

Noxious Weed Alert

Houndstongue (*Cynoglossum officinale*)

Noxious weeds are the single greatest threat to rangeland health and stability and continued cattle production and wildlife habitat in eastern Montana. Weeds are spreading across the state at up to 20 percent each year, seriously threatening the ecologic and economic value of healthy rangelands. **Weed Prevention Areas (WPAs)** aim to protect valued rangelands from rapid and chronic weed spread and challenging weed problems through early intervention efforts of unified stakeholders with common goals to preserve native plant resources.

Houndstongue (Borage Family) is a native of Europe and seems to have been introduced to North America as a contaminant in agricultural seed. Houndstongue is a biennial or short-lived perennial forb. It forms a rosette its first



photo by Pete Fay

year of growth and produces a stem, flowers, and seeds during its second year, then dies. The rosette is comprised of large, velvety leaves that are rough to the touch (resembling a hound's tongue) and often appear dusty. Flowers are reddish-purple, produced on a single stout, heavy stem that can reach 4 feet in height. The seeds are distinctive, prickly, adhesive nutlets that stick to clothing and animals, spreading great distances. Nutlets are commonly referred to as "beggar's lice."

Houndstongue prefers areas with more than 10 percent bare ground and is common on gravelly, alkaline soils. Houndstongue is a poor competitor with native plants and requires disturbed or bare areas to establish. It grows on rangeland, pastures, abandoned cropland, roadsides, and waste areas. Houndstongue contains alkaloids that are toxic to grazing animals, especially cattle and horses. Sheep seem to be more resistant to houndstongue poisoning. The nutlets reduce the value of wool.



This weed reproduces solely from seed. Mature plants can produce up to 2,000 seeds and remain viable on the parent plant for two to three years. Buried seed rarely survive more than one year.

Houndstongue can be dug-up or hand-pulled if soil conditions permit. Hand pulling may be difficult as the taproot is strong and grows deep into the soil. Individual plants and small patches respond well to appropriate herbicide treatments. Small patch eradication requires follow-up management (two to three times per year) to locate overlooked plants and seed dispersal must be stopped completely. Some managers allow houndstongue to grow and develop seeds, then clip and bag the stalks and nutlets. Small patch eradication works this way through steady seed attrition and knowing the biennial plants will not regrow the following year as each plant dies following seed production.

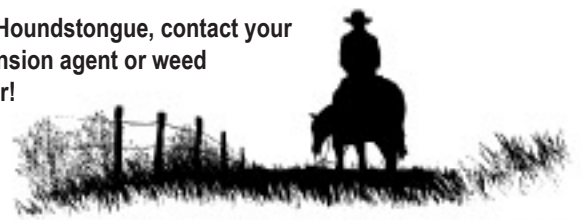


Proper herbicide selection should be advised by your local Extension agent or weed coordinator and the herbicide label strictly followed. Escort® at a rate of 1 ounce per acre applied with a non-ionic surfactant during spring/early summer is effective. Applications of phenoxyacetic herbicides such as 2,4-D may work only to suppress houndstongue, but this herbicide is sometimes the only cost-effective choice near water. Drought stress reduces the effectiveness of most herbicides.

WPA actions for houndstongue: Prevent establishment by locating new plants early and maintaining healthy populations of native plant communities. Eradicate small patches, if present. The keys to eradication are persistent management to entirely prevent reproduction/seed dispersal. Revegetate small patches or disturbed areas with native grasses, if necessary.

—K. Goodwin and R. Sheley, 406.994.6749

If you see Houndstongue, contact your local Extension agent or weed coordinator!



WEED PREVENTION AREAS
PROTECTING MONTANA FROM INVASIVE WEEDS



Noxious Weed Alert

Dalmatian and yellow toadflax (*Linaria dalmatica* and *L. vulgaris*)

Noxious weeds are the single greatest threat to rangeland health and stability and continued cattle production and wildlife habitat in eastern Montana. Weeds are spreading across the state at up to 20 percent each year, seriously threatening the ecologic and economic value of healthy rangelands. **Weed Prevention Areas (WPAs)** aim to protect valued rangelands from rapid and chronic weed spread and challenging weed problems through early intervention efforts of unified stakeholders with common goals to preserve native plant resources.

Dalmatian and yellow toadflax (Figwort Family) are natives of the Mediterranean region and seem to have been introduced to North America as ornamentals. These weeds are rhizomatous, perennial forbs with bright



photo by B. Nowierski

yellow snapdragon-shaped flowers. Mature plants have one to 25 erect floral stems and can reach 3 feet tall. Leaves and stems of Dalmatian toadflax are waxy and a whitish to bluish shade of green. Heart-shaped leaves are alternate and clasp around the somewhat woody stems. The leaves of yellow toadflax are lance-shaped, pale-green, and also alternate on the stem. The main taproot of toadflax can penetrate 3 to 4 feet into the soil and lateral roots can reach 6 to 12 feet long.

Dalmatian toadflax can adapt its growth to fit a wide range of environmental conditions. It is most commonly found in rangelands, clear cuts, pastures, and along roadsides and fences. Disturbed ground is a prime candidate for colonization, but Dalmatian toadflax has been recorded in naturally occurring small openings in pristine, excellent-condition rangeland. The seedlings are considered ineffective competitors with established rangeland plants, but once established toadflax becomes an intense competitor for limited soil resources.

Dalmatian and yellow toadflax displace native species, reducing rangeland diversity. This alteration of species composition disrupts the proper functioning of healthy rangelands. Toadflax significantly affects livestock and wildlife forage production. In one study, Dalmatian toadflax-free plots produced 2.5 times more grass than plots where toadflax was absent. These weeds are toxic to livestock, but they are generally considered unpalatable and reports of livestock poisonings are rare.

Dalmatian and yellow toadflax reproduce by seeds and vegetatively through rhizomes. Vegetative reproduction from rhizomes allow these weeds to rapidly spread in closed grasslands even without seed production. Yellow toadflax colonies persist mostly via vegetative means while those of Dalmatian toadflax persist both by vegetative and seed production.

Spring emergence of toadflax depends primarily on temperature. During the first year the plants form a stem/rosette and develop a deep root system. Stems emerge in the fall and direct floral stem production the

following year. These strong, upright floral stems that characterize mature toadflax plants develop after a winter's dormancy and emerge about the same time as new seedlings during early spring.

Flowering occurs from early spring to late summer and seeds mature from summer to early fall. Vegetative reproduction from root buds on rhizomes can occur as early as two to three weeks after germination. Root fragments can also produce new plants. Mature toadflax plants can produce up to 30,000 seeds and seeds may remain viable in the soil for up to 10 years.

Young, individual plants can be dug-up or hand-pulled before the root system becomes developed and extensive. Small patches should be eradicated with an appropriate herbicide during the rosette/seedling stage or the early bud/pre-bloom stage, depending on environmental conditions. Herbicide absorption is enhanced with early bud/pre-bloom and fall regrowth treatments when shoot to root translocation is the greatest. However, if fall is a dry period, a spring application during the rosette/seedling stage, when root carbohydrate reserves are at their lowest, is recommended. Small patch eradication requires follow-up management (two to three times per year) to locate regrowth or overlooked plants and reproduction (seed production and vegetative growth) must be stopped completely. Treatments must be repeated as long as there are viable seeds in the soil (up to 10 years).

Herbicides have highly variable effects on toadflax, probably due to its high genetic variability. Proper herbicide selection should be advised by your local Extension agent or weed coordinator and the herbicide label strictly followed. Picloram (Tordon®) at a rate of 1 pint per acre plus 2,4-D at a rate of 2 quarts is effective when applied during the early flowering stage. Metsulfuron (Escort®) at a rate of 1 ounce per acre with a non-ionic surfactant applied during active growth is also very effective. Phenoxyacetic herbicides such as 2,4-D or MCPA used alone on toadflax are not very effective, but these herbicides are often the only cost-effective choice near water. Drought stress reduces the effectiveness of most herbicides.

—K. Goodwin and R. Sheley, 406.994.6749

If you see Dalmatian or yellow toadflax, contact your local Extension agent or weed coordinator!



photo by B. Nowierski



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Noxious Weed Alert

Saltcedar (*Tamarisk spp.*)

Noxious weeds are the single greatest threat to rangeland health and stability and continued cattle production and wildlife habitat in eastern Montana. Weeds are spreading across the state at up to 20 percent each year, seriously threatening the ecologic and economic value of healthy rangelands. **Weed Prevention Areas (WPAs)** aim to protect valued rangelands from rapid and chronic weed spread and challenging weed problems through early intervention efforts of unified stakeholders with common goals to preserve native plant resources.

Saltcedar (Tamarisk Family) is a native of Eurasia, introduced to North America for use as an ornamental, windbreak, and erosion control. Saltcedar is a deciduous, loosely branched shrub or small tree, reaching heights of 15 feet or more. Flowers are whitish or pinkish and leaves are appressed, scale-like, and alternately arranged. The primary root of saltcedar can grow to a depth of up to 90 feet or more. After reaching the water table, plants develop spreading horizontal roots that can spread up to 150 feet and are capable of producing adventitious buds and new shoots.

Saltcedar crowds out native stands of riparian and wetland vegetation. It increases the salinity of surface soil, rendering the soil inhospitable to native plant species. Saltcedar provides low wildlife habitat value and it uses more water than comparable native plant communities. It dries up springs, wetlands, riparian areas and small streams by lowering surface water tables. Saltcedar widens floodplains by clogging stream channels and increases sediment deposition due to the abundance of saltcedar stems in dense stands.

Saltcedar grows well on moist sandy, sandy loam, loamy, and clayey soil textures and is tolerant of highly saline habitats, concentrating salt in its leaves. This weed is not tolerant of shade. Shaded plants have altered morphology and reduced reproduction. Saltcedar commonly occurs along floodplains, riverbanks, stream courses, saltflats, marshes, and irrigation ditches.

Seedlings grow slowly and require saturated soils throughout the first two to four weeks of growth. Ideal conditions for first-year survival are saturated soil during the first few weeks of life, a high water table, and open sunny ground with little competition from other plants.

Saltcedar reproduces by seeds as well as vegetatively. It sprouts from the root crown and rhizomes, and adventitious roots sprout from submerged or buried stems. An adult plant can produce 600,000 seeds annually.



photo by S. Dewey



Seeds are viable for up to 45 days under ideal conditions during summer, and can complete germination within 24 hours following contact with water. Seeds are readily dispersed by wind and water.

Saltcedar eradication in areas that contain significant numbers of interspersed, desirable shrubs and trees is problematic. Depending upon site conditions, it may not be possible to rapidly kill saltcedar plants without also affecting desired shrubs and trees. In such situations, it may be necessary to cut and treat saltcedar stumps with a herbicide. While this method is slow and labor-intensive, it will spare desired woody plants. Herbicides, such as triclopyr (Garlon®) or imazapyr (Arsenal®), must be applied immediately to the cut because wound healing occurs very quickly and decreases herbicide penetration. This treatment appears to be most effective in the fall when plants are translocating materials to their roots. The efficacy of treatments is enhanced by cutting the stems within 5 cm of the soil surface, applying a herbicide within one minute of cutting, applying herbicide all around the perimeter of the cut stems, and retreating any resprouts four to 12 months following initial treatment. If desired woody plants are not present, a foliar herbicide application may be adequate. Follow-up management is important to treat regrowth or saltcedar not killed by initial treatment.

WPA actions for saltcedar: Prevent establishment by locating new plants early and maintaining a dense canopy cover and healthy vegetation to protect soil surface from saltcedar seeds. The keys to eradication are follow-up management and revegetation to prevent or retard reinvasion.

—K. Goodwin and R. Sheley, 406.994.6749

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Noxious Weed Alert

Leafy spurge (*Euphorbia esula*)

Noxious weeds are the single greatest threat to rangeland health and stability and continued cattle production and wildlife habitat in eastern Montana. Weeds are spreading across the state at up to 20 percent each year, seriously threatening the ecologic and economic value of healthy rangelands. **Weed Prevention Areas (WPAs)** aim to protect valued rangelands from rapid and chronic weed spread and challenging weed problems through early intervention efforts of unified stakeholders with common goals to preserve native plant resources.

Leafy spurge (Spurge Family) is a native of Eurasia, introduced to North America as an ornamental or as a crop seed contaminant. Spurge is an extremely aggressive, long-lived, rhizomatous forb. Flowers are yellowish-green, small and arranged in numerous small clusters, subtended by paired heart-shaped yellow-green bracts. The entire plant contains white, milky latex and foliage of the plant is smooth and hairless. Leafy spurge can reach up to 3 feet tall and is most aggressive in dry situations where plant competition is less intense. It occurs most commonly in rangeland, pastures, prairies, roadsides, streams and ditches, and waste areas. Spurge grows on all types of soils, but is most abundant in coarse-textured soils and least abundant on clayey soils.

Leafy spurge can invade excellent condition rangeland and easily displaces native plants through high seed production and extensive underground shoot buds. These two reproductive techniques allow it to rapidly form dense monocultures. Leafy spurge dramatically reduces rangeland diversity and forage production for livestock and wildlife. Ranches infested with leafy spurge often sell at a fraction of their values.



Spurge is one of the earliest plants to emerge in the spring, usually mid-April. Terminal flower clusters begin one to two weeks after stem emergence. Flowering generally ends during the hotter portion of the summer. But if conditions are favorable, spurge may produce flowers throughout the summer and fall, producing seeds until frost. A large plant can produce up to 130,000 seeds that remain viable in the soil for five to eight years. Seed capsules explode when ripe, sending the seeds up to 15 feet from the parent plant. If adequate moisture is present, germination of seed can occur throughout the growing season.

Despite being a successful seed producer, spurge primarily reproduces vegetatively through its extensive lateral root system. Long roots have the capability to produce shoots and can reach nearly 15 feet

laterally and 30 feet in depth. Rapid reestablishment of treated spurge stands often occurs after an apparently successful management effort because of the large nutrient reserves stored in the extensive root system. Leafy spurge also produces an allelopathic compound that inhibits the growth of other plants.

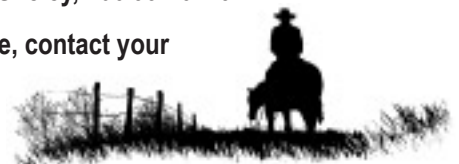
Young, individual seedlings may be hand-pulled before the root system becomes developed and extensive. Small patches will not respond to hand pulling and should be eradicated with an appropriate herbicide. Follow-up applications will be necessary to affect the root system and ensure vegetative reproduction and seed production is stopped completely.

Proper herbicide selection should be advised by your local Extension agent or weed coordinator and the herbicide label strictly followed. Picloram (Tordon®) at a rate of 1 quart per acre with 2,4-D amine at a rate of 1.5 quarts per acre is effective when applied during the spring when flowers emerge or during the fall. Spring-applied 2,4-D applications may work only to suppress growth but is often the only cost-effective choice near water. Plateau® applied in the fall at the proper rate seems to be effective in certain situations. However, this herbicide is not recommended as it can permanently damage native plants when the exact rate and timing of application is not closely followed. Contact your Extension agent or weed coordinator for information on this herbicide. Drought stress reduces the effectiveness of most herbicides.

WPA actions for leafy spurge: Prevent establishment by locating new plants early and eradicate small patches while still possible. Maintain healthy and competitive native plant communities. The keys to eradication are entirely preventing reproduction (vegetative and seed production) and persistent management to eliminate root reserves. Revegetate small patches with native grasses, if necessary.

—K. Goodwin and R. Sheley, 406.994.6749

If you see leafy spurge, contact your local Extension agent or weed coordinator!



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Noxious Weed Alert

Whitetop (*Cardaria draba*)

Noxious weeds are the single greatest threat to rangeland health and stability and continued cattle production and wildlife habitat in eastern Montana. Weeds are spreading across the state at up to 20 percent each year, seriously threatening the ecologic and economic value of healthy rangelands. **Weed Prevention Areas (WPAs)** aim to protect valued rangelands from rapid and chronic weed spread and challenging weed problems through early intervention efforts of unified stakeholders with common goals to preserve native plant resources.

Whitetop or hoary cress (Mustard Family) is native of Eurasia, introduced to North America probably as a contaminant of crop seed. Whitetop is a rhizomatous weed with numerous white flowers with four petals, giving the plant a white, flat-topped appearance. Leaves are lance-shaped, alternate on the stem, and covered with soft white hairs. Mature plants can reach 2 feet tall. The roots usually occur at a depth of 30 inches, but have been recorded to penetrate to a depth of 30 feet.

Whitetop prefers open, unshaded, disturbed ground. It can be found in fields, waste areas, meadows, pastures, croplands, and along roadsides. It grows well on alkaline soils that are wet in late spring and generally does better in areas with moderate amounts of rainfall. Whitetop invades rangelands and is highly competitive once it becomes established. This weed spreads primarily by



extremely persistent roots and will eventually eliminate native vegetation and become a monoculture. In the absence of competition, a single plant can spread over an area 12 feet in diameter in a single year.

Whitetop reproduces vegetatively and by seeds. The root system of whitetop consists of vertical and horizontal roots from which new rosettes and flowering shoots arise. Plants emerge very early spring, stems arise in early May, and flower in early summer. The plants usually set seed by mid-summer and if conditions are favorable, a second crop of seeds can be produced in the fall. A typical plant can produce about 3,000 seeds. Buried seeds can remain viable for three years.

Young, individual seedlings may be hand-pulled before the root system becomes developed and extensive. Small patches will not respond to hand pulling



photo by Kim Goodwin

and should be eradicated with an appropriate herbicide. Follow-up applications will be necessary to affect the root system and ensure vegetative reproduction and seed production is stopped completely.

Proper herbicide selection should be advised by your local Extension agent or weed coordinator and the herbicide label strictly followed. Metsulfuron (Escort®) at a rate of 1 ounce per acre with a non-ionic surfactant applied during active growth is most effective. Spring-applied 2,4-D applications alone at 2 quarts per acre may work only to suppress growth. But this herbicide is often the only cost-effective choice near water. Picloram (Tordon®) does not affect whitetop. Drought stress reduces the effectiveness of most herbicides.

WPA actions for whitetop: Prevent establishment by locating new plants early and eradicate small patches while still possible. Maintain healthy and competitive native plant communities. The keys to eradication are entirely preventing reproduction (vegetative and seed production) and persistent management to eliminate root reserves. Revegetate small patches and disturbed areas with native grasses, if necessary.

—K. Goodwin and R. Sheley
406.994.6749

If you see Whitetop, contact your local Extension agent or weed coordinator!



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Noxious Weed Alert

Spotted, Diffuse and Russian knapweed (*Centaurea maculosa*, *C. diffusa*, *Acroptilon repens*)

Noxious weeds are the single greatest threat to rangeland health and stability and continued cattle production and wildlife habitat in eastern Montana. Weeds are spreading across the state up to 20 percent each year, seriously threatening the ecologic and economic value of healthy rangelands. **Weed Prevention Areas (WPAs)** aim to protect valued rangelands from rapid and chronic weed spread and challenging weed problems through early intervention efforts of unified stakeholders with common goals to preserve native plant resources.

Spotted and diffuse knapweed are taprooted perennial forbs while Russian knapweed is rhizomatous (all contained in the Sunflower Family). These knapweeds are native to Eurasia and seem to have been introduced to North America in contaminated crop seed. They have solitary (spotted and Russian) or clusters of two to three (diffuse) urn-shaped flowers at the ends of branches. Flowers range from whitish-pink with spines on the bracts (diffuse) to pinkish-purple with spots on the bracts (spotted) to purple with paper-like bracts (Russian). Rosette leaves of each are lobed and leaves are alternate on mature



Spotted knapweed



Diffuse knapweed



Russian knapweed

stems. Mature plants can reach 2 to 4 feet tall with one or more stems. Knapweeds are not restricted to any particular soil but Russian prefers clayey soil and diffuse and spotted prefer light to coarse-textured soils. The knapweeds typically invade disturbed areas, such as roadsides, waste areas, and pastures. A colony is established and plants invade adjacent undisturbed areas through dominant resource capture and allelopathic chemicals that inhibit neighboring plant growth. Russian knapweed reproduction through rhizomes allows rapid spread into closed grasslands, covering a 40-square-foot area within two years. The knapweeds greatly reduce the productivity and diversity of rangeland by displacing native plants.

Diffuse and spotted knapweed reproduce solely by seed producing up to 40,000 and 140,000 seeds per square meter, respectively. Seeds can remain viable in the soil for up to eight years. Spotted knapweed can live up to nine years while diffuse is a semelparous perennial; it grows as a rosette until it reaches critical size, then bolts, flowers, and usually dies. The involucre remains closed until the plant dries up, breaks off at ground

level and effectively becomes a tumbleweed, allowing seeds to be dispersed over long distances. A Russian knapweed plant can produce up to 1,200 seeds, but reproduction is primarily vegetative through rhizomes. Depending on site elevation, knapweeds usually flower mid-summer with mature seeds formed by early fall.

Young, individual Russian knapweed seedlings may be hand-pulled before the root system becomes developed and extensive. Small patches will not respond to hand pulling and should be eradicated with an appropriate herbicide with follow-up applications to affect the root system. Diffuse and spotted knapweed can be hand pulled at any growth stage, especially when the soil is moist or contains an adequate sand portion to ensure removal of root crown. Small patches can be eradicated through hand pulling, but it must be repeated frequently. The first pulling should be during late spring, the second during summer focusing on bolted plants, and the third just before seed dispersal. Small patches can also be eradicated with herbicide treatments.

Proper herbicide selection should be advised by your local Extension agent or weed coordinator and the herbicide label strictly followed. Clopyralid + 2,4-D (Curtail®) applied at a rate of 2 quarts per acre during the rosette or bud stage is effective. Picloram (Tordon®) applied at a rate of 1 pint per acre during spring or fall is effective. 2,4-D amine applied at a rate of 2 quarts per acre during active growth can be moderately effective. Clopyralid + triclopyr (Redeem®) applied at a rate of 1 quart per acre with a surfactant during active growth can also be effective. Drought stress reduces the effectiveness of most herbicides.

WPA actions for knapweeds: Prevent establishment by locating new plants early and eradicate small patches while still possible. Maintain healthy and competitive native plant communities. The keys to eradication are entirely preventing reproduction and persistent management. Revegetate small patches or disturbed areas with native grasses, if necessary.

— K. Goodwin and R. Sheley, 406.994.6749

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photo by Kim Goodwin



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