and turns first purple, and then brown, as it dries. Each **spikelet** has 5 to 8 **florets**, and forms 1 to 2 **tillers** or sometimes as many as 20. Twisting leaf blades **glabrous** to **hispid** with soft, short hairs on leaf **sheaths**. Plants are shade tolerant and can establish on a variety of soil types.



Photo Credit: activerain.com
Plant Name: Cheat grass



Photo Credit: Intermountain Herbarium
Plant Name: Cheat grass
Plant Part: Panicle



Photo Credit: Shelton
Plant Name: Cheat grass

Management:

Cheat grass reproduces entirely from seed, control strategies should focus on preventing seed production and depleting seed bank reserves. Repeated mowing every 2 to 3 weeks during spring and summer may be as effective as chemical application. Prescribed burning is effective when used in combination with other control methods such as chemical control or reseeding with perennial species. Grazing can be used for this invader but plants must be green and not in seed. When repeatedly done, disking or tillage operations may be effective if Cheat grass seed is buried at least 4 to 6 inches deep. Early applications of herbicides on younger new infestations, is also quite effective, followed by reseeding of desired crops. Since reseeding is often problematical, it may take several attempts to establish desired plants. Fall is the preferred season to apply herbicide on Cheat grass, and it usually offers the greatest chance for seeding success on rangeland and pastures.

Chicory (*Cichorium intybus*)

Description:

Clusters of 1 to 4 velvety blue, 2.5 to 5 cm dandelion type flower heads widely spaced along mostly naked branches. 5 to 6 small, loose outer **bracts** encase 6 to 8 inner **bracts** that tightly enclose the **receptacle**, all sparsely covered with **glandular** hairs on the outer surface. Typically 17 **rays**, each **ray** with a blue **stamen** with deep blue fused **anthers** and a **style** with a split tip. The tip of each **ray** has 5 small teeth. Chicory has rough, **basal**, lance shaped leaves 8 to 25 cm wide. Plants can be between 0.3 and 2.0 m in height. Chicory is edible and was a coffee substitute in depression days. It can be confused with showy aster, which has a yellow centre, while chicory flowers are completely blue. **See photos of showy aster (*Aster conspicuus*) below.**



Plant Name: Chicory



Plant Name: Chicory



Photo Credit: Wild About Flowers
Plant Name: Showy Aster



Photo Credit: Wild About Flowers
Plant Name: Showy Aster

Management:

Chicory causes dairy products to taste bitter, however other livestock can eat this plant. It is frequently found on roadsides and disturbed areas. Mowing and cutting before seed set over several years will exhaust nutrient reserves in the roots and control new plants. Small infestations can be easily removed with manual efforts. Several herbicides are available and effective. Infestations are best treated in the spring/early summer before mature seeds develop. Late season methods should include the removal of the flowers/seeds, and larger infestations treated with a residual herbicide.



Plant Name: Chicory

Creeping bell flower (*Campunaula rapunculoides*)

Description:

This plant was introduced from Europe to the prairies as an ornamental. It is on the noxious weed list in Alberta and is of concern across Canada. The erect stems are often purplish, can be hairy or smooth, and grow to 1 m or more. Leaves are alternate, 3 to 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. 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. The fruit is a round **capsule**, containing numerous small, elliptical, light brown seeds with small wings, allowing seeds to be spread by wind. Each plant can produce 3,000 or more seeds annually. Creeping bellflower is a perennial that spreads by seed, **propagules** and **rhizomes** and can grow through concrete.



Photo Credit: ISCBC
Plant Name: Creeping bell flower



Photo Credit: Invasiveplants.ab.ca
Plant Name: Creeping bell flower

Management:

Do not purchase wildflower mixes that do not list the contents as seed mixes may contain creeping bell flower. This plant may also be available at some nurseries or hitch a ride with other perennials. As this plant is likely unpalatable, grazing is not a control option. Tilling is not a good control option as root fragments could result in new plants. 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 as much of the roots system as possible can be successful, but will require several years of effort. Like most plants, chemical treatment is best applied in spring while populations are starting to establish and are more easily managed. If treated later in season ensure all root mass, and seeds/flower heads are gathered.

Cypress spurge (*Euphorbia cyparissias*)

Description:

Cypress spurge is a low growing perennial that overwinters as root and **crown** tissue. Cypress spurge reproduces by seed and lateral root buds. Leaves are linear, approximately 1.5 to 3 cm long and 1 to 2 mm wide. Upper stem leaves that occur near the **inflorescence** are yellow or yellowish-green in color. Leaves are stalk-less, alternate, narrow and linear to lance-shaped. Stems are 10 to 80 cm high, hairless, green to yellowish green in color and branch in the upper portions. The leaves and stems emit a milky, toxic sap when broken. Flowers are yellowish-green usually turning reddish green towards maturity and are clustered in bunches at the ends of stems.



Plant Name: *Cypress spurge*

Management:

Preventing the populations from spreading is important in management of this weed. Using a combination of control methods proves to be the most effective way to control populations. Using mechanical (not tillage) and herbicide control methods together proves to be important in eradicating established infestations. Hand pulling or digging is a viable option when managing new, small cypress spurge infestations. Be sure soil is moist and extract the entire root system. When handling plants wear rubber gloves and eye protection, to protect you from the irritating milky sap. There are several herbicide options available, but will require multiple applications to ensure entire root mass is killed. This species is best treated when populations are small, infestation is contained to patch's, and during the early part of the season. Fall time applications of herbicide are less effective as plant has a strong root system and may not absorb herbicides late in fall. Spring time applications manually or chemically are desired.



Plant Name: *Cypress spurge*



Plant Name: *Cypress spurge*

Field scabious / Blue button (*Knautia arvensis*)

Description:

Field scabious is a perennial plant that grows between 25 cm and 1 m. It prefers grassy places and dry soils, avoiding heavy soils, and flowers between July and September. There are 4 **stamens** in each flower, and 1 notched long **stigma**. The fruit is nut-like, cylindrical and hairy, 5 to 6 mm in size. It has a tap root. The stem has long stiff hairs angled downwards. There are no **stipules**. The leaves form a **basal rosette**, are paired on the stem, the lowest typically 30 cm long, spear shaped, whereas the upper are smaller.



Photo Credit: ISCBC
Plant Name: Field scabious
Plant Part: Rosette



Photo Credit: ISCBC
Plant Name: Field scabious



Photo Credit: ISCBC
Plant Name: Field scabious

Management:

Field scabious seeds can be transported by animal movement, however, this weed can be grazed. Disking before flowering is effective in crop land situations. Mowing is effective to prevent seed production but would likely need to be repeated in the season because of re-sprouting. The deep tap root is difficult to remove in anything but loose soils; therefore hand pulling usually results in the stem breaking off at ground level and then re-sprouting occurs. Any removal of seed is beneficial. Wear long sleeves and gloves as skin contact with the hairy plant causes considerable itching. There are numerous herbicide options for this species, but if plants are in bloom it is best to use a residual product to assist in future seed development. Plants treated in early spring before mature seeds develop may be treated with less invasive herbicide products. Smaller infestations may be treated throughout season manually long as the entire plant is removed.

Giant knotweed (*Polygonum sachalinense*)

Description:

Giant knotweed is the biggest of the three invasive knotweeds, with stems usually between 2 and 4.8 m, but reaching as much as 5.2 m tall in some areas. The stems are smooth, hollow and light green, resembling the **canes** of bamboo, and sparingly branched. The leaves are 15 to 41 cm long, with a deeply heart-shaped base and a blunt leaf tip. Diagnostic hairs on the leaf underside are long, thin and wavy (hairs are sparse and sometimes fall off late in the season, best seen with a hand lens June through mid-September). The flowers are small, creamy white to greenish white, and grow in short, branched clusters from leaf **axils** near the ends of the stems. Flower clusters are generally shorter than the **subtending** leaf.



Photo Credit: ISCBC
Plant Name: Giant knotweed



Photo Credit: ISCBC
Plant Name: Giant knotweed

Management:

Cutting the knotweed only removes the above ground portion and only serves to stimulate the below ground **rhizome**. In some cases, weekly mowing can eventually draw down enough of the plant's reserves to kill it. The best approach to control is through a combination of cutting and herbicide application. A late spring/early summer treatment followed by an early fall re-treatment is needed. Several years of treatment may be needed for well-established populations. The plant will not re-sprout from the cut **cane**, but removing them may aid in finding and treating re-sprouts in an infested patch. The area will also be more conducive to revegetation if the cut **canes** are removed. Spring time is the optimal time for treatment as it allows completion to grow, and aids in the detection of new sprouts to be quickly identified. Also due to the size of this species a late season treatment will leave plant matter behind for future growth.



Photo Credit: ISCBC
Plant Name: Giant knotweed

Himalayan balsam/ Policeman's helmet (*Impatiens glandulifera*)

Description:

Himalayan balsam has highly visible pink flowers on fleshy hollow stems that are green in the spring but become red as the year progresses. The elliptical leaves and side branches arise in **whorls** of 3 to 5 from stem joints. A distinctive characteristic of the plant are the seed **capsules** which provide its alternative name (Touch-me-not balsam). The **capsules** open explosively when touched spreading the seeds up to 7 m enabling the plant to colonize new areas. As an annual it has a very shallow root system, barely adequate for its tremendous height.



Plant Name: Himalayan balsam

Management:

Himalayan balsam primarily spreads through waterways so an upstream strategy is strongly recommended. This method attempts to limit the impact of dispersal along rivers by tackling upstream populations first thereby reducing the ability of the species to expand downstream. Mechanical control such as mowing and uprooting is the method of choice, since it is an annual with relatively weak roots. Work should be completed before the fruits of the plant begin to ripen. This control may need to extend over two years as seeds often remain viable for more than one year. It is important to realize that control is ineffective if the sources of seeds are not simultaneously suppressed. Manual treatments are best done between spring and the middle of season. Grazing is an option for this plant as this plant is palatable. However, the key is to remove all seed or not allow plants to get to the seed stage. Herbicide options are generally limited as this species likes to grow close to water. If herbicides are an option, applications should be done early to mid-season before mature seed development has occurred.



Plant Name: Himalayan balsam



Plant Name: Himalayan balsam

Himalayan knotweed (*Polygonum polystachyum*)

Description:

Himalayan knotweed is a clumping perennial with large leaves, hollow stems, and long creeping **rhizomes**. It is not usually confused with other knotweeds. It is recognized by its long slender leaves and can grow to about 2 m in height. Flowers are showy, pinkish, and fragrant with clusters borne at tips of branches. Leaves are leathery, alternate, 13 to 30 cm in length with sharply pointed tips. They have slightly heart shaped to tapered bases. Stems are smooth and upright with twigs that zigzag slightly from leaf **node** to leaf **node** and are reddish-brown at maturity. The small 3-sided **achenes** have the old **sepals** attached and are smooth.



Photo Credit: ISCBC
Plant Name: Himalayan knotweed



Photo Credit: ISCBC
Plant Name: Himalayan knotweed
Plant Part: Soft Hairs on Undersides of Leaves



Photo Credit: ISCB,
Plant Name: Himalayan knotweed

Management:

Sprouting slows after August, so you can reduce cutting frequency, but try and prevent the plants from ever exceeding 15 cm in height. Pile the cut stems where they will quickly dry out. Using a weed-eater or mower, cut as low as possible and as often as possible, but at least every 2-3 weeks through August. Be sure you are not scattering stem or root fragments onto moist soil or into the water. If the knotweed has established in soft soil, or better yet sand, try pulling the plant and major **rhizomes** up by the root **crown** to remove as much of the root system as you can. Each time you see new sprouts (start looking a week after you pull and search at least 20 feet away from the original plant), uproot them as well, trying to pull out as much of the root as you can each time. Be sure to carefully dispose of any root material. Used alone, tilling or otherwise physically disturbing the root system will not provide control and will create many re-sprouts. Herbicide combinations and application methods have been tried on knotweed, and work to a greater or lesser degree depending on many factors. Infestations are best treated early in season before roots have time to spread.

Hoary alyssum (*Berteroa incana*)

Description:

Hoary alyssum is an annual to short-lived perennial forb with a slender **taproot**, star-shaped hairs on the stems. The leaves have **clasps** on the stems, **sepals**, and seed pods, and four white, notched petals on flowers clustered at the stem tips. It is invasive along roads, railroads, trails, and gravelly stream and lake banks, in lawns, farmyards, vacant lots, overgrazed pastures and rangeland, and in hay meadows. This plant grows to be about 70 cm tall. Hoary alyssum when ingested by horses can cause fever, laminitis, and limb edema and can cause death.



Photo Credit: ISCBC
Plant Name: Hoary alyssum



Plant Name: Hoary alyssum

Management:

Early spring to late spring is optimal for control of species, as the key is to stop seed production. Applications with herbicides when plants are actively growing and prior to bolting will be most effective. Repeated applications will be needed to target regenerating plants. Hand pulling that removes the root **crown** is effective and can be done throughout the season as long as the seed head is removed. Mowing will not control hoary alyssum and may increase infestations by cutting down a shading canopy and spreading seed pods. However, regular, repeated mowing to a six-inch stubble height may reduce seed production when combined with irrigation and nutrient management to increase the vigour of desired plants. Shallow tilling that severs the **taproot** below the root **crown** will kill hoary alyssum plants however; this type of disturbance will favour hoary alyssum regeneration from the seed bank. Herbicide options are plentiful, but late season applications should be done with a residual product.

Hoary cress (*Cardaria draba*)

Description:

Hoary cress is a deep-rooted, perennial that is a highly-competitive and aggressive member of the mustard family. The plant normally grows from 25 to 61 cm tall. It is an herbaceous, relatively long-lived, perennial weed with deep, extensive **rhizomes**. It has both **basal** and stem leaves. **Basal** leaves taper to a short stalk that attaches to the **crown** near the ground. Stem leaves are grayish to bluish-green, arrowhead-shaped, with smooth and occasionally finely toothed edges. All leaves have a covering of soft white hairs. Plants have heart shaped seed pods.



Photo Credit: ISCBC
Plant Name: Hoary cress



Photo Credit: ISCBC
Plant Name: Hoary cress

Management:

Mowing 2 to 3 times a year for several years may slow the spread and reduce seed production. Mowing should be conducted during the bud stage and repeated when the plants re-bud. Fire may enhance hoary cress populations by setting back other vegetation because the plant rapidly re-sprouts from **rhizomes** or establishes from seeds. Spring applications of herbicide while plants are in the pre bud stage are most effective for long term control. Multiple herbicide applications are usually needed to provide lasting control. Manual efforts are best done when the infestations are relatively small (new) as extensive digging is required to ensure root fragments are not left behind. Preferably spring applications are best before root system starts spreading.



Photo Credit: ISCBC
Plant Name: Hoary cress

Hound's tongue (*Cynoglossum officinale*)

Description:

Hound's tongue is a biennial to short-lived perennial plant in the Borage family which flowers from May through July. This soft, hairy plant forms a low growing **rosette** of leaves in its first year and then bolts in the second year to form a plant 30 cm to 1 m tall. The common name for this weed results from the size and shape of the **rosette** leaves which resemble a dog's tongue. The dull reddish-purple flowers (1 cm wide) originating on the upper part of the stem, produce four **nutlets** each. These brown to greyish-brown seeds, rounded triangular in shape, are covered with short, hooked prickles.



Photo Credit: ISCBC
Plant Name: Hound's tongue



Photo Credit: ISCBC
Plant Name: Hound's tongue
Plant Part: Hooked Prickled Seeds



Photo Credit: ISCBC
Plant Name: Hound's tongue
Plant Part: Rosette

Management:

Don't let hound's tongue go to seed! Hand pull isolated plants and small patches and remove as much of the root as possible. Cutting second year plants, by conventional mowing if practical or with mechanical "weed-eaters," greatly reduces seed production and spread potential as many plants will not regrow. Seed disturbed and bare soil areas to a competitive perennial forage cover immediately after disturbance. Clean **burrs** from animals, clothing and shoes before leaving infested areas. Hound's tongue can be controlled in the short term with selective herbicides which all should be used in the pre bud stage in the spring. If plants are in bloom seed heads should be removed. Use of natural agents which weaken hound's-tongue by feeding on various parts of the plant could provide long term, economical control when combined with other methods.

Japanese knotweed (*Fallopia japonica*)

Description:

Japanese knotweed is a large, herbaceous perennial plant native to Eastern Asia in Japan, China and Korea. In North America and Europe. The species is very successful and has been classified as an invasive species in several countries. Japanese knotweed has hollow stems with distinct raised **nodes** that give it the appearance of bamboo. While stems may reach a maximum height of 3 to 4 m each growing season, it is typical to see much smaller plants in places where they sprout through cracks in the pavement or are repeatedly cut down. The leaves are broad oval with a **truncated** base, 7 to 14 cm long and 5 to 12 cm broad, with an entire **margin**. The flowers are small, cream or white, produced in erect **racemes** 6 to 15 cm long in late summer and early autumn.



Photo Credit: ISCBC
Plant Name: Japanese knotweed



Photo Credit: ISCBC
Plant Name: Japanese knotweed



Photo Credit: ISCBC
Plant Name: Japanese knotweed

Management:

Research has found that Japanese knotweed can extend over 7 m below ground. It is recommended to dig test pits and examine for the presence and the extent of **rhizomes** while digging out the parent stand. Excavations should also be to 3 m below the surface if removing Japanese knotweed from a site. Wherever possible, the amount of Japanese knotweed excavated should be kept to a minimum and focus should be directed to treating the Japanese knotweed in its original location. If the area of Japanese knotweed is very small, it is possible to spray the leaves and **canes** with herbicide. Several different herbicides can be used to kill Japanese knotweed. Spring time is the optimal time for treatment as it allows completion to grow, and aids in the detection of new sprouts to be quickly identified. Also due to the size of this species a late season treatment will leave plant matter behind for future growth.

Leafy spurge (*Euphorbia esula*)

Description:

Leafy spurge is a long-lived perennial that forms an extensive, persistent, creeping root system. Stems are arranged in clumps, smooth and hairless, grow up to 1 m tall and contain milky latex. Leaves are numerous and attached directly to the stem, arranged alternately or sometimes spirally, are up to 7 cm long, narrow, waxy, have smooth edges and are bluish-green in colour, turning yellowish or reddish-orange in late summer. Flowers are small, yellowish-green, lack both petals and **sepals**, and are supported by 2 green, heart-shaped, leaf-like **bracts**, arranged in numerous small clusters. Seeds are about 2 mm, smooth, oblong, light grey to dark brown in colour and grow in pods on top of the **bracts**. When mature, the dried seed pods explode.

CAUTION: All parts of the plant contain milky-coloured latex that can poison livestock and cause skin irritation on humans.



Photo Credit: ISCBC
Plant Name: Leafy spurge



Photo Credit: ISCBC
Plant Name: Leafy spurge

Management:

Leafy spurge is difficult to manage and can recover from almost any control effort. A management scheme that combines control methods over four to five years is recommended. Monitor infestations for recurrence and adopt a maintenance program. Vigorous grass growth is an important aspect of leafy spurge control. Over-grazing stresses grasses and makes them much less competitive with weeds, leafy spurge in particular. Irrigation, where applicable, may favor grass growth and make it more competitive with leafy spurge. For optimum leafy spurge control, proper timing of herbicide application is imperative. Applications should be performed in the spring to early summer period. This allows for no seed production. Manual attempts are generally done while infestations are quite small.

Marsh plume thistle (*Cirsium palustre*)

Description:

Marsh plume thistle is an herbaceous biennial (or often perennial). It is a tall thistle which reaches up to 2 m in height. The strong stems have few branches and are covered in small spines. In its first year the plant grows as a dense **rosette**, at first with narrow, entire leaves with spiny, dark purple edges; later, larger leaves are lobed. In the subsequent years the plant grows a tall, straight stem, the tip of which branches repeatedly, bearing a **candelabra** of dark purple flowers, 10 to 20 mm with purple-tipped bracts. In the northern hemisphere these are produced from June to September. The flowers are occasionally white, in which case the purple edges to the leaves are absent.



Plant Name: Marsh plume thistle
Plant Part: Rosette



Plant Name: Marsh plume thistle



Plant Name: Marsh plume thistle

Management:

Ensure all equipment is cleaned of all soil, seeds, and plant parts prior to entering or exiting marsh plume thistle infested areas. This is especially important for track vehicles and horses. Do not unload, store, or park vehicles or equipment in infested areas. Mechanical control can be effective, especially if done before flowering to prevent seed-set. In this case, plants can be hand-pulled or cut/mowed and left on site to decompose. If mechanical treatment is performed while flowers are present on stems, the flowers must be bagged and removed from the site to prevent production of viable seeds. Monitor treatment success over 3-5 consecutive years. Herbicide recommendations and use must consider site characteristics and be prescribed based on site goals and objectives. Due to being a biennial, is best treated in the **rosette** stage. Managed best between spring and mid-July before bolting plants produce seed.

Mountain bluet (*Centaurea montana*)

Description:

Mountain bluet, also known as perennial cornflower or perennial bachelor's buttons, is escaping gardens and infesting landscapes. Mountain bluet is a **taprooted** perennial herb from Europe. It prefers full sun and dry to medium-wet conditions. It grows up to 30 to 80 cm tall and has simple, lance-shaped leaves that have a lightly woolly underside. The whole plant is lightly hairy. Flower heads are similar to knapweeds. The **disk** flowers are usually blue but can be white. Flowers bloom from late spring to early summer.



Photo Credit: ISCBC
Plant Name: Mountain bluet



Photo Credit: ISCBC
Plant Name: Mountain bluet

Management:

Small infestations can be hand pulled or dug-out when plants are young; making sure the whole root is removed as new seedlings can regenerate from root fragments. There are multiple herbicide options available for use, all are best applied before plants bloom, as plant spreads rapidly by seed. Residual herbicides should be utilized if applying late in the season. Larger infestations can still be treated with a residual herbicide to assist with future growth. Manual efforts can be used throughout the life cycle. Plants in bloom should have the seed heads removed, and pre bloom plants should have entire stock pulled right to the ground. They can regrow if no root is pulled but focus is on no seed production. No biological options are available, but can be affected by aphids, leaf hoppers, rust, aster yellows, and stem rot.



Photo Credit: ISCBC
Plant Name: Mountain bluet

Nodding thistle (*Carduus nutans*)

Description:

Nodding thistle is usually a biennial, requiring 2 years to complete a reproductive cycle. Seedlings may emerge at any time from spring to late summer and develop a **rosette**. Plants overwinter in the **rosette** stage, sending up a multi-branched flowering stem in mid spring of their second year. Mature plants range in height from 1 to 1.5 m tall and have multi-branched stems. Nodding thistle has sharply spiny stems and leaves. The stem is cottony/hairy. The plants develop a **rosette**, with large leaves 30 to 60 cm long. The leaves are dark green, coarsely **bi-pinnately** lobed, with a smooth, waxy surface and sharp yellow-brown to whitish spines at the tips of the **lobes**. They are more or less hairy on top, and wooly on the veins below. Flowering occurs from late spring to late summer, and seed dissemination occurs approximately one month after the flowers form. A single flower head may produce 1,200 seeds and a single plant up to 120,000 seeds, which are wind dispersed.



Photo Credit: abinvasives.ca
Plant Name: Nodding thistle

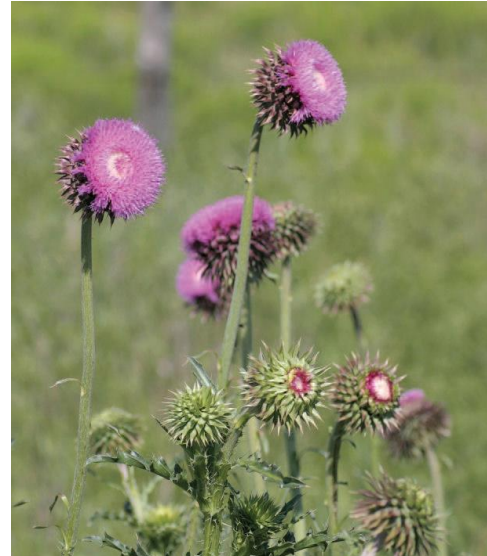


Photo Credit: abinvasives.ca
Plant Name: Nodding thistle

Management:

Preventing seed production is the key to controlling this invasive plant. Unmanaged grazing will result in larger infestations. Since the plant is biennial and reproduces only from seed, frequent cultivation is effective and chemical treatment is most effective in the **rosette** stage. Hand-digging or mowing can provide control if repeated over a number of years. Mowing just before seed set is effective, but the debris should be collected and burned. Severing the **taproot** just below ground will kill plants. Managed best between spring and mid-July before bolting plants produce seed.



Photo Credit: abinvasives.ca
Plant Name: Nodding thistle

Plumeless thistle (*Carduus acanthoides*)

Description:

Plumeless thistle is a winter annual or biennial. Its **rosettes** have wavy leaves with yellow spines along the white-coloured leaf **margins**. The stems are covered with leaf-like, winged spines that extend up to the flowering heads. The flower heads, in clusters of 2 to 5, are alone at the end of the branches. They are purple to dark red in colour and are 1.5 to 2.5 cm in diameter. Leaves are alternate, stalk-less, hairy underneath and blend into the stem. Mature plants can grow taller than 1.5 m and can produce upwards of 9,000 seeds. Habitats for include pastures, fields, disturbed lands, logged-over areas, river valleys, along roadsides and in native grasslands. Plumeless thistle is one of the most aggressive thistles, due to its high seed production.



Photo Credit: abinvasives.ca
Plant Name: Plumeless thistle



Photo Credit: Invasive.or,
Plant Name: Plumeless thistle



Photo Credit: T. Pfeiffer
Plant Name: Plumeless thistle

Management:

The key to managing Plumeless thistle is to prevent seed production. Dense stands can be treated by spot use of herbicide programs. Due to the unknown seed viability of Plumeless thistle, monitoring up to 10 years, and repeating control methods may need to occur for many years to completely eliminate an infestation. Any mechanical or physical method that severs the root below the soil surface will kill Plumeless thistle. Mowing or chopping is most effective when Plumeless thistle plants are at full bloom. Be sure to properly dispose of the flowering cut plants since seeds can mature and become viable after the plant has been cut down. Due to being a biennial, is best treated in the **rosette** stage. Managed best between spring and mid-July before bolting plants produce seed. **Rosettes** are easily killed by herbicide and can be easily dug up

Purple loosestrife (*Lythrum spp.*)

Description:

Purple loosestrife is an herbaceous perennial plant that can grow 1 to 2 m tall, forming clonal colonies of 1.5 m or more in width with numerous erect stems growing from a single woody root mass. The stems are reddish-purple or red to purple and square in cross-section. The leaves are lanceolate, 3-10 cm long and 5 to 15 mm broad, downy and **sessile**, and arranged opposite or in **whorls** of three. The flowers are reddish purple, 10-20 mm diameter, with six petals (occasionally five) and 12 **stamens** (one **stamen** has up to 3,000 seeds), and are clustered tightly in the **axils** of **bracts** or leaves; there are three different flower types, with the **stamens** and **style** of different lengths, short, medium or long; each flower type can only be pollinated by one of the other types, not the same type, thus ensuring cross-pollination between different plants. Prefers moist riparian areas, but will grow in dry conditions as well. **Looks like Fireweed (see fireweed photos at the bottom of the page).**



Photo Credit: ISCBC
Plant Name: Purple loosestrife



Photo Credit: ISCBC
Plant Name: Purple loosestrife

Management:

Four biological control agents have been tried in BC and the NW States. Some sites in BC have been effectively controlled with the introduction of *Galerucella californiensis*. Digging for small sites and a wide range of herbicides will control species. Best treated in spring to early summer.



Photo Credit: ISCBC
Plant Name: Fireweed



Photo Credit: ISCBC
Plant Name: Fireweed



Photo Credit: ISCBC
Plant Name: Purple loosestrife

Rush skeletonweed (*Chondrilla juncea*)

Description:

Leaves are 4 to 12 cm long, 1.5 to 4.5 cm wide, and **oblanceolate** in shape. The leaf **margins** are deep and irregularly toothed with **lobes** pointing backward toward the leaf base. The leaf base narrows to a short, winged **petiole**. Normally, 1 flowering stem grows per **rosette**. Flowering stems reach heights of 50 to 100 cm and have numerous spreading branches. They are **glabrous** except for short, rigid, downward-pointing hairs near the base. The stems are leafless, they may have long-linear, **bract**-like leaves, or they may have leaves similar to the **rosette** leaves but smaller and only on the lower part of the stem. The flower heads are solitary or in groups of 2 to 5 in the stem branch **axils**, along the branches, and at the branch ends. The cylindrical **involucre** has 2 rows of **bracts**; the outer row is very short and **crow**n-like, the inner row has 7 to 9 linear-lanced shaped **bracts** with either no hairs, sparsely **tomentose**, or sometimes a row of rigid hairs on the median line. Each **capitulum** bears 9 to 12 bright yellow, **ligulate florets**. The **florets** produce **achenes** three to four mm long and with numerous ribs. At the tip of the **achene** is a **beak** 5 to 6 mm long that bears a **pappus** of numerous soft **bristles**.



Photo Credit: ISCBC
Plant Name: Rush skeletonweed



Photo Credit: ISCBC
Plant Name: Rush skeleton
Plant Part: Rosette



Photo Credit: ISCBC
Plant Name: Rush skeletonweed

Management:

The morphology of rush skeleton; specifically the lack of leaf area, reduces herbicide translocation as a result of inadequate retention and adsorption. The poor soil conditions favored by the plant (dry, coarse, and low in organic matter) reduce herbicide persistence in the soil. Hand pulling and digging can provide control of small populations if plants are pulled several times each year for many years. Hand pulling will stimulate adventitious growth from root buds for the first few years until root reserves are depleted. 6-10 years of mechanical control will be needed to eliminate large established populations. Mowing when plants bolt to flower may temporarily reduce seed production but plants will survive to flower again. Best treated in spring in **rosette** form to increase surface area for herbicides and prevent roots from fully establishing.

St. John's wort or Goatweed (*Hypericum perforatum*)

Description:

St. John's wort is a perennial plant with extensive, creeping **rhizomes**. Its stems are erect, branched in the upper section, and can grow to 1 m high. It has opposing, stalkless, narrow, oblong leaves that are 12 mm long or slightly larger. The leaves are yellow-green in color, with transparent dots throughout the tissue and occasionally with a few black dots on the lower surface. Leaves exhibit obvious translucent dots when held up to the light, giving them a 'perforated' appearance. Their flowers measure up to 2.5 cm across, have five petals, and are colored bright yellow with conspicuous black dots. The flowers appear in broad **cymes** at the ends of the upper branches, between late spring and early to mid-summer. The **sepals** are pointed, with **glandular** dots in the tissue. There are many **stamens**, which are united at the base into three bundles. The pollen grains are **ellipsoidal**.



Photo Credit: ISCBC
Plant Name: St. John's Wort

Management:

It is important to keep non infested areas clear of St John's wort. Once an infestation is established, preventing spread should be a priority. Spread occurs through attachment of seed **capsules** to animals. Care should be taken to avoid the transport of seed in machinery and vehicles; don't drive through infestations with mature reddish-brown seed **capsules**. Many different herbicides are used to control St John's wort along roadsides or tracks in natural ecosystems, either by spot-spraying or used broader-scale, at various recommended dose rates and with varying results. Plants can be managed throughout the season for smaller infestations that are to be managed manually. Remove all seed heads. Herbicides should be applied before mature seeds have developed, and only residual products if applications are occurring in the fall.



Photo Credit: ISCBC
Plant Name: St. John's Wort



Photo Credit: ISCBC
Plant Name: St. John's Wort

Sulphur cinquefoil (*Potentilla recta*)

Description:

Sulphur cinquefoil has pale yellow sulphur-coloured flowers with 5 heart-shaped petals. Stems are upright with some branching near the top, and up to 1 m tall. There can be one to several stems per plant. There are numerous leaves on the stems, 5 to 7 leaflets with distinctly toothed edges. The plant is distinguished by long, stiff hairs on stems and leaves that stick straight out from the surface. Sulphur cinquefoil seeds also have a net-like pattern on them, compared with the smooth seed coat of the native graceful cinquefoil. Look-alike native graceful or slender cinquefoil (*Potentilla gracilis*) has short hairs that lie flat on the stems and leaves and brighter yellow flowers. **Looks like graceful/slender cinquefoil (see photos at the bottom of the page).**



Photo Credit: science.halleyhosting.com
Plant Name: Slender cinquefoil



Photo Credit: science.halleyhosting.com
Plant Name: Slender cinquefoil



Photo Credit: ISCBC
Plant Name: Sulphur cinquefoil

Management:

Mowing is not effective. It can increase the population size by stimulating **crown**-sprouting and can spread the infestation if plants are already in seed. Digging is effective for small populations removing all of root. Repeated cultivation is also effective over time. Several herbicides are effective but may require repeat treatment and a suitable surfactant. Best treated in spring before roots can fully establish and chemically before seeds are produced.



Photo Credit: ISCBC
Plant Name: Sulphur cinquefoil

Tansy ragwort (*Senecio jacobaeae*)

Description:

Tansy ragwort is a biennial to short-lived perennial plant in the Sunflower family. A low-growing **rosette** of leaves is produced in the first year. Erect stems growing 0.3 to 1.2 m high are produced in the second and often subsequent years. The dark green stalkless leaves are deeply cut into irregular segments giving the plant a "ragged" appearance. The daisy-like bright yellow flowers, evident from July through September, produce an abundance of seed which is easily transported by wind, water and animals. One ragwort plant can produce in excess of 150,000 seeds. Seeds can lie dormant on the soil surface for 4 to 5 years or over 20 years if buried. Seeds germinate in both spring and fall to form new **rosettes**



Plant Name: Tansy ragwort



Plant Name: Tansy ragwort



Plant Name: Tansy ragwort

Management:

Most farming animals do not directly graze ragwort but the poison from this weed can persist in silage, deeming crops unusable. Control attempts using strictly mechanical methods or herbicides rarely produce effective long-term results. However, Tansy ragwort can be managed through a combination of biological, physical and chemical controls. In B.C., several biological agents have been introduced including two moths, two beetles, and one fly. Of these, a combination of *Longitarsus jacobaeae* and *Cochylis atricapitana* are successfully controlling localized areas. Sheep grazing is another effective control option as sheep do not suffer ill effects from this plant's toxic alkaloids. Hand pulling and cultivating techniques are useful in smaller areas, where care can be taken to remove the entire root system. Most effective treatments are done earlier in the season. Less root mass to dig out manually, and with herbicides, treatments should be done before plants produce mature seeds. Fall treatments may be needed as plants can bolt and flower late in season.

Tartary buckwheat (*Fagopyrum tataricum*)

Description:

Tartary buckwheat is a 15 to 45 cm tall annual that spreads by seeds. Its leaves are arrow-shaped, about as broad as they are long, growing to width of 10 cm; lower leaves long stalked, upper leaves short stalked. The flowers are greenish, small, and clustered at the ends of stems and in leaf **axils** appearing in early summer. Seeds must go through an after-ripening period before they will germinate. This occurs most quickly under warm, dry conditions. Seed buried in moist soil lose their dormancy very slowly and may not do so until brought to the surface. Seeds buried deeper than 8 cm fail to germinate but retain their viability.



Photo Credit: anpc.ab.ca
Plant Name: Tartary buckwheat



Photo Credit: anpc.ab.ca
Plant Name: Tartary buckwheat



Photo Credit: alienplantsbelgium.be
Plant Name: Tartary buckwheat

Management:

Delay seeding to kill as much buckwheat as possible before applying seed. Early, light spring tillage may encourage germination. When buckwheat seedlings have emerged, about ten days later, till again and seed. This practice will usually provide good buckwheat control but often results in some loss of moisture. Best results are obtained when the surface soil is dry. Sprouts on the grain should not be more than two cm long. Forage crops thin down infestations of buckwheat but don't eradicate them. Cut forages before any Tartary buckwheat seed is formed. Two cuttings are usually necessary to prevent any seed production. Numerous herbicide options are available, and are best applied before seed production. Spring and early summer is the optimal time for any type of treatment. Focus on not allowing seed production. Small infestations can be managed season long with manual efforts.

Wild parsnip (*Pastinaca sativa*)

Description:

Biennial plant, however grows without flowering in the first year with **basal rosettes** between 10 and 40 cm in width. This plant bolts in year two, producing one to many stalks with yellow flat topped flowers between 5 and 15 cm. Wide leaves are made up of 5 to 15 leaflets and are arranged alternate and **petioles** wrap the stem, deep edible **taproot**. **Closely resembles our native cow parsnip see photos below.**



Photo Credit: berkeley.edu
Plant Name: Wild parsnip

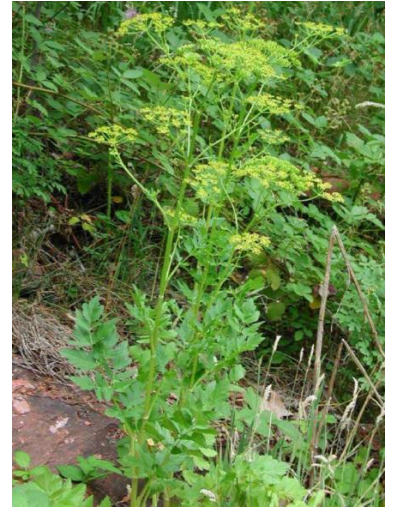


Photo Credit: swbiodiversity.org
Plant Name: Wild parsnip



Photo Credit: oregonstate.edu,
Plant Name: Cow parsnip



Photo Credit: uconn.edu
Plant Name: Cow parsnip

Management:

Discovered in Pine Pass in 2013, the plant has chemical compounds that can increase skin sensitivity to sunlight and cause severe dermatitis, it is known to decrease weight gain and fertility in cattle. Clipping seed heads causes sprouting. Lots of herbicide options are available and best used before it produces seed and ideally in **rosette** stage. Manual efforts can be made throughout the season collecting seed heads and digging tap roots. After handling the fruit, flowers or leaves of Wild parsnip, humans can develop dermatitis. Aided by sunlight, chemicals in the plant cause inflammation of the skin. Mild cases cause burning sensations and reddening of the skin. Severe cases can lead to blistering and extreme burning sensations.



Photo Credit: berkeley.edu
Plant Name: Wild parsnip

Burdock (*Arctium spp*)

Description:

Burdock is an interesting biennial plant because it consists primarily of carbohydrates, volatile oils, plant sterols, tannins, and fatty oils. Burdock is best recognized as a stout, common weed with annoying **burrs** that stick to animal fur and clothing. This plant grows relatively tall therefore having deep roots which are brownish green, or nearly black on the outside. The **basal rosette** of leaves stays close to the ground the first year and the beginning of the second. These **basal rosettes** can grow up to 1 m wide. Burdock has purple flowers on tips of prickly ball of **bracts** that blooms between June and October. Flower heads are 1-3 cm across, composed of purple **disc florets** surrounded by several rows of overlapping hooked **bracts**. Large, wavy, heart-shaped leaves that are green on the top and whitish on the bottom makes identifying burdock easy. Leaves can grow to 50 cm in size. This plant grows to a height of about 1-2 m tall.



Plant Name: Burdock



Plant Name: Burdock

Management:

Plowing or disking as soon as burdock seedlings appear will destroy them. First-year **rosettes** growing in grass pasture, along fence rows, and in waste areas are easily destroyed by using herbicides. Late summer treatment ensures that late emerging seedlings will not grow large enough to produce the root reserves necessary for overwintering. A second-year **rosette** can send up a new flower stalk if the plant is only cut off at the surface. Spading or otherwise removing most of the **taproot** will prevent regrowth. The other option is simply to mow after the flower stalk forms. The plant will not regrow, and its seeds will have been eliminated. Mechanically this species can be managed throughout the season if the entire plant is removed. With herbicides, plants should be treated while in **rosette** or early bolting stages.



Plant Name: Burdock

Comfrey (*Symphytum spp*)

Description:

The leafy stem, 60 cm-1 m high, is stout, angular and hollow, broadly winged at the top and covered with bristly hairs. The lower, radical leaves are very large, up to 25 cm long, ovate in shape and covered with rough hairs which promote itching when touched. The stem-leaves are **decurrent**. They decrease in size the higher they grow up the stem, which is much branched above and terminated by one-sided clusters of drooping flowers, either creamy yellow, or purple, growing on short stalks. These **racemes** of flowers are given off in pairs, and are what is known as **scorpioid** in form, the curve they always assume suggesting, as the word implies, the curve of a scorpion's tail, the flowers being all placed on one side of the stem, gradually tapering from the fully-expanded blossom to the final and almost imperceptible bud at the extremity of the curve. The corollas are bell-shaped, the **calyx** deeply five-cleft, narrow to lance-shaped, spreading, more down in the purple flowered type. The fruit consists of four shining **nutlets**, perforated at the base, and adhering to the **receptacle** by their base. Comfrey is in bloom throughout the greater part of the summer.



Plant Name: Comfrey



Plant Name: Comfrey

Management:

Comfrey can be difficult to remove due to the potential for vegetative regeneration from root fragments. Mowing plants before they produce seeds can prevent populations from spreading. It is best managed in spring, but can be manually treated throughout the season by removing seed heads. Herbicides used in the spring are most effective due to its usually massive root system. **This plant is toxic to livestock.**



Plant Name: Comfrey

Common tansy (*Tanacetum vulgare*)

Description:

Tansy is a flowering herbaceous plant with finely divided compound leaves and yellow, button-like flowers. It has a stout, somewhat reddish, erect stem, usually smooth, 50 to 150 cm tall, and branching near the top. The leaves are alternate, 10 to 15 cm long and are **pinnately** lobed, divided almost to the center into about seven pairs of segments, or **lobes**, which are again divided into smaller **lobes** having saw-toothed edges, giving the leaf a somewhat fernlike appearance. The roundish, flat-topped, button-like, yellow flower heads are produced in terminal clusters from mid-to-late summer. The scent is similar to that of camphor with hints of rosemary. The leaves and flowers are toxic if consumed in large quantities; the volatile oil contains toxic compounds, which can cause convulsions and liver and brain damage.



Plant Name: Common tansy

Management:

The use of fertilizer can increase the competitive ability of grasses and other desirable plants, thereby preventing or reducing infestations of common tansy. Common tansy cannot be controlled with single mowing events (once-a-year), as the plants will respond with an increase in vegetative growth. Mowing sites very low to the ground before July can prevent seed production. Combined mowing and subsequent herbicide treatment of re-growth appears to be an effective control method. Treatments must be repeated over several years. Hand pulling may be used in areas where mowing and herbicide application are not feasible. Gloves and other protective clothing should be worn to prevent skin irritation. Herbicide recommendations and use must consider site characteristics and be prescribed based on site goals and objectives. Infestations are managed best early in spring or early summer while plants are smaller and not yet produced viable seed. Ensure entire root is removed and any seeds if present.



Plant Name: Common tansy



Plant Name: Common tansy

Dalmatian toadflax (*Linaria dalmatica*)

Description:

Creeping rooted perennial that can grow up to 1.2 m tall. It has pale green waxy leaves clasp the stem and are heart-shaped with a pointed tip; bright yellow "snapdragon-like" flowers with orange spot on the lower lip (2.5 to 4 cm long). A single plant can have up to 25 flowering stems. Fast-growing horizontal roots make it an aggressive invader of farms and grasslands. A mature plant annually produces up to five hundred thousand seeds, viable for ten years. New plants are also formed from horizontal roots which can be as long as 3.7 m.



Plant Name: *Dalmatian toadflax*
Plant Part: Leaves



Plant Name: *Dalmatian toadflax*



Photo Credit: ISCBC
Plant Name: *Dalmatian toadflax*

Management:

Individual plants and small patches of Dalmatian toadflax can be hand-pulled or hand-cut to prevent seed formation. Hand-pulling is most successful where soils are sandy and/or moist, allowing for removal of as much root as possible. Hand-cutting toadflax stands to ground level in spring or early summer is an effective way to eliminate seed production and dispersal, but it will not destroy plants. Mechanical mowing might even be less effective on toadflax than cutting because it leaves several centimetres of stem above the soil surface that may allow them to re-sprout more rapidly. Since the plant also spreads through vegetative propagation, and the seeds can remain viable for up to 10 years, physical removal must be repeated annually for at least 10 years to completely control a stand. Cultivation can be reduced by substituting herbicide treatment for some of the cultivation operation. Plants are best treated before seed has set early in the spring/summer, by using select herbicides and surfactant. Multiple applications yearly may be required for multiple seasons.

Diffuse knapweed (*Centaurea diffusa*)

Description:

Diffuse knapweed is a biennial or weak perennial that is usually shorter than spotted knapweed. Growing from a deep **taproot**, its upright stems have numerous spreading branches giving the plant a ball shape. Heads of white (sometimes pink to purple) flowers are solitary or in clusters of two or three at the ends of the branches. Excluding flowers and spines, heads are about 4 to 5 mm in diameter and 8 mm tall. **Bracts** around the flower heads are yellowish green with a light brown **margin**, fringed in spines ending with a longer spine at the tip. It flowers continuously from early summer into the fall, as long as moisture and temperatures permit.



Photo Credit: ISCBC
Plant Name: Diffuse knapweed



Photo Credit: ISCBC
Plant Name: Diffuse knapweed

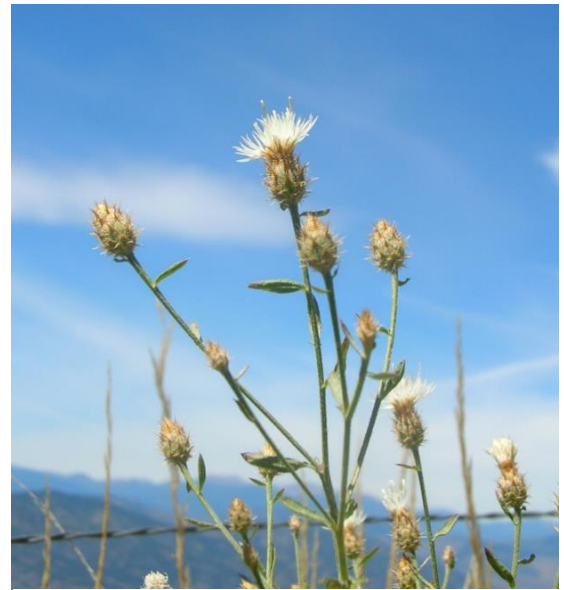


Photo Credit: ISCBC
Plant Name: Diffuse knapweed

Management:

Cutting the above ground portion of diffuse knapweed will greatly decrease the spread of seeds; it does not remove the root. With only its root still intact, diffuse knapweed can survive and continue to grow. For a program of cutting to be effective, it must be long-term so that the effect of reduced seed spreading can be realized. Digging removes both the portion above ground and the root of diffuse knapweed and has shown to be very effective; if the plant is properly disposed of, it can neither regrow nor spread its seeds. The largest problem with digging knapweed is that it is extremely labor-intensive. Additionally, the recently vacated soil should be planted with a native species to avoid knapweed reintroducing itself in the disturbed soil. There are several good herbicide options for knapweed. If plants are treated in pre bud stage, many products will kill plant and roots. If applying herbicides after seed development then a residual herbicide is recommended, as seeds will regrow rapidly. Manual efforts can be made throughout the season removing the **taproot** and any seed heads. Herbicides are best applied during the spring killing **rosettes** and bolting plants.

Green foxtail (*Sertaria viridis*)

Description:

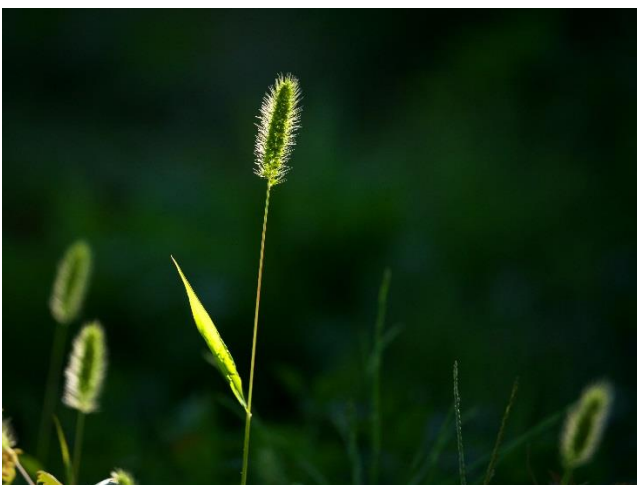
Green foxtail is an annual that has a **fibrous** root system and reproduces by seed. It grows 15-115 cm tall and is erect rather than sprawling. Green foxtail often grows in clumps because of **tillering**. Stems are smooth and usually hollow in the center. The leaf **sheath** is smooth except for the **margins**, which are lined with short upward-pointing hairs that are especially noticeable near the collar. The **ligule** is a fringe of hairs about 1-2 mm long. **Auricles** are absent. Leaf blades are flat, up to 25 cm long, and 6-18 mm wide. They have sharply pointed tips and a rounded base. The upper surface of the mature leaf blades varies from smooth to sparsely hairy; the lower surface is always smooth. Leaf blade **margins** may be smooth or slightly rough. The mature seed head is a fuzzy tapered cylinder, 2.5-12 cm long, and 1-2.5 cm wide, including **awns**. **Awns** are usually green, but occasionally purple, and all are covered with tiny **barbs**. The **barbs** point upward, so the **panicle** feels soft and fuzzy when stroked toward the tip. The **panicle** is usually erect but may nod slightly.



Plant Name: Green foxtail

Management:

Since seeds can germinate over the entire summer, a combination of cultural and chemical controls is advised. Most pre emergence herbicides are effective in controlling foxtail if applied at the recommended time and rate. However, herbicides applied very early in the season often lose their effectiveness by the time foxtail germination is at its peak. Mowing before foxtail seeds mature is a cost-effective way to prevent its spread in solid stand forages. An effective cultural method for controlling foxtail in row crops is to provide early canopy closure by planting narrow rows and supplying the nutrients necessary for vigorous crop growth. Herbicide selection is limited and only effective early in growth cycle (pre flower).



Plant Name: Green foxtail
Plant Part: Spikelet

Meadow goat's-beard or salisfly (*Tragopogon pratensis*)

Description:

Biennial, occasionally an annual or short-lived perennial reproducing only by seed. The stalk immediately below the flower head is abruptly narrowed to normal stem thickness, and is not hollow. Stem leaves taper quickly into long, slender, curled tips and often have crisped or wrinkled **margins**. Brighter yellow (canary yellow) **florets** surrounded by usually only 8 green **involucral bracts** which are about as long as or shorter than the **florets**. Has a fairly large distinguishable **taproot**. Lives in the same habitats as Goat's-beard (pastures, meadows, roadsides and occasionally continues until September). Very similar to Goat's-beard in appearance and growth habit but differing from it by having stem leaves which taper more quickly into long, slender, curled tips, and often have crisped or wrinkled **margins**. And the stalk immediately below the flower head is abruptly narrowed to normal stem thickness, and is not hollow. They have a milky sap. The involucral **bracts** of Meadow goat's beard are as long as or shorter than the **florets**. With Goat's beard the involucral **bracts** are much longer than the **florets**. **Looks like Goat's beard (*Tragopogon dubius*) (see photos at the bottom of the page).**



Photo Credit: MFR,
Plant Name: Meadow goat's-



Photo Credit: MFR
Plant Name: Meadow goat's-beard

Management:

Herbicides are best applied pre bloom stage, throughout the season. Residual products do offer longer term control. Hand pulling can be done all season long removing flower heads. Cutting early in the season before flowering and then repeated mowing later in the season will prevent seed spread and suppress plant growth. Repeated cultivation over a season will also offer control.



Photo Credit: J. Werther
Plant Name: Goat's beard



Photo Credit: MFR
Plant Name: Goat's beard



Photo Credit: berkeley.edu
Plant Name: Meadow goat's-beard

Orange hawkweed (*Heiracium aurantiacum*)

Description:

Stems are erect, usually leafless, and covered with bristly hairs. They grow 15-90 cm tall and contain a milky sap. There may be one to several stems per plant. Leaves are mostly **basal**, elliptical covered with bristly hairs, and is 10-15 cm long. Any stems leaves are much smaller. Flowers are composed of **ray** flowers with square edged, notched petals. The orange-red flowers are borne in clusters of 5-30 heads at the ends of stems. The **involucre**s (base of the flower) have long bristly hairs and blackish glands. This is the only hawkweed, native or introduced, to have orange flowers.



Plant Name: Orange hawkweed



Plant Name: Orange hawkweed



Plant Name: Orange hawkweed

Management:

Dense forage stands will compete with orange hawkweed. Ensure that pastures are maintained in a competitive condition through moderate grazing, fertilization and variety selection. Experience in B.C. has shown that fertilizing light infestations with ammonium sulphate results in reduced density and vigour of hawkweed due to increased grass/forb competition. Fertilizer applied to severe infestations containing few grasses or forbs will result in little or no effect. Seed bare soils to adapted perennial grasses or grass/legume mixtures. **DO NOT** use orange hawkweed as a garden ornamental, as is occasionally done! Control small patches **EARLY** to prevent expansion. Control small infestations by careful digging of **rosette** plants. Avoid breaking off the shallow roots as plants can quickly re-grow from root pieces. For this reason, pulling is seldom effective. Removal of flower stems prevents seed production, but repeated mowing can encourage vegetative growth. Heavily infested pastures/hayfields can be cultivated and rotated to an annual crop. Hawkweed is a poor competitor in annual cropping systems especially if combined with herbicide's which can be used throughout season.

Russian thistle (*Salsola kali*)

Description:

Russian thistle is a bushy summer annual with numerous slender ascending stems that become quite woody at maturity. Stems vary from 20-91 cm in length and usually have reddish to purplish stripes. Seedlings have very finely dissected leaves that almost look like pine needles. Leaves of young plants are fleshy, dark green, narrow, and about 2.5 cm in length. Young plants are suitable for livestock forage and are sometimes grazed. As the plant matures in July through October, the older leaves become short and stiff with a sharp-pointed tip. The single, inconspicuous flowers lack petals and are borne above a pair of small spine-tipped **bracts** (a small modified leaf at the base of the flower) in most leaf **axils** (where the narrow leaves meet the stem). The **bracts** and spiny leaves prevent predation by herbivores as the plant nears maturity. The overall shape of the plant becomes oval to round and at maturity can attain a diameter of 45 cm-1.8 m or more under favourable soil moisture and fertility conditions. After the plant dries, the base of the stem becomes brittle and breaks off at soil level in fall and early winter. These round, spiny plants are capable of dispersing seed as they tumble along in the wind. This dispersal characteristic has led to the more commonly used name of tumbleweed.



Plant Name: Russian thistle

Management:

Russian thistle is easily pulled or hoed out, at early growth stages. If plants have already started producing seed, it is best to collect the plants and dispose of them to prevent new contributions to the soil seed reserve. Pulling the plants at later stages may require wearing gloves for comfort, due to the spike-like **inflorescence**. In fields, light tillage can disrupt the young plants from the soil. Mowing is a limited option that must be timed to prevent the plant from being able to regrow and produce seed, and is best done when the plant is beginning to bloom. Herbicides are most effective from spring to early summer before any seeds are produced.



Plant Name: Russian thistle

Spotted knapweed (*Centaurea biebersteinii*)

Description:

Spotted knapweed is a biennial or short-lived perennial. Its name is derived from the spots formed by black **margins** on the flower **bract** tips. Spotted knapweed typically forms a **basal rosette** of leaves in its first year and flowers in subsequent years. **Rosette** leaves are approximately 20 cm long by 5 cm wide, borne on short stalks, and deeply lobed once or twice on both sides of the center vein, with **lobes** oblong and wider toward the tip. The **taproot** is stout and deep. Flowering stems are erect, 20 cm to 1.3 m tall, branched above the middle, and sparsely to densely hairy. Stem leaves alternate along the stem, are unstalked, and may be slightly lobed, or linear and unlobed. Leaf size decreases towards the tip of the stem. Flowers are purple to pink, rarely white, with 25 to 35 flowers per head. Plants bloom from June to October, and flower heads usually remain on the plant. The brown, oval seeds are 1 to 3 mm long, with pale longitudinal lines and a short fringe on one end.



Plant Name: Spotted knapweed

Management:

The most cost effective management strategy for spotted knapweed is to prevent its spread to non-infested areas. Spread by seed can be minimized by avoiding travel through infested areas by: 1) cleaning footwear, clothing, backpacks, and other items after hiking through infested areas; 2) not grazing livestock when ripe seeds are present in the flower heads; and 3) using certified weed-free hay. Individual plants can be pulled by hand when the soil is moist as long as the entire **crown** and **taproot** are removed, using a shovel or weed-popper type tool if necessary. Control of spotted knapweed infestations with manual treatments involves fully removing the **taproot** and any seeds. Herbicide treatments are most effective in the spring to early summer, before seeds have developed. Fall applications are only somewhat effective, they do kill **rosettes**, offer some assistance for future, but allow seeds to be left for future growth.



Photo Credit: ISCBC
Plant Name: Spotted knapweed
Plant Part: Rosette



Photo Credit: ISCBC
Plant Name: Spotted knapweed

Invasive yellow hawkweeds (*Pilosella* spp.)

Description:

Yellow hawkweed is a perennial with **fibrous** roots and **rhizomes**. Plants grow up to 90 cm inches tall and exude a milky juice when injured. Flower heads in compact, flat-topped clusters of 5-25 (or more). Flower heads composed of all yellow **ray** flowers with fused petals into a strap-like shape. **Bracts** at the base of flower heads with simple, **stellate** and **glandular** hairs. Leaves all **basal** except for one or two stem leaves. Leaves covered in hair with the upper leaf surface having long simple hairs and possibly a few **stellate** hairs. The lower leaf surface has simple, **stellate** and **glandular** hairs. Stems grow up to 35.4 inches tall with lower stems having dense simple, **stellate** or **glandular** hairs.



Photo Credit: ISCBC
Plant Name: Yellow hawkweed



Plant Name: Yellow Hawkweed
Plant Part: Rosette



Plant Name: Yellow hawkweed

Management:

Fertilizer and soil fertility management is important to prevent yellow hawkweed from invading. Minimize soil disturbance and promptly re-vegetate disturbed areas. Dig out **rosettes** and their shallow roots in new, small infestations. Take care not to spread any of the vegetative parts of the plant as re-growth from roots, **stolons** and **rhizomes** can occur. Mowing should be used with caution as it encourages enhanced vegetative spread. Currently no biocontrol agents are available. In soils with low nitrogen and sulphur levels (such as pastures and range areas), where grass species are growing amongst the hawkweed, the competitive ability of grasses can be increased through application of fertilizer with nitrogen and sulphur components. Spring treatments with both nitrogen fertilizer and herbicide is recommended, however fall herbicide treatments are also effective for control. Hawkweed is a poor competitor in annual cropping systems especially if combined with herbicide's which can be used throughout season.

Wild caraway (*Carum carvi*)

Description:

Distinguishable by its parsley look and white flowers. Develops a narrow **taproot**, like a carrot, and it grows in a variety of soil types. Several stems are attached to each plant, with the leaves alternately arranged on the stem and finely divided. The flowers are white but occasionally have a pinkish tinge. They occur in groups and cluster at the top of the stems. Plant height ranges from 60 cm to 90 cm. A similar plant often mistaken for Wild Caraway is Wild Carrot. The easiest way to distinguish between the two plants is the flowers on the stem. Wild Caraway is either **bractless** or has one to three **bracts**, whereas Wild Carrot has a distinct **whorl** of widely divided **bracts**. Wild Caraway also flowers in late spring to early summer, much earlier than Wild Carrot. Wild Caraway has a two year life cycle and begins growth in early spring. It produces a low growing **rosette** of leaves in its first year of growth, and then a flowering white stalk in its second year. The weed can flower a third year before it dies and the seedlings can even handle some spring flooding and mild frost.



Photo Credit: swbiodiversity.org
Plant Name: Wild caraway

Management:

The best control option for Wild Caraway is to stop the plant from going to seed. In addition, the plant is easiest to control in its first year of growth with a residual herbicide. Repeated mowing has proven ineffective as the plant continues to flower closer and closer to the ground allowing for seed dispersion to take its course. Hand-pulling is effective as it does not have an intricate rooting system, as well small infestations can be managed throughout the season. If the weed has gone to seed, be sure to bag it and dispose of it in a landfill. Herbicides are most effective before plants flower, which can be early for this species so plants should be treated early in the spring where possible.



Photo Credit: swbiodiversity.org
Plant Name: Wild caraway



Photo Credit: swbiodiversity.org
Plant Name: Wild caraway

Annual bluegrass (*Poa annua*)

Description:

Annual bluegrass is a cool-season grass weed that starts germinating in late summer or fall and continues to germinate throughout winter, allowing several flushes of germination at any one site throughout the season. It has a short maturation period and produces viable seeds only a few days after pollination. Annual bluegrass grows 15 to 20 cm high when left not mowed. It has light green flattened stems that are bent at the base and often rooted at the lower stem joint. Leaf blades are often crinkled part way down and vary from 2.5 to 7.5 cm long with typical *Poa* boat-shaped leaf tips. The **inflorescence** has branched **panicles** that are 2.5 to 10 cm long. Seed clusters, also called seed heads, can form as soon as plants are six weeks old, although this can occur from early fall through early summer (in warmer climates), most seed heads are formed in spring.



Photo Credit: umass.edu
Plant Name: Annual bluegrass

Management:

Maintenance gardeners frequently spread weeds from site to site when weed seeds contaminate mowers, string trimmers, and airifiers. Cleaning landscape equipment after use in infested sites can help prevent annual bluegrass from spreading to non-infested areas. If solitary plants of annual bluegrass are found, they should be removed before seed production starts. Isolate small areas of infestation until control can be accomplished. Hand pulling or hoeing to remove annual bluegrass can be effective as long as it is done frequently. Because dense seedling infestations are common, open areas where old plants have been removed will often have new flushes of seedling plants. Controlling annual bluegrass infestations manually is very expensive in commercially maintained landscapes and usually not practical. Annual bluegrass is a threat to the fine seed industry; it is difficult to control with herbicide because of its genetic variation. Herbicides can be applied but need to be applied before seed production and sporadically throughout the season being careful not to kill desired vegetation.



Photo Credit: swbiodiversity.org
Plant Name: Annual bluegrass
Plant Part: Panicle



Photo Credit: umass.edu
Plant Name: Annual Bluegrass

Common toadflax (*Linaria vulgaris*)

Description:

From perennial and creeping **rhizomes**, the yellow toadflax sends up several slender stems, erect and often branched. Once in bloom, they resemble a small version of the snapdragon. The yellow toadflax flower has a distinct snapdragon-like flower that is yellow (or even a pale cream at times depending on growing conditions) with a “bearded” orange **throat**. They grow to about 2.5 cm long. The flowers grow in a dense terminal elongated cluster and bloom between July and October. The mouth of the flower is completely closed and never opens until a bee forces it open. Yellow toadflax has numerous pale green, narrow leaves that are pointed at both ends. Leaves are about 6 to 7 cm long and grow alternately on the stem but may appear to be opposite. This wild edible weed often grows 30 to 60 cm tall.



Photo Credit: ISCBC
Plant Name: Common toadflax



Photo Credit: ISCBC
Plant Name: Common toadflax



Photo Credit: ISCBC
Plant Name: Common toadflax

Management:

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. Pasture invasions flourish because the plant is not palatable to livestock. Repeated cultivation can effectively destroy the root system. Equipment should be thoroughly cleaned after. Thorough hand-pulling can be effective in soft soils where the roots can be removed may be done throughout the season. Repetition is required to deplete the seed bank and all root pieces. Mowing can assist by starving the roots. Some herbicides have been helpful in managing this invasive plant, but chemical applications should be completed early in the season before flowers are produced.

Creeping (Canada) thistle (*Cirsium arvense*)

Description:

Canada thistle is an herbaceous perennial with erect stems 30 cm to 80 cm tall, prickly leaves and an extensive creeping rootstock. Stems are branched, often slightly hairy, and ridged. Leaves are lance-shaped, irregularly lobed with spiny, toothed **margins** and are borne singly and alternately along the stem. Rose-purple, lavender, or sometimes white flower heads appear from June through October, generally, and occur in rounded, umbrella-shaped clusters. The small, dry, single-seeded fruits of Canada thistle, called **achenes**, are 2.5 to 3.8 cm long and have a feathery structure attached to the seed base.



Photo Credit: ISCBC
Plant Name: Creeping thistle
Plant Part: Seedling



Photo Credit: ISCBC
Plant Name, Creeping thistle



Photo Credit: ISCBC
Plant Name: Creeping thistle

Management:

Canada thistle spreads primarily by an expanding root system and vegetative reproduction. Seeds of the plant can remain viable in the soil for 21 years therefore, preventing seed production should also be considered. Combinations of control practices, such as grassland management; a well-designed Integrated Pest Management program; or mowing, fire, herbicides, and biological control agents together, may reduce Canada thistle infestations the most successfully. Hand pulling is not effective for controlling established stands of Canada thistle because root reserves can survive if the plant is not completely removed. Regular cultivation has been used to control Canada thistle in cropland. Cultivation can break up the root system, but the land is susceptible to reinvasion if not cultivated regularly. Several herbicides have been labelled for Canada thistle control in annual and perennial crops, fallow cropland, rangeland, pasture, and on non-cropland. Fall time herbicide applications are most effective for long term control, but recommend no tilling after the use of herbicides on established patches. Multiple faceted treatments may be needed to provide the Canada thistle control desired in a long-term management plan.

Kochia (*Kochia scoparia*)

Description:

Kochia is an annual herbaceous plant that has a deep **taproot** and grows 48 cm to 1.5 m tall. Kochia stems are upright and spreading with many branches. Flowers are small and green, grouped in clusters in the upper leaf **axils** and on terminal spikes. Kochia leaves are alternately arranged and are 2.5 to 5 cm long. They are narrow to lance shaped with smooth, hairy edges and may have silky hairs on leaf undersides. Stems are upright, branched and have hairs on the upper parts of stems, sometimes tinged red. Each flower forms a small inflated seed bearing structure that is covered by the **sepals**. Seeds are wedge-shaped and light brown.



Photo Credit: ISCBC
Plant Name: Kochia



Photo Credit: ISCBC
Plant Name: Kochia



Photo Credit: ISCBC
Plant Name: Kochia

Management:

As Kochia germinates early in the spring, delayed seeding and pre-seeding tillage or pre-seeding herbicides will help reduce in-crop weed densities. A number of herbicides are registered for control of Kochia. The key to success with most of these products is to spray early. Remember that Kochia is one of the first weeds to emerge in the spring and is usually well advanced by the time other broadleaf weeds are ready to spray. Choose an herbicide that provides the widest possible window of application for Kochia and the other weeds in your field. Good spray coverage is important for heavy infestations of Kochia, especially when using contact herbicides. Because the majority of Kochia seeds don't live for more than one year, preventing seed production for a single year will help reduce Kochia problems. Mowing or cutting for feed are effective ways of controlling Kochia seed production, as long as the plants have not yet set seed. Mechanical efforts can be made season long whereas being that herbicides selection is limited for Kochia are best applied early in season.

Night-flowering catchfly (*Silene noctiflora*)

Description:

Night-flowering catchfly is an annual herb producing a hairy, **glandular** stem up to about 75 or 80 cm in maximum height. It is sticky in texture. The hairy, widely lance-shaped leaves grow in opposite pairs and are up to 14 cm long and 5 cm wide, the largest ones located low on the stem. The flowers are nocturnal, and occur in an open **cyme** of up to fifteen blooms, each borne on an erect **pedicel**. The flower is encapsulated in a hairy **calyx** of fused **sepals** lined with a netlike pattern of veining. The 5 petals are white to pink and each has 2 **lobes** at the tip. They measure up to 2.5 cm wide when fully open. The fruit is a yellowish-brown **capsule** with six chambers which splits open to release the seeds.



Photo Credit: anpc.ab.ca
Plant Name: Night-flowering catchfly



Photo Credit: nps.gov
Plant Name: Night-flowering catchfly



Photo Credit: minnesotawildflowers
Plant Name: Night-flowering catchfly

Management:

Shallow cultivation can create sufficient disturbance to population density of this plant. In Britain, stubble burning and early tillage has decreased density, but this weed flowers much later in Britain than in BC. Resistant or somewhat resistant to several common herbicides, including 2,4-D, and MCPA. More consistent management is often achieved with combinations of 2 or more herbicides. Improved separation of crop seed has reduced the spread of night-flowering catchfly. Mechanical options like cultivation can be achieved season long always preventing seed production. Herbicides are generally most effective if used early in the pre bud stages.

Oxeye daisy (*Chrysanthemum vulgare*)

Description:

Oxeye daisy has daisy-like flowers at the end of course, slender stems, with lower spoon-shaped leaves. Central yellow **disks** grow 10-20 mm wide and white **ray** flowers 1-2 cm long. The plant can grow up to 1 m in height at maturity. Oxeye daisy is often confused with the ornamental Shasta daisy, which has larger yellow disk (2-3 cm) and white **ray** flowers (2-3 cm). Oxeye daisy reproduces by seed and underground stems. A single plant produces 26,000 seeds and dispersal from parent plants lead to nearby infestations. Due to its unpleasant taste, most grazers avoid this plant, leaving it to spread easily within grazed grasslands, pastures, and rangelands.



Plant Name: Oxeye daisy



Plant Name: Oxeye daisy

Management:

Resist invasion of oxeye daisy by managing tenured areas appropriately to maintain healthy plant communities. Mowing may effectively reduce seed production, but should be repeated as it may stimulate vegetation growth. Grazing by sheep and goats may reduce oxeye daisy populations. Pulling or digging up plants, ensuring that most roots are removed. New shoots may emerge from remaining root portions. Follow-up treatments will be required as seeds can remain viable in the soil for many years. No biocontrol agents are currently available for oxeye daisy in BC. Further research is required. Herbicide recommendations and use must consider site characteristics and be prescribed based on site goals and objectives. Manual treatments can be done season long ensuring the flower heads are gathered. Herbicides should be used pre bloom if possible. Residual products do offer assistance with long term control.

Scentless chamomile (*Matricaria perforate*)

Description:

Scentless chamomile has single, white, daisy-like flowers with yellow centers at the ends of each branched stem. Flowers are odourless when crushed, with semi-erect stems that are smooth and branched with fern-like leaves. Fruits are dark brown, rectangular, with 3 prominent, wing-like ribs on one side and a pale brown broad central area on the other side. Mature plants reach 15 cm to 1 m in height.



Photo Credit: ISCBC,
Plant Name: Scentless chamomile



Photo Credit: ISCBC, Plant Name: Scentless chamomile,
Plant Part: Rosette / Fern-like Leaves



Photo Credit: ISCBC, Plant Name: Scentless chamomile

Management:

Frequent shallow tillage will manage seedlings effectively by encouraging germination of seeds after the current seedlings have been destroyed. Plants are less likely to re-establish if soils are tilled during hot, dry weather and before plants flower. Seed production can be reduced if plants are mowed before they flower in pastures, hay land, and non-crop land. Scentless chamomile produces new flowers below the cutting height of the swather. Mowing will be effective only if the stands are mowed early and often, with each successive mowing lower than the previous one. Hand-pulling can be done season long but is only feasible on smaller infestations. Scentless chamomile does not compete well with vigorous plants. Numerous herbicide options are available to assist in controlling Scentless Chamomile. Herbicides should be applied before seed production starts, and may require multiple treatments throughout the season due to non-stop germination.

Tall/Meadow buttercup (*Ranunculus acris*)

Description:

This species is variable in appearance across the world. It is a somewhat hairy plant that has ascending flowering stems bearing glossy yellow flowers about 25 mm across. There are 5 to 9 overlapping petals borne above five green **sepals** that soon turn yellow as the flower matures. It has numerous **stamens** inserted below the **ovary**. As with other members of the genus, the numerous seeds are borne as **achenes**. This and other buttercups contain ranunculin, which breaks down to the toxin protoanemonin, a chemical that can cause dermatitis and vomiting. The flowers are **hermaphrodite** and are pollinated by Bees, flies, beetles, lepidoptera. Perennial growing to 1 m.



Photo Credit: UNBC, Plant Name: Tall buttercup



Photo Credit: umass.edu,
Plant Name: Tall buttercup



Photo Credit: umass.edu,
Plant Name: Tall buttercup

Management:

Hand pulling and digging to extract all of the rootstock may be an effective method to temporarily reduce small-scale infestations and scattered plants, either as new invaders or those persisting after herbicide treatments. However, any **rhizomes** left in the soil will regenerate into new plants and follow-up control will be needed to target those plants and plants regenerating from the soil seed bank. Pulling **rosette** and flowering plants will reduce seed set. The disturbance of tillage can create a favourable environment for tall buttercup growth and reproduction by reducing competitive perennial plants. Therefore, tillage has the potential to spread tall buttercup and is not recommended unless integrated with herbicide management and followed by revegetation with desired, competitive plants. Optimum timing for herbicide application is during the leafy phase in late spring prior to flower-shoot growth.

American dragonhead (*Dracocephalum parviflorum*)

Description:

American dragonhead is a member of the mint family. Flowers are in a thick spike 2.5 to 10 cm long at the top of the stem and at the end of stems arising from upper leaf **axils**. Individual flowers are about 6 mm long, pale blue-violet, tubular with a notched upper lip and a 3-lobed lower lip. The **bracts** are long, hairy, sharply toothed with spines at the tooth tips. Leaves are to 7.5 cm long and 2.5 cm wide, light to medium green, with large, coarse sharp teeth, a pointed tip, rounded or tapered at the base and a slender stalk. Attachment is opposite and there are often small leaflets clumped in the leaf **axils**. Leaf surfaces and the stem are smooth to sparsely hairy. Stems are square and typically branched. The flower head dries to brown as fruit matures. Fruit is a black, 1-seeded **nutlet**. **Looks like Hempnettle (*Galeopsis bifida*), see the photo's below.**



Photo Credit: UNBC,
Plant Name: Hempnettle



Photo Credit: umass.edu,
Plant Name: Hempnettle



Photo Credit:
theuniversesmiles.blogspot.ca.
Plant Name: American
dragonhead



Photo Credit:
wisflora.herbarium.wisc.edu, Plant
Name: American dragonhead

Management:

American dragonhead is not usually a large issue in agricultural production. This is likely due to its low competitive ability, evidenced by how it is almost completely replaced by other species about 3 years after the plant has colonized a new area after a disturbance. Thus, early seeding of a crop with a low disturbance method to lessen germination of the plant will likely be sufficient to keep the weed well under management. Treating manually can be done season long while herbicide applications are best done early (pre bud).



Photo Credit: wnmw.edu,
Plant Name: American dragonhead

Arrow Grass (*Triglochin maritima*)

Description:

Arrow grass is a perennial that has fleshy, dark-green, half-rounded, grass-like leaves that grow from the base of the plant. Although clumps of leaves are only 15 to 45 cm tall, slender flower stalks may reach a height of 1.5 m. Small, green flowers appear close together along the upper part of the stalk early in the season. Later, the flowers develop into golden-brown fruits. Species of arrow grass are widely distributed in marshy areas and wet meadows throughout the United States. Arrow grass grows on wet, alkaline soils and may be found growing over large areas or small patches near springs. Arrow grass starts growing in early spring. It is often found growing in native meadows that are cut for hay. Arrow grass cut for hay may be toxic.



Photo Credit: berkeley.edu, Plant Name: Arrow grass



Photo Credit: british-wild-flowers.co.uk,
Plant Name: Arrow grass



© 2003 Eleanor Saulys

Photo Credit: botanical-society.org,
Plant Name: Arrow

Management:

Keep animals off areas where the growth of arrow grass has been retarded by drought or frost or regrowth following harvest. The action of hydrocyanic acid is so rapid that it is usually too late to treat an affected animal after the signs of poisoning are recognized. Some poisoned animals may be saved by immediate treatment and consultation with your veterinarian is recommended. Arrow grass can be controlled by select herbicides when applied during seed stalk elongation. Manual efforts for control should include the removal of the entire plants and can be done season long.

Bladder campion (*Silene cucubalus*)

Description:

Perennial growing to 0.6 m; white **taproot** and numerous deep penetrating woody branching roots; stems and leaves light green to whitish with a waxy bloom (fine powdery coating); bladder-like **calyx** has green to purplish veins and 5 short triangular teeth. It is sometimes confused with night-flowering catchfly (*Silene noctiflora*) or white cockle (*Lychnis alba*) but has no hairs and is virtually waxy throughout. **See photos at the bottom of the page for comparison photos.**



Photo Credit: *uvm.edu*, Plant Name: *Bladder campion*

Management:

Alternate cropping and intensive summer fallow will give good control of bladder campion. This rotation will reduce it to the point where it does not seriously interfere with successful crop production. After-harvest tillage is especially important to destroy new seedlings and new sprouts which develop as soon as the crop is removed. Cultivation is most beneficial if it is deep enough to cut the roots off below the **crown**. Such cultivation must be thorough to ensure that all plants are cut off. Care should be taken to prevent new infestations starting from seed or root segments. Manual treatments may be done season long removing the seed heads and most of the plant if early in season. Herbicides are effective but are best applied early in season to prevent seed growth. Fall time applications with residual products also offer long term control.



Photo Credit: *nps.gov*,
Plant Name: *Night-flowering catchfly*



Photo Credit: *anpc.ab.ca*,
Plant Name: *Night-flowering catchfly*



Photo Credit: *wildflowersofontario.ca*,
Plant Name: *White cockle*



Photo Credit: *omnilexica.com*,
Plant Name: *White cockle*



Photo Credit: *actaplantarum.org*,
Plant Name: *Bladder campion*

Bluebur western (*Lappula spp*)

Description:

This is an annual herb from the Boraginaceae family. This plant grows from a **taproot** 10 to 80 cm tall. The stems are short, straight, usually branched, and appressed-hairy throughout. The **basal** leaves are broadly lance shaped with the stem leaves being narrower in shape, reduced upwards, unstalked, entire, and alternate. The flowers are blue with 5 yellow bulges at the **throat**. The seeds are small, round, black, **burrs**.



Photo Credit: nps.gov
Plant Name: Bluebur western



Photo Credit: mountainnature.com
Plant Name: Bluebur western



Photo Credit: natureray.com
Plant Name: Bluebur western

Management:

Bluebur plants can easily be pulled up by hand, through several manual applications and 5 years or so of monitoring is necessary to ensure control of plants germinating from buried seeds. Diligent care must be taken to remove and dispose of nuts that attach to clothing or gear during control efforts, for this species is commonly introduced to new areas by animal and human dispersal. Best managed manually when infestations are smaller in size. Infestations can be mechanically treated throughout the season. Herbicide treatments are effective on Bluebur. Many different products are available, but most are best used while plants are in pre bud growth.

Buckwheat, wild (*Polygonum convolvulus*)

Description:

Wild buckwheat is an annual plant with a vining growth habit and **fibrous** root system. The stem below the seed leaves of wild buckwheat seedlings is smooth or slightly rough, erect, and sturdy. It grows 12 to 43 mm long by the time the seed leaves are fully formed. The **cotyledons** are oval, up to 18 mm long, and about 3 mm wide, have rounded tips and base, and they are attached to the main stem by a leaf stalk less than 3 mm long. True leaves are alternate and appear one at a time after the seed leaves grow to their maximum size. The **petiole** of true leaves is 6 to 18 mm long. A papery **sheath** called an **ochrea** wraps around each **petiole** where it joins the main stem. The first true leaves are oval, up to 2.5 cm long and half as wide. They have pointed tips and two rounded **basal lobes** that eventually become pointed, giving the leaves an arrowhead or heart shape. When the seedling is a few inches tall, its weight bends the stem over and the plant begins to grow along the ground in search of upright support.



Photo Credit: oregonstate.edu
Plant Name: Buckwheat, wild



Photo Credit: berkeley.edu
Plant Name: Buckwheat, wild



Photo Credit: umass.edu
Plant Name: Buckwheat, wild

Management:

One factor is seed production, seeds are produced in great numbers and can remain dormant for up to 5 years. Another factor is the seedlings' ability to germinate throughout the summer and emerge from great depths. As a result, burying seeds by tilling is ineffective and harrowing before crop emergence actually increases the number of wild buckwheat plants that will emerge. One of the most effective ways to control wild buckwheat is to purchase clean crop seed. Crop seed contaminated by only 1% of its weight in wild buckwheat seed can distribute twenty-seven weed plants per square meter. It is sometimes deep and **fibrous** root system make manual treatments difficult, for smaller infestations the seed heads should be picked at the very least. Although immune to several popular herbicides, there are still many products that will control growth. Applications in early stages when plants are actively growing but not yet produced seed are recommended.

Bull thistle (*Cirsium vulgare*)

Description:

Bull thistle is often mistaken for Creeping (Canada) thistle. Bull thistle is a branching, erect biennial, 60 cm to 2 m tall. **Rosettes** form in first year, flowering stems the second. It has long sharp spines on the leaves at the midrib and the tips of the **lobes**. Leaves are deeply lobed and hairy and there are coarse hairs on leaf tops, making leaf feel rough to the touch, and woolly hairs on the underside. The leaf bases extend down onto stems and form spiny wings along the stems. Pink-magenta flower heads top each stem between June and September. Flower heads are "gumdrop" shaped and spines extend all around the base of the flower heads.



Photo Credit: brandeis.edu
Plant Name: Bull thistle



Photo Credit: oregonstate.edu
Plant Name: Bull thistle



Photo Credit: anpc.ab.ca
Plant Name: Bull thistle

Management:

Bull thistle can be dug up with a shovel. Usually removing the top couple of inches of root is sufficient to kill the plant, especially after it has bolted (produced stems). A shovel or other tool can be used to chop off leaves from one side of the plant to gain easier access to the roots, which can then be dug up. Flowering stems should be collected and destroyed to keep them from forming viable seed. Mowed thistles will produce new branches from **basal** buds but close cutting or cutting twice per season will usually prevent seed production and reduce the population over time. Cultivation and tilling can also be effective to control bull thistle. There are several herbicides that work on Bull Thistle, but best applied when plant is in **rosette**, or early bolting stage. Pointless once the plant has produced seed, unless using a residual product for treatment. Generally for every Bull thistle you can see, there is a **rosette**, somewhere close by.

Chickweed, mouse eared (*Cerastium spp.*)

Description:

Mouse-ear chickweed is a perennial herb that reproduces by seeds and spreads by rooting along its creeping stems. The root system is shallow and **fibrous**. The branched stems are green or purple and grow 15 to 50 cm long. Flower-bearing stems grow erect, rising about 10 cm above the densely matted growth that forms as the rest of the stems trail along the ground. Leaves are dark greyish-green, opposite, and attached directly to the stem. The leaves are oval or lanceolate in shape, 1 to 2 cm long, and 3 to 6 mm wide. Leaves on the lower part of the stem often have clusters of smaller leaves in their **axils**, where the main leaf joins the stem. The entire plant is covered with short white hairs.



Photo Credit: biosurvey.ou.edu
Plant Name: Chickweed, mouse eared



© Peter Smith

Photo Credit: omafra.gov.on.ca
Plant Name: Chickweed, mouse eared

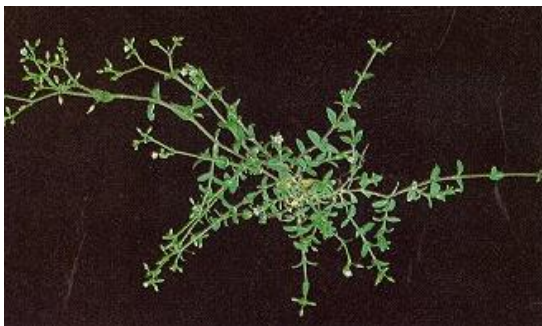


Photo Credit: omafra.gov.on.ca
Plant Name: Chickweed, mouse eared

Management:

Maintaining a healthy grass sod is the best way to prevent mouse-ear chickweed from invading turf. The weed can easily take over in areas where grass is thin. Close mowing does not kill mouse-ear chickweed; it only encourages the weed to hug the ground more closely. However, close mowing does help to prevent seed production and may be the best solution in lawns. Since the root system is shallow and weak, small patches may easily be hoed out, and the ground reseeded or covered with new sod. Liming the soil may discourage chickweed in bluegrass lawns. If mouse-ear chickweed is an extensive problem in established turf, chemical herbicides can bring it under control. In hay fields, as in turf, the best weed control is to maintain a healthy crop. Using herbicides for weed control is most effective during early growth. Manual treatments to smaller infestations can be done throughout the season but need to ensure no seeds are left behind.

Cleavers (*Galium aparine*)

Description:

Cleavers are annuals with creeping straggling stems which branch and grow along the ground and over other plants. They attach themselves with the small hooked hairs which grow out of the stems and leaves. The stems can reach up to 1 m or longer, and are angular or square shaped. The leaves are simple, narrowly **oblanceolate** to linear, and borne in **whorls** of 6 to 8. Cleavers have tiny, star-shaped, white to greenish flowers, which emerge from early spring to summer. The flowers are clustered in groups of two or three, and are borne out of the leaf **axils**. The globular fruits are **burrs** which grow one to three seeds clustered together; they are covered with hooked hairs which cling to animal fur, aiding in seed dispersal.



Photo Credit: tamu.edu
Plant Name: Cleavers

Management:

The number of cleavers seed can be reduced by summer fallowing. Plants can re-root in moist soil, so tillage is most effective under warm dry conditions. An early shallow tillage encourages germination of cleavers seeds. A second tillage, immediately before or at seeding destroys these seedlings. If delayed seeding is not possible, sow the crop early so that it gains a competitive advantage over cleavers. If pre-seeding tillage is performed then post-seeding tillage should not be necessary. Crops that are seeded early may not benefit from post-seeding tillage because crop growth may be too advanced before weed emergence is complete. Fall tillage will encourage cleavers seeds to germinate and the seedlings will be killed by frost. Rotations that include summer fallow, cereals and annual and perennial forages should help minimize cleavers populations. Winter annual cereals are especially effective. Do not grow canola on land infested with cleavers because cleaning cleavers seed from the crop is very difficult. In heavy cleavers infested fields, crops such as barley and wheat will compete more vigorously with cleavers than oilseeds and pulses. Many herbicides are available to treat species, but is mainly only effective if plants are treated before they produce seed. Manual treatments are effective, but need to ensure all seeds are gathered. Basically remove plants.



Photo Credit: utexas.edu
Plant Name: Cleavers



Photo Credit: utexas.edu
Plant Name: Cleavers

Corn spurry (*Spergula arvensis*)

Description:

Corn spurry is an annual plant that is spread by seeds. It is branching, grows 15 to 40 cm high, sparsely hairy, and somewhat sticky and slender. The bright green, needle-like, leaves form **whorls** of 6 to 10 around the stem at each **node**, about 2.5 cm long, and are rounded on the upper surface and grooved on the lower surface. The flowers, which emerge in July, are white with 5 petals that are about 6 mm across. The flowers open in sunshine and grow in clusters in which the central flowers open first and are borne on stalks about 12 mm long. These stalks turn down as the **capsule** matures and then turn upward. The seeds are borne in a **capsule** which splits into five sections when mature. The seeds are small, dull black, lens-shaped, with a small notch at one side and have a pale narrow wing. The seeds ripen in July and August. Corn spurry can produce mature seeds ten weeks after germination.



Photo Credit: commanster.eu
Plant Name: Corn spurry

Management:

Corn spurry establishment is best controlled by prevention. Corn spurry is not able to emerge from great depths. Regular cultivation can help; however, burial increases the longevity of the seeds which will eventually resurface due to the cultivation. A number of herbicide options are available.



Photo Credit: commanster.eu
Plant Name: Corn spurry
Plant Part: Slender Branching Stems



Photo Credit: biopix.eu
Plant Name: Corn spurry

Curled dock (*Rumex crispus*)

Description:

Curled dock is a perennial in the Buckwheat Family growing 0.8 to 1.5 m tall with a deep penetrating yellow **taproot**, dark green wavy, crisp **margin**ed leaves that turn a rusty-red colour when mature. It produces 3,000 to 4,000 seeds per plant. Dock seedlings are not very competitive against healthy, rapidly growing pasture grasses, but once established, the root system is extensive and very difficult to control.



Photo Credit: umass.edu
Plant Name: Curled dock
Plant Part: Rosette



Photo Credit: umass.edu
Plant Name: Curled dock



Photo Credit: opsu.edu
Plant Name: Curled dock

Management:

Curled dock can be rather difficult to control using cultural weed control methods. It can withstand lawn mowing and large variances in soil moisture. Even if the weed and its roots are pulled, Curled dock seeds still can remain viable underground for more than 50 years. Manual control methods are not effective for large infestations as the root system is extensive. Small infestations can be easily removed manually throughout the active grow season. There are many products that can control Curled dock, but are really only effective pre bloom early in season. Larger established infestations will require multiple treatments for multiple years to gain control. In this situation a residual product is best suited as it will always be assisting with killing newly sprouted seeds.

Dame's rocket (*Hesperis matronalis*)

Description:

First-year plants develop into low **rosettes** at ground level. Flowering plants start as a **rosette** in early spring, but soon send up an erect, 61 cm to 1.2 m tall flower stem. Flower clusters branch out from the upper parts of the plant. It often grows in extensive stands. **Rosette** leaves are up to 15 cm long. Flowering-stem leaves are pointed and lance-shaped, 5 to 15 cm long, wider at the base, and attached alternately along the stem. Leaves decrease in size up the stem. Lower leaves usually have short **petioles** (leaf stalks), while the upper leaves attach directly to the stem. There are widely spaced teeth along the leaf edges. Both stems and leaves are covered with fine hairs.



Photo Credit: uwex.edu
Plant Name: Dame's rocket



Photo Credit: unbc.ca
Plant Name: Dame's rocket



Photo Credit: colostate.edu
Plant Name: Dame's rocket

Management:

Hand-pulling or digging flowering plants can be effective, especially in small infestations. Hand pulling alone is usually not practical in large or established patches, but is needed to catch flowering plants missed by other treatments. Plants can be pulled anytime during flowering and up until when seed pods are ready to shatter. When pulled, stems may break off at the base and the **taproot** may re-sprout if not removed. Hand-pulling can increase seed germination through soil disturbance, but this can also expedite depletion of the seed bank. The site should be monitored for several years to eliminate newly emerging plants. Herbicide applications can be effective, and best applied before viable seed has been produced. Fall treatments especially with residual products can be effective for short term control. Best control is when populations are small by manually removing the entire plant and not allowing any seeds to be left behind.

Flixweed (*Descurainia sophia*)

Description:

Flixweed is a grayish-green annual or winter annual that grows up to 1 meter high. Alternating branches and leaves that are two to three times divided into very narrow segments, some have star-like hairs. Flowers are very small, clustered at the top of the stem, petals pale yellow and not longer than the **sepals**. Seed pods are linear, 10 to 30 mm long, on stalks 6 to 12 mm long, and borne at an angle from the stem. The seeds themselves are about 1 mm long, oblong, bright orange in one row in each half of the pod.



Photo Credit: hopsu.edu
Plant Name: Flixweed



Photo Credit: ewu.edu
Plants Name: Flixweed



Photo Credit: ewu.edu
Plant Name: Flixweed
Plant Part: Fern-like Leaves

Management:

Flixweed seeds germinate in greatest number in the fall. These plants can then over-winter and continue to grow early in the spring. Many seeds also germinate in early spring. Plants begin flowering early in the summer and produce large quantities of seeds which mature early and shatter out very easily. Control of flixweed is important in the fall. Plants which are allowed to live over winter often take a great deal of moisture before spring tillage is possible. Those which escape spring tillage are usually too mature for good control with herbicides in the crop. Because the newly germinated plants are often not noticed in the fall, a careful inspection should be made to see if they are present. Delay fall tillage until a maximum number of seedling **rosettes** have emerged. Flixweed is not a particularly good competitor; therefore practices which produce a strong stand of grain are important in its control. Small infestations can be easily removed by hand anytime throughout growing season ensuring seeds don't pop. Easily controlled by many different herbicides throughout the season.

Foxtail barley (*Hordeum jubatum*) Native

Description:

Foxtail barley thrives in disturbed ground, waste places and moist depressions where soil is slightly saline or alkaline. It is a perennial with shallow, **fibrous**, roots, spreading by seed. Seed heads are grayish-green and 30 to 60 cm long, smooth, round, hollow, swollen at the **nodes**. The blades are rough, prominently ribbed, less than 5 mm wide. The **sheath** is ribbed but not rough, lower **sheaths** sometimes hairy, split. **Ligule** is membranous and less than 1 mm long with absent or rudimentary **auricles**. **Bristles** are green or reddish in early stage, shiny, cream color at maturity. They are 3 to 4 mm long, each with 4 to 8 long **bristles** that host a sharp point near base with minute **barbs** which readily stick to anything that passes. These **bristles** can cause irritation of mouth, eyes or skin of grazing cattle.



Photo Credit: swbiodiversity.org
Plant Name: Foxtail barley



Photo Credit: swbiodiversity.org
Plant Name: Foxtail barley



Photo Credit: siu.edu
Plant Name: Foxtail barley

Management:

Tillage usually provides good control of foxtail barley. For zero tillage systems, a combination of herbicides and cultural practices is required for control. Research by Agriculture and Agri-Food Canada at Lethbridge has shown that the use of higher seeding rates and banding instead of broadcasting fertilizer can increase crop yields by giving crops a competitive advantage over foxtail barley. Foxtail barley does not seem to compete well with thick grass complex. Manual treatments can be effective and can be done throughout the season. Collecting the entire plant is best. Herbicide options are extremely limited, and have to be applied before viable seed is produced otherwise not a productive exercise. Chemical treatments may have to take place multiple times throughout a season as it can germinate all season long.

Groundsel, common (*Senecio vulgaris*)

Description:

The plant is usually a winter annual, sometimes biennial, though it may germinate in all seasons. It grows from 10 to 46 cm tall. Flower heads are numerous, with yellow disk flowers, but no **ray** flowers. The heads are cylindrical, 6 to 12 mm long, with black-tipped **bracts** around the base. Leaves are deeply lobed with toothed **margins** and may be smooth to hairy. They have little or no stalks and are alternately arranged on the stem. **Basal** leaves are usually purplish on the under surface, 2.5 to 10 cm long and 1.5 to 3 cm wide. Plants typically have one stem that may have branching, 10 to 40 cm tall. The seeds are slender, ridged, about 1.5 cm long, and tipped with a tuft of silky white hairs. **A similar species is woodland groundsel (*Senecio sylvaticus*), see photos below.**



Photo Credit: ncsu.edu
Plant Name: Groundsel, common

Management:

In most situations, common groundsel is easily controlled by hand removal or cutting the plant off at its **taproot**. In larger areas, rototilling of young plants is effective. Mowing can be effective if blade is set as close to the ground as possible. Common groundsel in the home garden and landscape is best controlled using cultural and mechanical methods. Many herbicide options are available. Applications are best applied before seeds have developed, and multiple treatments may be required as species germinates all season. Fall applications with residual products are also effective.



Photo Credits: oregonstate.edu
Plant Name: Woodland groundsel



Photo Credits: altervista.org
Plant Name: Woodland groundsel



Photo Credit: oregonstate.edu
Plant Name: Woodland groundsel



Photo Credit: umass.edu
Plant Name: Groundsel common
Plant Part: Seedling



Photo Credit: ncsu.edu
Plant Name: Groundsel common

Hawksbeard, narrowleaf (*Crepis tectorum*)

Description:

Narrow leaf hawksbeard is an annual or winter annual with milky juice. The plant is 15 to 90 cm high, slender and branched. Stem leaves are narrow without teeth, and stalkless. The **basal** and lower leaves very variable, 10 to 15 cm long, usually with backward-pointed teeth. Flowers heads are bright yellow, usually in groups of 5, and up to 2 cm across when fully expanded. The **bracts** below the flower heads are in several rows, the outer row being shorter than the inner rows. The **bracts** of the inner row have short, oppressed hairs on their inner surfaces. Flowering begins about mid-June and continues throughout the summer. About 3 mm long, dark purple when mature and strongly ribbed. They have a **pappus** of soft white hairs which enable them to be borne by the wind.



Photo Credit: umass.edu
Plant Name: Hawksbeard, narrowleaf



Photo Credit: J. Lehmuskallio
Plant Name: Hawksbeard, narrowleaf



Photo Credit: J. Lehmuskallio
Plant Name: Hawksbeard, narrowleaf

Management:

Good tillage will control this weed on cultivated land. Where spring tillage is necessary to control over-wintered plants, it must be early and thorough. Plants which have not been thoroughly uprooted often continue to grow. The weed may readily become established in thin stands of forage crops, therefore, it is important that forage stands be kept as vigorous as possible. Good seeding practices, good quality seed, recommended varieties and the use of fertilizer are important. Early mowing of hay and forage on infested areas is necessary to prevent seed production. Hand pulling small infestations is easily done by pulling as much of plant out as possible. No need to dig. Can be done season long. Numerous of herbicides will work, and can be applied season long. Best applied pre-bloom, but plants are very easy to control no matter when they are treated.

Hemp nettle (*Galeopsis tetrahit*)

Description:

Hemp nettle is an annual forb in which flowers occur in dense clusters from leaf **axils**. Flowers can be purple, pink, white, or pale yellow with dark markings. Petals are fused into a tube with 2 lips. The **sepals** fuse to form a spine-tipped **calyx** that elongates as the fruit matures. Four clustered **nutlets** are produced from each flower. **Nutlets** are egg-shaped, 3 to 4 mm long, and smooth. Opposite leaves are stalked and egg-shaped to lance-like, and have large, rounded teeth and pointed tips. Leaves are prominently veined and covered in bristly hairs. Branched stems grow 15 to 100 cm tall and are square with bristly hairs. Stems are swollen below the leaf **nodes**, where stiff, downward-pointing hairs are found. **Fibrous taproot**. Rounded **cotyledons** have a notch at the tip and 2 pointed **lobes** at the base. The first leaves are opposite, coarsely toothed, and prominently veined.



Photo Credit: unbc.ca
Plant Name: Hemp nettle



Photo Credit: discoverlife.org
Plant Name: Hemp nettle



Photo Credit: umass.edu
Plant Name: Hemp nettle

Management:

Spring cultivation can control seedlings as they emerge. Repeated cultivation of summer fallow or other non-seeded areas may reduce populations. Clip forages with hemp-nettle infestations before seed-set Monitor feeding areas for new weeds. Clean equipment before leaving an infested site. Delayed seeding will allow early-growing seedlings to be removed by cultivation. Plant companion crops with slow-growing forage crops. Smaller infestations are easily controlled by simply pulling them. Can treat manually all season, long as the seeds are gathered. Hemp-nettle can be resistant to 2,4-D, although a number of herbicides are registered for control or suppression of hemp-nettle in various crops. Infestations are easily controlled with herbicides, and are best treated early in season before plants produce viable seeds.

Lamb's quarters (*Chenopodium album*)

Description:

An upright, branched, summer annual that grows 10 cm to 2 m tall. Branches generally arch upward, and stems are grooved, often purplish or with red stripes. Leaves are arranged alternately along branches, and are covered with tiny, white, granular scales. Leaf undersides and **margins** are sometimes purplish. Lower leaves are borne on stalks, have coarsely toothed **margins** or shallow **lobes**, and often resemble a goose's foot. Upper leaves do not have stalks and are narrow and linear. Leaves are 1.5 to 7.5 cm long and up to 3 cm wide. Tiny, petal-less, gray-green flowers occur in tightly clustered spikes at the ends of branches. Flowers are globular and are enveloped almost entirely by a cup of 5 green **sepals**. Flowers produce minute, smooth, circular black or brown seeds, covered with a thin, papery casing.



Photo Credit: *umass.edu*
Plant Name: *Lamb's quarter*
Plant Part: *Seedling*



Photo Credit: *umass.edu*
Plant Name: *Lamb's quarter*



Photo Credit: *umaine.edu*
Plant Name: *Lamb's quarter*

Management:

Maintaining a healthy perennial plant population or early establishment of annual plants can go a long way toward preventing common lambs quarters colonization. Soil solarization can be effective in reducing lambs quarters seed population in the soil. Tilling, hoeing, or hand-pulling must be done repeatedly throughout the season to control the continual emergence of seedlings. To avoid compaction and give lawns a competitive edge over lambs quarters, traffic should be minimized and the soil aerated. Consistent mowing, preferably before lambs quarters seed production can give highly effective control. Numerous herbicide options are available to control this species and can be applied season long, but applications should be done early to late spring before viable seeds are produced in summer. Small infestations can be easily removed by hand pulling.

Mallow (*Malva neglecta*)

Description:

Common mallow is a summer annual or biennial, freely branching at the base, with a prostrate growth habit. It is a low growing weed, with a deep fleshy **taproot**. The seeds germinate through the summer and broken stems can also root. This plant has stems that originate from a deep **taproot** and are low spreading with branches that reach from 3 to 60 cm long. The flowers are borne either singly or in clusters in the leaf **axils** blooming from June to late autumn. They have 5 petals and are white, pinkish or lilac flowers that measure on average, 1 to 1.5 cm across. Common mallow leaves are alternate, on long **petioles**, circular to kidney-shaped, toothed and shallowly 5 to 9 lobed, 2 to 6 cm wide. Short hairs present on upper and lower leaf surfaces, **margins** and **petioles**. This plant can grow anywhere from 10 to 60 cm in length. The common mallow likes to grow in lawns, gardens, roadsides, waste areas and cropland.



Photo Credit: *umass.edu*
Plant Name: Mallow



Photo Credit: *siu.edu*
Plant Name: Mallow



Photo Credit: *wnmu.edu*
Plant Name: Mallow

Management:

Mallows are best controlled mechanically by hoeing or hand pulling. Young mallow can also be killed by cutting them off at the **crown**, but older plants may re-sprout from the **crown**. If there are a large number of plants, shallow mechanical cultivation may be used when the plants are young. Cultural control can be done by planting competitive desirable plants in areas where mallow is a problem. The shade provided by these plants will reduce germination and growth of mallow seedlings. At least 3 inches of organic mulch, such as bark or wood chips, will make it physically difficult for the seedling to emerge and will screen out the amount of light that mallow requires to effectively sprout. However, the mulch must be maintained to ensure that it remains at the needed depth. Infestations that are smaller in size can be easily controlled season long by hand pulling, and removing root. Numerous different herbicides will control infestations. Plants can germinate season long so multiple treatments is sometimes required, but an early summer treatment will often give season long control.

Mullein (*Verbascum thapsus*)

Description:

They are biennial or perennial plants, rarely annuals or subshrubs, growing to 0.5 to 3 m tall. The plants first form a dense **rosette** of leaves at ground level, subsequently sending up a tall flowering stem. Biennial plants form the **rosette** the first year and the stem the following season. The leaves are spirally arranged, often densely hairy, though **glabrous** in some species. The flowers have 5 symmetrical petals; petal colours in different species include yellow (most common), orange, red-brown, purple, blue, or white. The fruit is a **capsule** containing numerous minute seeds.



Photo Credit: swbiodiversity.org
Plant Name: Mullein



Photo Credit: umass.edu
Plant Name: Mullein
Plant Part: Rosette



Photo Credit: swbiodiversity.org
Plant Name: Mullein

Management:

The best strategy is to control common mullein while the population density is low. Plant numbers can easily expand from a few to hundreds per acre in just a couple years due to prolific seed production. Sparse populations can be controlled by mechanical removal using a spade or shovel in late April and early May. Individual plants can be dug out or cut just at the soil surfaces as long as the whole **rosette** is removed. Single mowing of new 30 to 60 m tall plants can reduce population and seed production for the season, especially in dry years. Herbicides also can be effective in providing season long control; however, be aware that the thick woolly coat of hairs on the leaves can reduce herbicide uptake and control. Apply herbicide when the **rosette** has 6 to 12 leaves and before the stem starts to grow, which is usually in May to mid-June. Numerous herbicides will give effective control.

Mustard, dog (*Erucastrum gallicum*)

Description:

Dog mustard is an annual or winter annual, spreading by seeds. The erect stems are 10 to 60 cm high with the lower part of the stem having downward-pointing hairs. Leaves are alternate and have 1 per **node**. The leaves are often in a dense **rosette** in late autumn and early spring. The leaves are dark green to blackish-green, oblong, **pinnately** cut or divided in to coarsely lobed segments, and the bottoms of the spaces between the segments are somewhat rounded.



©2005 Gary Fewless

Photo Credit: uwgb.edu
Plant Name: Mustard, dog



©2005 Gary Fewless

Photo Credit: uwgb.edu
Plant Name: Mustard, dog



L. Allen

Photo Credit: anpc.ab.ca
Plant Name: Mustard, dog

Management:

Fairly easily controlled in cereals, forages, and flax as it is very easily outcompeted. It has more of the potential of becoming a problem in tame mustard and rapeseed crops. Small infestations can be easily controlled by pulling plants out at the base of the ground. Herbicides can be used season long as species is very susceptible to herbicides. Best application times are spring time before plants go to bloom. This allows zero seeds to be left behind. There is a wide range of products that are effective on this species. Best managed by seeding desirable species and simply out competing.

Mustards (*Sisymbrium* spp.)

Description:

N/A



Photo Credit: *discoverlife.org*
Plant Name: *Sisymbrium altissimum* (Tall Tumble mustard)



Photo Credit: *minnesotawildflowers*
Plant Name: *Sisymbrium loeselii* (Loesel's tumble mustard)



Photo Credit: *calflora.net*
Plant Name: *Sisymbrium irio* (London rocket)



Photo Credit: *naturspaziergang.de*
Plant Name: *Sisymbrium officinale* (Hedge mustard)

Management:

These plants all reproduce via seed production so seed heads should be removed, however, these plants are also easy to hand pull, bag, and dispose of in designated disposal areas.

Pineapple weed (*Matricaria matricarioides*)

Description:

Often mistaken for chamomile, pineapple weed is a close sister. It is an annual plant that grows from May to September. This wild edible weed grows in many countries in the northern and southern hemisphere and in some places is nicknamed "street weed". Pineapple weed looks like chamomile only without the flower petals. It is a low-growing plant with finely divided foliage that gives off a pineapple smell when crushed. Pineapple weed has a cone-shaped or rounded non-rayed, composite flower head that is yellow-greenish in colour. Pineapple weed leaves are finely divided into narrow, feathery segments. They grow alternatively along the stem and average from 2 to 4cm. long. Leaves are **glabrous**. This plant grows to about 30 cm tall.



Photo Credit: berkeley.edu
Plant Name: Pineapple Weed



Photo Credit: weedinfo.ca
Plant Name: Pineapple Weed
Plant Part: Seedling



Photo Credit: pittstate.edu
Pineapple Weed

Management:

This plant is not considered a problem in cropland. It is a nuisance plant in waste areas, and areas such as driveways and parking lots that do not have competition. Plants are easily out competed by competitive vegetation. Manual treatments can be done season long by simply pulling them out at the base. Remove seed heads at the end of the season to prevent future seed bank. There are many herbicide options available for control over pineapple weed. Best application time is while plants are in the pre bloom stage. Due to multiple germinations multiple applications may be required. Residual herbicides applied anytime throughout the season will provide decent long term assistance with controlling species.

Prickly lettuce (*Lactuca serriola*)

Description:

It is sometimes referred to as "wild lettuce", because it is closely related to, and inter-fertile with, cultivated lettuce. Another common name is "compass plant", because the leaves on the main stem are held vertically in a north-south plane, perpendicular to direct sunlight. Prickly lettuce forms a **rosette** of leaves after emergence, usually in autumn, and develops a long **taproot**. It overwinters as a **rosette**, and then produces one or more flowering stems in early summer. Each flowering stem bears many small (8 to 12 mm in diameter) yellow flower heads during July and August. The small, greyish brown seeds (4 to 5 mm long) have an attached **pappus** and are wind-dispersed. The leaves, roots and stems exude a milky juice when damaged. Prickly lettuce may be mistaken for dandelion, at the **rosette** stage, or for sow-thistles at any stage. All of these species are members of the sunflower family, contain a milky latex, have yellow flowers and produce numerous wind-dispersed seeds. A distinguishing feature of prickly lettuce is a row of spines along the midrib on the underside of the leaf. These spines are occasionally absent from small, upper stem leaves or from leaves on stems that have regrown after mowing.



Photo Credit: oregonstate.edu
Plant Name: Prickly lettuce
Plant Part: Rosette



Photo Credit: weedalogue.com
Plant Name: Prickly lettuce Plant
Part: Deeply Lobed Leaves



Photo Credit: tarleton.edu
Plant Name: Prickly lettuce

Management:

Seedlings and **rosettes** of prickly lettuce are easily controlled by cultivation, and it is not usually found in tilled fields. Mowing of **rosettes** is not an effective control practice, because leaves lie close to the soil surface. Plants that are mown after stem extension readily produce new stems or branches and flowers. **Rosettes** of prickly lettuce can be controlled in the fall or spring by non-selective herbicides and some cases with larger **rosettes** requiring higher rates. Plants are difficult to control with herbicides once the flowering stems have begun to elongate. Smaller infestations can be manually removed season long, assuring the seeds are removed. Many herbicide options are available for control. More than one application per year may be required as plants can germinate all season long.

Quackgrass (*Agropyron repens*)

Description:

Quackgrass is a weed that grows in patches or mats. The blades are usually broad (up to 8 mm wide), tapered, and attached to a hollow stem. Unlike crabgrass, they do not branch off, but instead, the clump of blades attach to a central patch of weeds. The color is a deep green-blue and often it turns brown in the heat of the summer. It can be easy to mistake quackgrass for crabgrass. One of the easiest ways to distinguish between the two plants other than looking at how the blades are attached to the plant is to try and pull the plant up out of the ground. Crabgrass has very shallow roots, making it very easy to pull up, even if it is a relatively large plant. Quackgrass, on the other hand, has very deep roots made of **rhizomes**. This makes a large established plant almost impossible to pull up out of the ground. Usually, these efforts only result in the plant breaking off at the base, but the roots remain so that the plant continues to thrive.



Photo Credit: purdue.edu
Plant Name: Quackgrass
Plant Part: Auricle



Photo Credit: www.wildflowerfarm.com
Plant Name: Crabgrass



Photo Credit: wildflowerfarm.com
Plant Name: Quack Grass

Management:

Quackgrass has very deep roots made of **rhizomes**. This makes a large established plant almost impossible to pull up out of the ground. Usually, these efforts only result in the plant breaking off at the base, but the roots remain so that the plant continues to thrive.

Sea buckthorn (*Hippophae rhamnoides*)

Description:

These shrubs reach from 0.5 to 6 m tall. The leaf arrangement can be alternate, or opposite. Common sea-buckthorn has branches that are dense and stiff, and very thorny. The leaves are a distinct pale silvery-green, lanceolate, 3 to 8 cm long and less than 7 mm broad. It is **dioecious**, with separate male and female plants. The male produces brownish flowers which produce wind-distributed pollen. The female plants produce orange berry-like fruit 6 to 9 mm in diameter, soft, juicy and rich in oils. The roots distribute rapidly and extensively, providing a non-leguminous nitrogen fixation role in surrounding soils.



Photo Credit: berkeley.edu
Plant Name: Sea buckthorn



Photo Credit: swbiodiversity.org
Plant Name: Sea buckthorn



Photo Credit: swbiodiversity.org
Plant Name: Sea buckthorn

Management:

There is very little data on management of this plant. However, other buckthorn species respond to hand pulling young plants, cutting and digging older plants. Ensure all fruits are picked up off the ground as they will leave seed behind. Often this species will grow almost bush or hedge like as most of these were planted as ornamentals. Over time there are many seeds deposited and could become a long term problem. Some herbicides are available for assisting in eradication, but care must be taken to remove fruits/seeds. Plants are sometimes treated by cut stump or girdling to maximize efficacy results.

Shasta daisy (*Leucanthemum x superbum*)

Description:

Shasta daisy is easily grown in average, dry to medium, well-drained soil in full sun. Tolerates light shade in hot climates. Shasta daisy, is a hybrid developed by Luther Burbank (1849-1926) in the 1890s near snow covered Mt. Shasta in northern California. Shasta's grow 90 cm to 1.2 m tall and spread 60 to 90 cm wide. The blooms have white **rays** and yellow center **disks**.



Photo Credit: plantsdb.gr
Plant Name: Shasta daisy



Photo Credit: plantsdb.gr
Plant Name: Shasta daisy



Photo Credit: umass.edu
Plant Name: Shasta daisy

Management:

These plants are commonly found in gardens and can be kept under control easily. As they are often mistaken for ox-eye daisy, it is important to keep Shasta daisies contained within a flower garden and treat if any signs of natural spreading occurs. A combination of mechanical and chemical methods can be used to terminate this plant. Be sure to dispose of all seed heads appropriately. Infestations are best managed when they are smaller. Can manually remove these plants any time throughout the season ensuring the seed / flower heads are removed and disposed of. There is a wide range of herbicides that can be effective. Most of these are best applied while the plants are in **rosette** form, as they have not yet produced any seed. Species can be easily managed.

Sheep sorrel (*Rumex acetosella*)

Description:

Sheep sorrel is a perennial herb that has a slender and reddish upright stem that is branched at the top, reaching a height of 0.5 m. The arrow-shaped leaves are small, slightly longer than 3 cm, and smooth with a pair of horizontal **lobes** at the base. It blooms during March to November, when yellowish-green (male) or reddish (female) flowers develop on separate plants at the **apex** of the stem, which develop into the red fruits (**achenes**). *Rumex acetosella* is widely considered to be a hard-to-control noxious weed due to its spreading **rhizome**. Blueberry farmers are familiar with the weed because it thrives in the same conditions under which blueberries are cultivated.



Photo Credit: ewu.edu
Plant Name: Sheep sorrel



Photo Credit: ewu.edu
Plant Name: Sheep sorrel



Photo Credit: umass.edu
Plant Name: Sheep sorrel
Plant Part: Arrow-shaped Leaves

Management:

Control of sheep sorrel can be difficult because of its creeping **rhizomes** and long-lived seeds. Plants are too short to be affected by mowing or grazing, and they usually survive prescribed burns. Repeated cultivation or frequent removal of re-sprouting plants will eventually exhaust the population. Several herbicides are available for use in pastures and lawns. Liming the soil may also help eradicate sheep sorrel. Seed removal is very important. Removal of plants can be done season long but is most effective early in the season before root system expands. Herbicides can be used but should be applied in the spring to early summer. These plants produce a lot of long lived seed. If fall treatments are being exercised then residual products should be utilized to assist with slowing down future growth of plants.

Smartweed (*Polygonum spp.*)

Description:

This genus primarily grows in northern temperate regions. They vary widely from prostrate herbaceous annual plants under 5 cm high, others erect herbaceous perennial plants growing to 3 to 4 m tall, and yet others perennial woody vines growing to 20 to 30 m high in trees. Several are aquatic, growing as floating plants in ponds. The smooth-edged leaves range from 1 to 30 cm long, and vary in shape between species from narrow lanceolate to oval, broad triangular, heart-shaped, or arrowhead forms. The stems are often reddish or red-speckled. The small flowers are, pink, white, or greenish, forming in summer in dense clusters from the leaf joints or stem apices. The genus name is from the Greek *poly*, "many" and *gonu*, "knee" in reference to the swollen jointed stem.



Photo Credit: fcps.edu
Plant Name: Smartweed



Photo Credit: brandeis.edu
Plant Name: Smartweed

Management:

This is an aquatic plant therefore chemical usage is restricted. Mechanical treatment that includes removal of the flower heads is very important. Due to the areas they tend to occupy plants should be manually removed with the focus being on gathering all the seed heads. This will sometimes be difficult but over time if seeds are gathered diligently, the species will decline and maybe eradication will be possible.



Photo Credit: brandeis.edu
Plant Name: Smartweed

Sow thistles (*Sonchus* spp.)

Description:

Perennial sow-thistle is a creeping rooted perennial growing 0.4 to 1.5 m tall; stems branch near the top; leaves with weak **marginal** prickles clasp the stem; plants contain a bitter milky juice; upper stalks and flower **bracts** usually covered in gland-tipped hairs; yellow flowers up to 3.8 cm broad often confused with annual sow-thistle (*Sonchus oleraceus*) which is **taprooted** and has much smaller flowers (less than 2.5 cm across) or spiny annual sow thistle (*Sonchus asper*) which has sharp, spiny leaves and smaller flowers.



Photo Credit: plant-identification.co.uk
Plant Name: Perennial Sow thistle

Management:

Because some sow thistle species are perennial and others are annuals controlling them is not so straight forward. For small infestations they can be hand-pulled, though their stout **taproots** can make this difficult causing a lot of soil disturbance as the plants are uprooted. As a result it is best to tackle these plants while they are small; mature perennial sow thistle will be particularly resistant to hand-pulling. They can also be cut down with a weed whip, mower or a metal blade hand tool but they are likely to re-sprout, and repeated cuttings will be needed. Manual removal of the flower heads can be done season long, but infestations should be dug up if possible. Herbicides are very effective on this species. Best applied early in the season from spring, to the middle of summer. If fall time applications are the only option, several residual herbicides are available and do offer long term control. There are many herbicides that are effective.



Photo Credit: minnesotawildflowers
Plant Name: Annual Sow thistle



Photo Credit oak.ppws.vt.edu
Plant Name: Spiny Annual Sow thistle

Stinking mayweed, Dog fennel (*Anthemis cotula*)

Description:

The finely divided leaves of stinking mayweed can allow it to be confused with a number of other weed species. It has the typical white and yellow "daisy-like" flowers of many Asteraceae weeds. The weed most similar in appearance is scentless chamomile. As suggested by their respective names, stinking mayweed has a very strong smell when crushed, unlike scentless chamomile, and the flowers are slightly larger in scentless chamomile and the leaflets slightly finer. Rayless chamomile (*Matricaria discoidea*) looks similar in the vegetative stage, but lacks the white **ray florets** ("petals") in the flower heads (hence the name). When crushed, rayless chamomile smells like pineapples, so is known as pineapple weed in some countries. Although the flowers of oxeye daisy are similar, the leaf shape is quite different. Yarrow has similar leaves but very different flowers despite being white. Stems usually erect, but low and bushy-branched, 10 to 60 cm high, usually hairless in the lower part but finely hairy just below the flower heads; leaves very finely dissected, soft, alternate (1 per **node**), numerous, or sparse where plants are crowded.



Photo Credit: oregonstate.edu
Plant Name: Stinking mayweed
Plant Part: Rosette / Fern-like Leaves



Photo Credit: oregonstate.edu
Plant Name: Stinking mayweed



Photo Credit: oregonstate.edu
Plant Name: Stinking mayweed

Management:

In pastures, stinking mayweed will eventually disappear by itself once it flowers because it is an annual, and pasture management should be used to improve density in the subsequent late winter to early spring period to prevent it establishing again. But if control is required, a number of herbicides work for this species but are best applied before seeds have been produced. Usually between early spring and the middle of summer. If infestations are smaller, then manual efforts are best. These can be done season long and are effective long as the **rosette** is removed including some root mass, and later in the season by removing the seed heads.

Stinkweed or Pennycress (*Thlaspi arvense*)

Description:

Grows to 5 to 60cm high, erect, branching in the upper part and sometimes also near the base, hairless. The first several leaves usually in a **basal rosette** at the ground surface, these with stalks and smooth or slightly wavy **margins**; lower stem leaves with shallow, irregular teeth, rounded towards the tip and tapering towards the narrow stalk which has 2 little **lobes** or **auricles** which clasp the stem; middle and upper leaves shallowly or sometimes deeply toothed, without stalks but with a pair of **lobes** at the base which strongly clasp the stem. Flowers white, very small (about 3 mm across) in rounded clusters at the ends of branches; seedpods very flat, rounded to oval, 8 to 12 mm wide and usually a bit longer; the central seed-containing portion slightly thickened but surrounded by a broad flat wing with a narrow deep notch at the tip, in the centre of which are the remains of the tiny **style**; seed-containing section divided into 2 compartments by a very narrow **septum**, each side containing 3 to 8 seeds; this white **septum** often remaining on the plant after the pod breaks apart to release the seeds; seeds reddish-brown to purplish or blackish, ovoid but somewhat flattened, 1.5 to 2 mm long with several rows of concentric ridges on each side. Flowers from early spring until late fall.



Photo Credit: commons.wikimedia.org
Plant Name: Stinkweed



Photo Credit: berkeley.edu
Plant Name: Stinkweed



Photo Credit: discoverlife.org
Plant Name: Stinkweed

Management:

Till early in the spring after stinkweed emerges (shallow tillage in summer, fall tillage will control the winter annual **rosettes**). Post-seeding tillage should not be required if pre-seeding tillage is done, or if seeding is after the main spring weed emergence. Seedlings will still germinate from existing seeds. Mowing prevents seed production but short plants may escape cutting. Manually removing plants and ensuring all the seeds are also removed is best for small populations. Can be done season long but easiest in spring before seeds are fully developed. Numerous herbicides offer control over species but are most effective in the spring. Residual herbicides applied any time will offer long term control.

Stork's bill (*Erodium spp.*)

Description:

Stork's bill is an annual or biennial, branched, herb that grows to be 5 to 50 cm tall. It has many limp-ascending stems, abundantly branched, hairy that are regular or slightly unequal, approximately 10 mm broad. It has 5 pink petals, sometimes with dark-spots at base, with entire tips, slightly different sizes (2 bigger than rest). There are 5 **sepals** usually clearly shorter than petals. The 10 **stamens** are scale-like, without **anthers**. **Inflorescence** is a 3 to 8 flowered **umbel**, terminating at the stems and branches. The leaves of the **basal rosette** and on the stem are opposite. The blades are narrowly triangular, feather-veined, and **pinnate**; leaflets are finely lobed.



Photo Credit: discoverlife.org
Plant Name: Stork's bill



Photo Credit: nathistoc.bio.uci.edu
Plant Name: Stork's bill



Photo Credit: commons.wikimedia.org
Plant Name: Stork's bill

Management:

New seedlings emerge very quickly after each tillage operation in the summer fallow. Therefore, it is not unusual to have five or six growths of this weed during the summer fallow year. Fall and spring cultivation of crop land will destroy seedlings from summer and fall-germinated seeds. On lighter soils where excessive fall cultivation is impractical, fall rye can be used as a control measure. Good crop competition from either fall rye or a spring-seeded cereal is an important factor in control. Manual removal of species can be done season long ensuring all of the seeds are gathered. Usually when species is found populations are too vast for manual treatments. A wide range of herbicides can be used for control, but may need to have several applications due to species having several germinations throughout any given season. Residual products do offer long term control, applied anytime.

Tarweed (*Madia glomerata*) Native

Description:

Tarweed is the most widely distributed *Madia*, its native range covering much of western and northern North America from Alaska to the Southwestern United States, most of southern Canada and into the Great Lakes region. *Madia glomerata* grows in a wide variety of habitat types, including disturbed areas such as roadsides. It is an annual herb sometimes exceeding a meter in height, its stem branched or not and covered in foliage. It is hairy to bristly in texture, studded with stalked yellow resin glands, and strongly aromatic with an unpleasant scent. The rough-haired leaves are up to 10 cm long. The **inflorescence** is generally a cluster of **glandular** flower heads with black-tipped yellow disc **florets** and sometimes one or more tiny greenish or purplish yellow **ray florets**. The fruit is a flat black **achene** with no **pappus**.



Photo Credit:
web.ewu.edu
Plant Name: Tarweed



Photo Credit: commons.wikimedia.org
Plant Name: Tarweed



Photo Credit: web.ewu.edu
Plant Name: Tarweed
Plant Part: Hairy, Bristly Texture

Management:

Maintain a strong, healthy competitive cover of perennial vegetation. Fertilize to soil test recommendation and do not over utilize the available forage. Seed bare or weak areas to an adapted perennial forage mix. Excellent control can be achieved with properly timed herbicide application. Application should be made when the tarweed is young and actively growing. Generally infestations are treated in the spring time as it will start germinating early in season and to avoid seed production plants should be treated earlier. Sometimes two or more applications are required as late season germinates are common. Residual herbicides can offer long term control in pastures. If manual efforts are to be made, these are effective if the plant is removed down to the **crown**, and seed heads are not left behind. Larger infestations are best left for cultivation (pre flower), followed by a reseeding regime. They do not like competition especially taller vegetation.

Western water hemlock (*Cicuta douglasii*)

Description:

The characteristics of water hemlock include its stem which is 0.5 to 2 m tall with purplish spots, thick roots, and leaves that are compound **pinnate** and alternate. The leaflets are usually 5 to 8 cm long and 1 to 2 cm wide with jagged edges. The flowers on it are compound **umbellate inflorescences** with many small, white flowers. There are two seeds for each flower. Seed dispersal for water hemlock seeds comes from means of wind, water, machinery, on clothing, and through transported soil.



Photo Credit: brazeau.ab.ca
Plant Name: Western water hemlock



Photo Credit: intermountainbiota.org
Plant Name: Western water hemlock



Photo Credit: sublettecountyweed.com
Plant Name: Western water hemlock

Management:

Control and avoidance of western water hemlock are the only ways to prevent livestock loss from poisoning. Plowing or repeated cultivation will prevent poison hemlock from establishing. If cultivation is not possible, mow the plants after they have bolted. Unfortunately, a single mowing will not provide complete control. Repeated mowing will reduce its competitive ability, deplete carbohydrate energy reserves in the **taproot**, and prevent seed production. Burning is not considered a useful method for poison hemlock control. Hand grubbing is a very effective method of removing western water hemlock, however, this plant is extremely poisonous so gloves and proper protective clothing must be worn. The roots must be entirely removed because they are attractive to grazing livestock and highly poisonous. Several herbicides are available and most are best applied pre bloom, as not seeds will be left. Residual products can offer longer term control, especially in areas with good competitive vegetation.

White cockle (*Lychnis alba*)

Description:

White cockle is a biennial or short-lived perennial with thick fleshy roots, reproducing only by seed. Erect, it stands 30 to 120 cm high, round, much branched if growing singly or branched near the top if plants are crowded, swollen at **nodes**, hairy, but not sticky. The leaves are opposite, oblong, pointed at the tip narrowed toward the stem and not toothed, 2 to 8 cm long, hairy. Flowers are white, and about 2 cm in diameter. Plants are either male or female. The flower of the male plant has ten **stamens** and its **calyx** has 10 veins. The flower of the female plant has five **styles** but no **stamens** and its **calyx** has twenty veins. Seed **capsules** are produced only by female flowers and when the **capsule** opens it has ten teeth around the opening. Flowers open at night from June to September and are quite fragrant.



Photo Credit: richmond.edu
Plant Name: White cockle



Photo Credit: wien.ac.at
Plant Name: White cockle



Photo Credit: habitas.org.uk
Plant Name: White cockle

Management:

White cockle is an extremely heavy seed producer. It is important that plants be prevented from setting seed by mowing, cultivating, pulling or burning. White cockle can be controlled by cultivation. Cultivation must be deep enough to cut the roots off below the **crown** and must turn the plant up to dry out. It must be done at a time when the soil moisture and temperature will ensure that the uprooted plants dry out and wilt rapidly. If the soil is very moist and temperatures are cool, plants may merely be transplanted by cultivation. Small infestations can be managed season long by digging and removing entire plant and root mass. Herbicides are effective and best applied pre bloom, usually from early spring to mid-summer. Residual products are effective and will offer descent long term control.

Wild mustard (*Sinapsis arvensis*)

Description:

Wild mustard is an annual plant that exhibits erect growth. The seedlings have broad kidney-shaped **cotyledons** that are indented at the tip. Older plants have alternate leaves that are somewhat hairy, especially on the lower surface of the veins. The lower leaves are usually stalked, deeply lobed with a large terminal segment and a few smaller lateral **lobes**. Upper leaves are stalkless, generally undivided but coarsely toothed. Plant height can range from 30 to 100 cm with either simple or much-branched stems. The stems usually have stiff downward pointing hairs, especially on the lower parts, and are green or somewhat purplish. Flowers are produced in small clusters at the ends of branches; these clusters elongating as the seedpods develop.



Photo Credit: burke.washington.edu
Plant Name: Wild mustard



Photo Credit: burke.washington.edu
Plant Name: Wild mustard



Photo Credit: weedscience.org
Plant Name: Wild mustard
Plant Part: Seedling

Management:

Since wild mustard is an annual plant that reproduces only by seed, this weed can be controlled by mechanical cultivation of newly emerged seedlings. However, cultivation of infested land is often impossible since wild mustard seed germinates at about the same time as spring planted annual crops. If cultivation is not possible or if chemical control is desired numerous herbicide products are available. Most products are best applied in the spring to mid-summer, before viable seeds are produced. In range lands and pastures it is easily controlled with a wide range of residual products for long term, as long as areas are replaced with desirable seed. Manual efforts are generally for smaller infestations and care should be taken to gather all seeds/flowers. Smaller populations can be hand pulled season long.

Wild oats (*Avena fatua*)

Description:

Wild oats grow 30 to 150 cm tall in a typical oat in appearance, a green grass with hollow, erect stems to 150 cm. It is sparsely hairy. Leaf blades are flat, about 10 to 45 cm long and 3 to 15 mm wide with the membranous small structure at the junction of the leaf **sheath** and leaf blade (**ligules**) up to 6 mm long. The long dark green leaves are rough due to small hairs. The youngest leaf is rolled up. The **ligule** is often irregularly toothed (dentate, fringed). The leaf bases do not have **auricles**. Leaf **sheaths** are smooth or slightly hairy, especially in younger plants. The **inflorescence** of *Avena fatua* is a loose, open **panicle** with 2 to 3 flowered stalked **spikelets**. The **panicle** is 10 to 40 cm long and up to 20 cm wide with spreading branches and the **spikelets** hanging from long stalks (**pedicels**). Each of the 2 to 3 **florets** has an oval abscission scar at its base, causing them to fall separately. **Spikelets** are 18 to 28 mm long, with the narrow lance-shaped (lanceolate) **glumes** enclosing the 2 to 3 **florets** each of these with an articulation below **glumes**. **Lemmas** are hairy, 14 to 20 mm long. Seed has an **awn** 2.5 to 4 cm long. Grains are 6 to 8 mm long. Seeds of are viable for 3 to 8 years

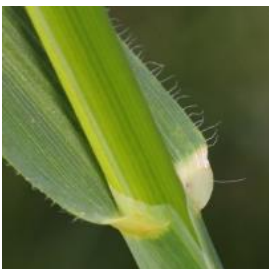


Photo Credit: tela-botanica.org
Plant Name: Wild oats
Plant Part: Auricle / Ligule



Photo Credit: omafra.gov.on.ca
Plant Name: Wild oats



Photo Credit: M. Licher
Plant Name: Wild oats
Plant Part: Panicle

Management:

Controlling the weed before it seeds will reduce future problems. Control is generally best applied to the least infested areas before dense infestations are tackled. Consistent follow-up work is required for sustainable management. There are effective nonchemical methods for controlling *A. fatua* through soil cultivation and crop rotation. When it is a weed of cereal crops such as wheat, oats, barley it is difficult to distinguish *A. fatua* from the crop until flowering. Therefore, the wild oat should only be removed after flowering. A controlled burn after harvest can reduce the viability of the *A. fatua* seeds that remain on the soil surface. Many selective herbicides can be effective alone, in mixtures or sequences. Correct timing and rate of herbicide application is critical to maximise control.

Wormwood or Absinthium (*Artemisia absinthium*)

Description:

Is an herbaceous, perennial plant with **fibrous** roots. The stems are straight, growing to 0.8 to 1.2 m (rarely 1.5 m, but, sometimes even larger) tall, grooved, branched, and silvery-green. The leaves are spirally arranged, greenish-grey above and white below, covered with silky silvery-white **trichomes**, and bearing minute oil producing glands; the **basal** leaves are up to 25 cm long, **bipinnate** to **tripinnate** with long **petioles**, with the **cauline** leaves smaller, 5 to 10 cm long, less divided, and with short **petioles**; the uppermost leaves can be both simple and **sessile**. Its flowers are pale yellow, tubular, and clustered in spherical bent-down heads (**capitula**), which are in turn clustered in leafy and branched **panicles**. Flowering is from early summer to early autumn; pollination is **anemophilous**. The fruit is a small **achene**; seed dispersal is by gravity. It grows naturally on uncultivated, arid ground, on rocky slopes, and at the edge of footpaths and fields.



Photo Credit: ncsu.edu
Plant Name: Wormwood



Photo Credit: wikipedia.org
Plant Name: Wormwood



Photo Credit: sdda.sd.gov
Plant Name: Wormwood

Management:

Absinth wormwood generally is not considered a serious problem on well-established or maintained pastures and rangelands. The plant tends to primarily invade over-grazed or disturbed areas where there is little competition from other plant species. Management should include proper grazing and rotational grazing techniques that would maintain rangelands and prevent invasion of the plant. Tillage can prevent establishment of absinth wormwood in crop production areas. Mowing may prevent seed production if mowed several times throughout the growing season, but mowing may be difficult in fence rows or rocky areas. Burning may not be an effective control method for absinth wormwood as infestations are not reduced and may increase. Several herbicides are available for absinth wormwood control. Herbicides can successfully control absinth wormwood if applied when the plant is at least 12 inches tall and in the active growing stage.

Yellow clematis (*Clematis tangutica*)

Description:

Yellow Clematis is a perennial vine; producing several stems per plant that can grow up to 4 m in length. Young stems are pliable while the older stems can become very woody. Leaves are green and compound with 5 to 7 lance-shaped leaflets 5 to 6 cm long, which may be lobed. Leaf tips are pointed and leaf edges are coarsely toothed. Leaves may be slightly hairy on the underside and are deciduous. Flowers are lemon-yellow, nodding, with four petals. Flowers are bell-shaped at first and then split as the petals spread. Petals may be silky-hairy on the outside and occasionally tinged purplish-brown. Flowers are borne at the ends of stems or in leaf **axils**, usually solitary but sometimes 2 or 3 together, on a short (0.5 to 3 cm) flower stem. Seeds are oval to 4.5 mm long, with silky tails about 5 cm long.



Photo Credit: cityofgp.com
Plant Name: Yellow clematis



Photo Credit: strathcona.ca
Plant Name: Yellow clematis
Plant Part: Bell-shaped Split Flower



Photo Credit: wsu.edu
Plant Name: Yellow clematis

Management:

Repeated hand pulling prior to seed set can provide effective control and possibly eradicate small infestations. Residual herbicides have been used successfully on flowering plants, newly emerging plants and the re-sprouting shoots of previously hand pulled plants, but does not have much effect on the woody stems of older plants. Residual products have been effective when used early spring or later in the fall. Some less invasive products are available but often have little to no effect. Therefore continued applications are required. Continue to stress the plant by hand pulling shoots. The earlier you can treat species the better, as it can be difficult to eradicate large infestations once established.

Appendix 1 - Terms and Definitions

Achene a small, dry, indehiscent fruit with a single locule and a single seed, and with the seed attached to the ovary wall at a single point, as in the sunflower.

Anemophilous wind pollinated; producing windborne pollen.

Anther the expanded, apical, pollen bearing portion of the stamen.

Apex the tip; the point furthest from the point of attachment.

Auricle a small ear-shaped appendage.

Awn a narrow, bristle-like appendage, usually at the tip or dorsal surface.

Axil the point of the upper angle formed between the axis of a stem and any part (usually a leaf) arising from it.

Barb short, rigid, reflexed points.

Basal positioned at or arising from the base, as leaves arising from the base of the stem.

Beak a narrow or prolonged tip, as on some fruits and seeds.

Bract a reduced leaf or leaf-like structure at the base of a flower or inflorescence; in conifers, one of the main structures arising from the cone axis.

Bristle a short, stiff hair or hair-like structure.

Burr a structure armed with often hooked or barbed spines or appendages.

Calyx the outer perianth whorl; collective term for all of the sepals of a flower.

Candelabra a branched candlestick; has several flowers.

Cane a slender, hollow, and often jointed stem, as in a reed; any straight, woody stem arising directly from the ground, as in the raspberry.

Capitulum a small flower head.

Capsule a dry, dehiscent fruit composed of more than one carpel.

Caudex the persistent and often woody base of an herbaceous perennial.

Cauline of, on, or pertaining to the stem, as leaves arising from the stem above ground level.

Clasp partly surrounding the stem.

Cotyledon primary leaf of the embryo; a seed leaf.

Crown the persistent base of an herbaceous perennial; the top part of a plant.

Cyme a flat-topped or round-topped determinate inflorescence, paniculate, in which the terminal flower blooms first.

Decurrent extending downward from the point of insertion, as a leaf base that extends down along the stem.

Dioecious flowers imperfect; the staminate and pistillate flowers borne on different plants.

Disk an enlargement or outgrowth of the receptacle around the base of the ovary; in the Compositae, the central portion of the involucre head bearing tubular or disk flowers.

Ellipsoid a solid body elliptic in long section and circular in cross section.

Fibrous bearing or resembling fibers.

Floret a small flower; an individual flower within a dense cluster, as a grass flower in a spikelet, or a flower of the Compositae in an involucre head.

Glabrous smooth; hairless.

Glandular of or pertaining to a gland; gland-like; bearing glands.

Glume one of the paired bracts at the base of a grass spikelet.

Hermaphrodite a plant with both pistils and stamens in the same flower; bisexual; monoclinal; perfect.

Hispid rough with firm, stiff hairs.

Inflorescence the flowering part of a plant; a flower cluster; the arrangement of the flowers on the flowering axis.

Involucre a whorl of bracts subtending a flower or flower cluster.

Lemma the lower of two bracts (lemma and palea) which subtend a grass floret, often partially surrounding the palea.

Ligulate with a ligule; strap shaped.

Ligule a strap-shaped organ; the flattened part of the ray corolla in the Compositae; the membranous appendage arising from the inner surface of the leaf at the junction with the leaf sheath in many grasses, some sedges; a tongue-like projection

borne at the base of the leaves above the sporangia.

Margin the edge, as in the edge of a leaf blade.

Node the position on the stem where leaves or branches originate.

Nutlet a small nut; one of the lobes or sections of the mature ovary.

Oblanceolate inversely lanceolate (tapering to a point at the apex and sometimes at the base).

Ochrea a sheath around the stem formed from the stipules, as in many members of the Polygonacea.

Ovary the expanded basal portion of the pistil that contains the ovules.

Panicle a branched, racemose inflorescence with flowers maturing from the bottom upwards.

Pappus modified calyx of the Compositae, consisting of awns, scales, or bristles at the apex of the achene.

Pedice the stalk of a single flower in an inflorescence, or of a grass spikelet.

Perianth the calyx and corolla of a flower, collectively, especially when they are similar in appearance.

Petiole a leaf stalk.

Plumule the embryonic shoot of seed-bearing plants; feather-like.

Propagule a structure, such as a seed or spore, which gives rise to a new plant.

Raceme an unbranched, elongated inflorescence with pedicellate flowers maturing from the bottom upwards.

Ray the strap-like portion of a ligulate flower in the Compositae; a branch of an umbel.

Receptacle the portion of the pedicel upon which the flower parts are borne; in the Compositae, the part of the peduncle where the flowers of the head are borne.

Rhizome horizontal, underground stem; rootstock.

Rosette a dense radiating cluster of leaves. First year plants may grow in this form.

Scorpioid shaped like a scorpion's tail; as in some coiled cymes; a determinate inflorescence with zigzag rachis.

Sepal a segment of the calyx.

Septum a partition, as the partitions separating the locules of an ovary.

Sessile attached directly, without a supporting stalk, as a leaf without a petiole.

Sheath the portion of an organ which surrounds, at least partly, another organ, as the leaf base of a grass surrounds the stem.

Spikelet a small spike or secondary spike; the ultimate flower cluster of grasses and sedges, consisting of 1-many flowers subtended by two bracts.

Stamen the male reproductive organ of a flower, consisting of an anther and filament.

Stellate star-shaped, as in hairs with several to many branches radiating from the base.

Stigma the portion of the pistil which is receptive to pollen.

Stipule one of a pair of leaf-like appendages found at the base of the petiole in some leaves.

Stolon an elongate, horizontal stem creeping along the ground and rooting at the nodes or at the tip and giving rise to a new plant.

Style the usually narrowed portion of the pistil connecting the stigma to the ovary.

Subtend to be below and close to, as a bract may subtend an inflorescence.

Taproot the main root axis from which root branches arise; a root system with a main root axis and smaller branches, as in most dicots.

Throat the orifice of a gamopetalous corolla or gamosepalous calyx.

Tiller a basal or subterranean shoot which is more or less erect.

Tomentose with a covering of short, matted or tangled, soft, wooly hairs; with tomentum.

Trichome a hair or hair-like outgrowth of the epidermis.

Truncate with the apex or base squared at the end as if cut off.

Umbel a flat-topped or convex inflorescence with the pedicels arising more or less from a common point, like the struts of an umbrella.

Whorl a ring-like arrangement of similar parts arising from a common point or node; a verticil

Report-A-Weed

There are many ways in which you can Report-A-Weed:

- 1) Phone the PRRD Invasive Plant Program at 250-784-3200 or 1-800-670-7773.
- 2) Email the Invasive Plant Program at prrd.dc@prrd.bc.ca
- 3) The Report-A-Weed Mobil App. or Report-Invasives-BC App.
- 4) Report-A-Weed Website - www.reportaweedbc.ca
- 5) Report the Weed in Person at 1981 Alaska Avenue, Dawson Creek, BC.



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Identification **Enforce Weed Control Act & Regulation**

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 ② www.reportaweedbc.ca
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PEACE RIVER REGIONAL DISTRICT

Weed Report



Contact Information

Name:

Telephone:

Email:

Weed location

Land Location:

Civic Address:

GPS:

Located on: Crown Public Private Land

Details Regarding Infestation

Weed Species (if known):

Size of Infestation:

Additional Comments

diverse. vast. abundant.