

VEGETATION MANAGEMENT GUIDELINE

Canada thistle (Cirsium arvense (L.) Scop.)SPECIES CHARACTER

DESCRIPTION

Canada thistle is a 2 to 5 foot (0.6 to 1.5 meters) tall forb with deep, wide spreading, horizontal roots. The grooved, slender stems branch only at the top and are slightly hairy when young, becoming covered with hair as the plant grows. The oblong, tapering, sessile leaves are deeply divided, with prickly margins. Leaves are green on both sides with a smooth or slightly downy lower surface. Numerous small, compact (3/4 inch or 1.9 cm. diameter), rose-purple or white flowers appear on upper stems from June to September. Seeds are small (3/16 inch or 0.5 cm long), light brown, smooth and slightly tapered, with a tuft of tan hair loosely attached to the tip.

SIMILAR SPECIES

Canada thistle is distinguished from other thistles (Cirsium spp.) by its deep-running perennial rootstocks, more slender stems, and small compact heads. Canada thistle should be accurately identified before attempting any control measures. If identification of the species is in doubt, the plant's identity should be confirmed by a knowledgeable individual and/or by consulting appropriate books.

DISTRIBUTION

Canada thistle, which is naturalized from Europe, occurs throughout the northern U.S. east of the Rocky Mountains. It is common in the northern half of Illinois and rare in the southern half. This species is very rare in southern Indiana and is not a serious problem in Missouri natural areas.

HABITAT

Canada thistle does best in disturbed areas (overgrazed pastures, old fields, waste places, fence rows, along roadsides). It sometimes occurs in wet areas where water levels fluctuate (along stream banks and ditches). It can invade sedge meadows and wet prairies from adjacent disturbed sites. This thistle does not do well in undisturbed prairies, good to excellent pastures, or in woodland. Plants are tall and lax, with few flowers, on sites that are shaded most of the day.

LIFE HISTORY

This dioecious, weedy perennial occurs in patches, commonly in disturbed areas. Introduction to new areas occurs mostly by windborn seed or sometimes by run-off in ditches. It spreads rapidly by rhizomes or root segments. Lateral roots 3 or more feet deep spread from a fibrous taproot. Aerial shoots are sent up at 2 to 6 inch intervals. Basal leaves are produced the first year, flowering stems the next. Pollination is mostly by honeybees, and wind pollination is limited. Most seeds germinate within one year. Some seeds immediately produce rosettes before winter and emerge to flower the next spring. Seeds remain viable in soil up to 20 years in some cases. Emergence occurs in early May, with vertical growth in mid-to-late June. As frequency of Canada thistle increases at a site, species diversity decreases, possibly due to allelopathic substances.

EFFECTS UPON NATURAL AREAS

Canada thistle is an alien species capable of crowding out and replacing native grasses and forbs. It is detrimental to natural areas where it occurs, particularly non-forested communities, and it can change the natural structure and species composition where it becomes well-established. Prairies, barrens, savannas, and glades are susceptible, particularly those sites that have been disturbed and are reverting naturally to native species, as well as those undergoing manipulative restoration management.

CURRENT STATUS

Canada thistle is a noxious weed under Illinois law.

CONTROL RECOMMENDATIONS

RECOMMENDED PRACTICES IN NATURAL COMMUNITIES OF HIGH QUALITY

Prescribed fire can be effective in controlling this species and is a preferred treatment. Late spring burns, between May and June, are most detrimental to this noxious weed and should be used when possible. Prescribed burns to control this plant should not be conducted early in the spring, as early spring burns can increase sprouting and reproduction of this species. During the first 3 years of control efforts, burns should be conducted annually.

Management practices that maintain and encourage the development of healthy stands of native species will help prevent establishment of Canada thistle or help shade and weaken plants on sites already infested.

Repeated and frequent pulling or hand-cutting of individual plants will eventually starve underground stems.

Cutting or pulling should be at least 3 times each season, in June, August, and September. This treatment is feasible for light and moderate infestations, but may be relatively time consuming in heavy infestations.

Spot application of the amine formulation of 2,4-D according to label instructions can control this plant. Individual plants of Canada thistle should be treated with a wick applicator or hand sprayer. The herbicide 2,4-D amine is selective for broadleaf plants. To reduce vapor drift, use an amine formulation of 2,4-D rather than an ester formulation. Precautions should be taken to avoid contacting nontarget plants with the solution. Do not spray so heavily that herbicide drips off the target species. The herbicide should be applied while backing away from the areas to avoid walking through the wet herbicide. By law, herbicides may only be applied as per label instructions and by licensed herbicide applicators or operators when working on public properties.

RECOMMENDED PRACTICES ON BUFFER AND SEVERELY DISTURBED SITES

Control procedures recommended above for high quality natural communities are also applicable to buffer and severely disturbed sites. Additional control measures are as follows. On large sites (old fields, ditch banks, roadsides) with heavy infestations, thistles should be mowed when in full bloom, and as close to the ground as possible. Cut flower-heads should be removed to prevent scattering seeds on site. Repeated mowing may be needed for several years to obtain adequate control.

A foliar application of a 1-2% solution of Roundup (a formulation of glyphosate) applied in spring when plants are 6-10 inches (15.2 -25.4 cm) tall is an effective herbicide treatment. Individual plants should be spot-treated with a wick applicator. Roundup normally kills the entire plant, including the roots, when applied in this manner. Roundup is a nonselective herbicide and precautions should be taken to avoid contacting nontarget plants with the solution. Do not spray so heavily that herbicide drips off the target species. As with 2,4-D amine, Roundup should be applied while backing away from the areas to avoid walking through the wet herbicide. Roundup should not be used in high-quality natural areas during the growing season because of the possibility of harming nontarget plants.

On severely disturbed sites with heavy infestations, such as cropland or abandoned cropland, the site could be plowed and sowed to a cover crop (wheat, alfalfa, rye), if practical and desirable. The following May, the cover crop should be plowed under and desired native species should be seeded.

FAILED OR INEFFECTIVE PRACTICES

Fire early in the growing season can increase sprouting and reproduction. Prescribed burns in late spring are effective, as discussed previously.

Tillage disturbance of soil may provide ideal conditions for reinvasion and for introduction of other exotics.

Grazing is not an effective control measure as the prickles prevent livestock from grazing near Canada thistle.

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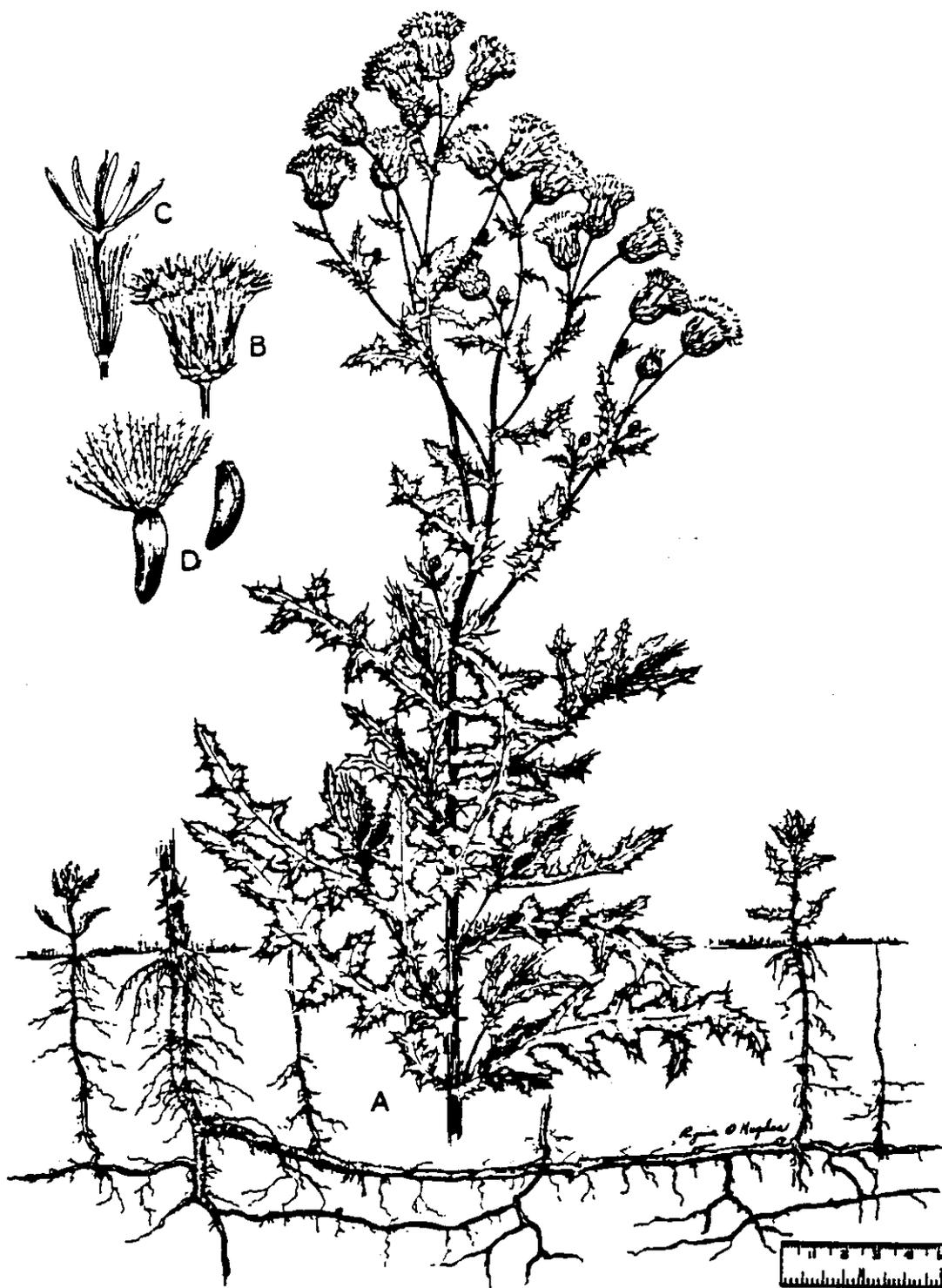
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Cirsium arvense (L.) Scop. Canada thistle. A, Habit— $\times 0.5$; B, head— $\times 1$; C, flower— $\times 2.5$;
D, achenes— $\times 3$.

VEGETATION MANAGEMENT GUIDELINE

Fescue (Festuca pratensis Huds.)

SPECIES CHARACTER

DESCRIPTION

This tall, coarse grass has short creeping rootstocks and grows in heavy clumps with erect stems 2-5 feet (0.6-1.5 meters) tall. It often forms dense solid stands. Leaves are 4-5 inches (10.1-12.7 cm) long, smooth on the undersurface and usually rough above. The erect panicles are usually 2-10 inches (5-25 cm) long and often nodding at top. The panicles are somewhat narrow and contracted to slightly spreading. Flowers occur in flat, oval spikelets that are 0.3-0.5 inches (8-12 mm) long. Usually, 6-12 individual flowers occur in each spikelet. Grasses, in general, are fairly difficult to identify, and fescue should be accurately identified before attempting any control measures. If identification of the species is in doubt, the plant's identity should be confirmed by a knowledgeable individual and/or by consulting appropriate books.

DISTRIBUTION

Fescue has been spread widely by cultivation throughout most of the U.S. and southern Canada. It now occurs throughout Illinois, but is particularly common in southern counties where there is much pasture land.

HABITAT

This grass occurs in a variety of disturbed habitats including pastures, abandoned fields, roadsides, grazed woods, and along railroad tracks. It can tolerate a wide range of moisture conditions and is common along some levees where it is often planted, and stream banks. Where it occurs in natural communities, it has often been spread by horses and cattle through manure.

LIFE HISTORY

This hardy perennial was introduced from Europe and is commonly sown for pasture and hay. It does well on poor acid soils and often is found where there is little competition from other species. Fescue grows best in open sunlight and spreads primarily by seed to form dense solid stands. The heavy clumps have thick mats of roots that make it almost impossible to pull the plant out of the ground. Fescue emerges early in spring and often forms new growth in fall after the seed matures in July and August. In southern Illinois, the leaves usually stay green all winter. This grass is slow to become established, but once the heavy

clumps are formed, it is difficult to eradicate. As the density of fescue increases at a site, species diversity decreases, partly due to allelopathic substances. It can withstand trampling and heavy grazing by livestock.

EFFECTS UPON NATURAL AREAS

Fescue occasionally invades open natural communities, such as prairies and glades. In a few places, it is changing the species composition and possibly is crowding out native species. This alien species has the potential to become a significant problem because of its adaptability to poor sites, allelopathic character, and difficulty of eradication.

CONTROL RECOMMENDATIONS

RECOMMENDED PRACTICES IN NATURAL COMMUNITIES OF HIGH QUALITY Initial effort in areas of heavy infestation

Dense stands should be burned in late spring. It may be necessary to burn 2 or 3 years in succession to get old fescue stands under control. If repeated late spring burning does not control fescue adequately, it should be sprayed with a 1-2% Roundup (a formulation of glyphosphate) solution in early spring or late autumn when fescue is green but native species are still dormant. Application should be done with a hand-held sprayer or wick/wiper applicator. Extreme care should be used while spraying to avoid contacting nontarget plants with the spray, because Roundup is a nonselective herbicide. Do not spray so heavily that herbicide drips off the target species. Roundup should be applied while backing away from the treated area to avoid walking through the wet herbicide. By law, herbicides may only be applied as per label directions and by licensed herbicide applicators or operators when working on public properties.

Effort in areas of light infestation

Late spring prescribed burning should help eliminate young plants. Repeated burning for 2-4 years may be needed to achieve good control. Spot applications of 1-2% Roundup applied with a hand-held sprayer or wick applicator in early spring or late fall may help if prescribed burning is insufficient. Spot applications of Fusilade 2000 (according to label instructions) may be effective following a burn. Fusilade 2000 selectively kills grasses and does not kill broadleaf plants. **DO NOT SPRAY SO HEAVILY THAT HERBICIDE DRIPS OFF THE TARGET SPECIES.** A few isolated clumps may be dug up by hand.

Maintenance control

Surrounding seed sources must be eliminated where

possible to prevent seed from continually moving into the natural area. Livestock should be kept out of the area, because seeds are spread in manure. Seedlings and young plants that invade should be eliminated by hand digging or spot applications of either 1-2% Roundup or Fusilade 2000, according to label instructions the first year.

RECOMMENDED PRACTICES ON BUFFER AND SEVERELY DISTURBED SITES Initial effort in areas of heavy infestation

The site should be burned in late spring and can then be sprayed with 1-2% Roundup the following autumn. It may be necessary to burn and spray 2 or 3 years in succession.

Effort in areas of light infestation

Late spring prescribed burning helps eliminate young plants and is a preferred treatment. A few isolated clumps may be dug up by hand. Spot applications of 1-2% Roundup in early spring or late fall are effective. Spot applications of Fusilade 2000 may work best following a burn.

Maintenance control

Same control practices recommended as for high quality natural communities.

FAILED OR INEFFECTIVE PRACTICES

- Pulling by hand is almost impossible because of tough root system. Digging up clumps is slow and sometimes undesirable in a high-quality natural area.
- Mowing does not reduce existing populations and may encourage spreading by root stocks.
- Fire usually is ineffective when fescue is dormant.
- Most herbicides are ineffective if applied while fescue is dormant or after mowing.
- Tillage usually is not an effective way to control any species in a natural area, but may be used in severely disturbed buffer areas.
- Grazing is ineffective since it usually eliminates other species first and encourages spread of fescue.
- Manipulating water levels usually is not practical on natural areas where fescue occurs.
- No biological controls are known that are feasible in natural areas.

ACKNOWLEDGEMENTS

Dr. Robert M. Mohlenbrock and the Southern Illinois University Press generously permitted use of illustrations from the Illustrated Flora of Illinois.

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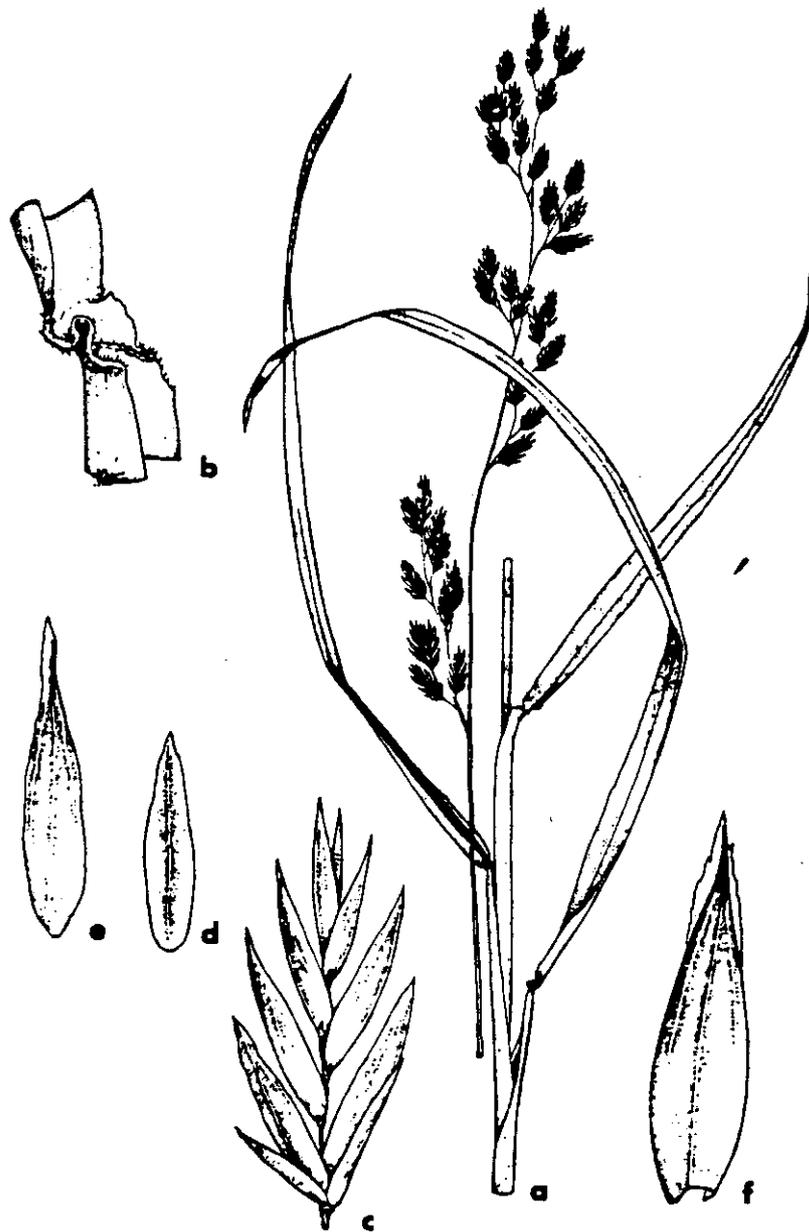
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146. *Festuca pratensis* (Meadow Fescue). a. Habit, X4. b. Sheath, with ligule, X5. c. Spikelet, X5. d. First glume, X10. e. Second glume, X10. f. Lemma, X10.

VEGETATION MANAGEMENT GUIDELINE

Garlic Mustard (Alliaria officinalis Andrz. or
Alliaria petiolata (Bieb.) Cavara & Grande)

SPECIES CHARACTER

DESCRIPTION

This member of the mustard family obtained its name from Allium, the genus of onion or garlic, referring to the plant's odor. Adult plants grow 5-46 inches (12-119 cm) high. Basal rosettes have kidney-shaped leaves that differ somewhat in shape from the sharply-toothed, triangular, petioled leaves on the stems. The black seeds are oblong, striate, in a single row, and are found in a linear capsule. The narrow, elongated, many-seeded capsule (1-2.5 inches or 2.5-6.4 cm long) is called a silique and is borne on short, thick pedicels. Small white flowers (approximately 0.2 inch or 0.5 cm) are borne in a simple terminal cluster, and the 4 petals are narrowed abruptly at the base. In Illinois, garlic mustard usually blooms in May.

SIMILAR SPECIES

Garlic mustard is distinguished from other herbaceous plants by its small white flowers in a terminal cluster, its coarsely toothed, broadly triangular stem leaves with a distinct petiole, and its odor of garlic. Garlic mustard should be accurately identified before attempting any control measures. If identification of the species is in doubt, the plant's identity should be confirmed by a knowledgeable individual and/or by consulting appropriate books.

DISTRIBUTION

Garlic mustard is native to Europe and Asia. It is now distributed from Quebec, Ontario, south to Virginia and Kentucky, and west to Kansas. In Illinois it occurs in at least 28 counties. It is becoming abundant and widespread in the northern half of Illinois, south to Coles and Clark counties. It occurs locally in Jackson County in southwestern Illinois.

HABITAT

This species occurs in upland and floodplain forests, savannas, and along roadsides. It invades shaded areas, especially disturbed sites, and open woodland. It also invades naturally disturbed sites, such as stream banks and occasionally occurs in areas receiving full sun.

LIFE HISTORY

Garlic mustard is a biennial herb that begins vegetative growth early in the spring and blooms from May-June. Young plants over winter as basal rosettes. Each plant dies after flowering. Seeds disperse when the capsules burst at maturity. The species reproduces readily from the numerous seeds produced. It is capable of growing in dense shade.

EFFECTS UPON NATURAL AREAS

Garlic mustard aggressively has invaded numerous forested natural areas and is capable of dominating the ground cover. It is a severe threat to many natural areas where it occurs because of its ability to grow to the exclusion of other herbaceous species.

CONTROL RECOMMENDATIONSRECOMMENDED PRACTICES IN NATURAL COMMUNITIES OF HIGH QUALITY
Initial effort in areas of heavy infestation

Fall or early spring burning is effective in oak woods.

Repeated burns over several years may be necessary to achieve adequate control. Prescribed fires should be of sufficient intensity to burn the affected site thoroughly. Low intensity fires that leave unburned areas will not control garlic mustard effectively. Any isolated plants that are not burned should be removed by hand.

Independent findings by Victoria Nuzzo and The Nature Conservancy's Illinois Field Office indicate that cutting stems at or near ground level (approximately 0-15 cm above ground) when the plants are in full flower and just beginning seed production kills plants. Plants cut near ground level when in full flower usually do not resprout. If viable seed occurs in the cut stems, the stems should be removed from the site.

The Nature Conservancy has successfully controlled or eliminated this plant from several sites by a combination of spring burning, hand-pulling, and cutting flowering stems with a scythe. When garlic mustard occurs in nearly pure populations with few other plants, scything is advantageous in that large areas can be covered quickly and the soil is not disturbed.

Spot application of 2% Roundup (a formulation of glyphosate) to the foliage of individual plants is effective during spring and fall when most native vegetation is dormant but garlic mustard remains green. Managers should exercise caution when applying herbicide to garlic mustard to avoid contacting nontarget plants. Roundup is a nonselective herbicide (kills all vegetation) and should not be used during the growing season in high-quality areas because of the possibility of harming nontarget plants. Do

not spray so heavily that herbicide drips off the target species. The herbicide should be applied while backing away from the treated areas to avoid contacting the wet herbicide. By law, herbicides only may be applied as per label instructions and by licensed herbicide applicators or operators when working on public properties.

Initial effort in areas of light infestation

Removal of plants by hand-pulling is effective if the root is removed. If the stem snaps off from the root crown, the plant may resprout. When hand-pulling, disturb the soil as little as possible. Soil disturbance can bring garlic mustard seed to the surface and create a favorable environment for garlic mustard germination and growth.

Maintenance control

Vigilant monitoring and hand removal of first- and second-year plants can be effective.

A regular burning regime in oak woods can control garlic mustard.

RECOMMENDED PRACTICES ON BUFFER AND SEVERELY DISTURBED SITES

Fall or early spring burning in oak woods can control this species. Repeated burns may be necessary over several years. Spot application of 2% Roundup to individual plants as described above can be used in severely disturbed woods. Cutting or scything flowering stems, as described above, is effective. Maintenance control is the same as given above.

In addition, hand spraying individual plants with an amine formulation of 2,4-D is an effective control when applied according to label instructions. To reduce vapor drift, use an amine formulation of 2,4-D rather than an ester formulation. A 1% solution of Mecamine (2,4-D plus Dicamba) applied to the foliage of young plants is also effective. Either herbicide should be applied only during spring or fall when most native vegetation is dormant but garlic mustard remains green. The herbicide 2,4-D amine is selective for broadleaf plants. As with Roundup, managers should exercise caution when applying these herbicides to garlic mustard to avoid contacting nontarget plants. Do not spray so heavily that herbicide drips off the target species.

FAILED OR INEFFECTIVE PRACTICES

Practical procedures for control with herbicide are being researched more thoroughly (Nuzzo 2 1/2 year study supported by the Illinois Department of Energy and Natural Resources).

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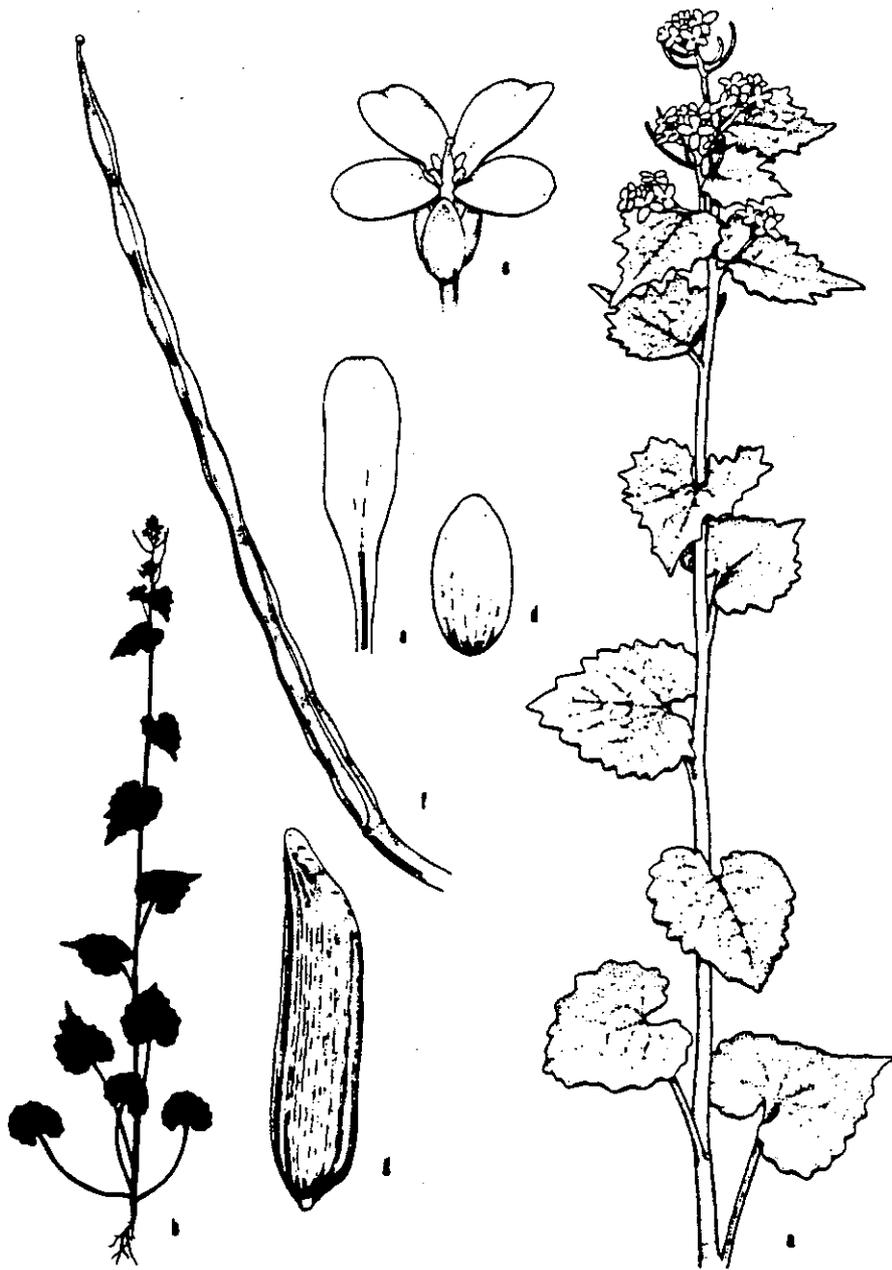
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85. *Alliaria officinalis* (Garlic Mustard). a. Upper part of plant, X $\frac{1}{4}$. b. Habit (in silhouette), X $\frac{1}{4}$. c. Flower, X $\frac{1}{5}$. d. Sepal, X10. e. Petal, X6. f. Fruit, X $\frac{1}{4}$. g. Seed, X $\frac{1}{5}$.

VEGETATION MANAGEMENT GUIDELINE

Johnson grass (Sorghum halepense)SPECIES CHARACTER

DESCRIPTION

Johnson grass is a tall, coarse, grass with stout rhizomes. It grows in dense clumps or nearly solid stands and can reach 8 feet (2.4 meters) in height. Leaves are smooth, 6-20 inches (15.2-50.8 cm) long, and have a white midvein. Stems are pink to rusty red near the base. Panicles are large, loosely branched, purplish, and hairy. Spikelets occur in pairs or threes and each has a conspicuous awn. Seeds are reddish-brown and nearly 1/8 inch (0.3 cm) long. Johnson grass should be accurately identified before attempting any control measures. If identification of the species is in doubt, the plant's identity should be confirmed by a knowledgeable individual and/or by consulting appropriate books.

SIMILAR SPECIES

Sorghum halepense with its white leaf vein, wide leaves, and reddish seedhead is distinguished from (1) eastern gamagrass (Tripsacum dactyloides), which has flowers in a spike rather than a loose panicle; (2) switchgrass (Panicum virgatum), which has no white vein and a greenish-yellow seedhead; 3) big bluestem (Andropogon gerardii) and Indiangrass (Sorghastrum nutans) which both have narrower leaves and usually lack a prominent vein.

DISTRIBUTION

Originally native to the Mediterranean, this grass now occurs in all warm-temperate regions of the world. It is widely distributed in tropical America, common in the southern U.S., and distributed throughout most of Illinois. It is particularly common in cultivated river bottoms in the southern 1/4 of the State, especially along the Mississippi, Ohio, and Cache River bottoms.

HABITAT

This species occurs in crop fields, pastures, abandoned fields, rights-of-way, forest edges, and along streambanks. It thrives in open, disturbed, rich, bottom ground, particularly in cultivated fields.

LIFE HISTORY

Johnson grass is a very aggressive, perennial grass. It occurs in dense clumps that spread by seed and rhizomes to form nearly pure stands. The grass emerges late in

spring and forms seed by July 1, reaching a height of 8 or more feet. Stems and leaves die back after the first frost, but the dead litter often covers the ground all winter. Rhizome cuttings commonly form new plants, making it very difficult to eradicate. It spreads rapidly and is not affected by many of the agricultural herbicides.

EFFECTS UPON NATURAL AREAS

Johnson grass invades riverbank communities and disturbed sites, particularly fallow fields and forest edges, where it crowds out native species and slows succession. It quickly dominates the herbaceous flora, reduces plant diversity, and is unsightly to observers. It occurs in disturbed parts of several natural areas such as Lower Cache, Horseshoe Lake, and Robeson Hills. This grass is a serious potential threat in many old fields where succession to forest communities is desired.

CONTROL RECOMMENDATIONS

RECOMMENDED PRACTICES IN NATURAL COMMUNITIES OF HIGH QUALITY Initial effort in areas of heavy infestation

Johnson grass does not infest areas of high natural quality heavily except for the naturally disturbed environment along river banks in southern Illinois where it is difficult to control selectively. Seed panicles should be cut and removed from the area where practical. Dense patches can be controlled by spraying the foliage with 2% Roundup (a formulation of glyphosphate) during June, just prior to seed maturity. Care should be taken to avoid contacting nontarget plants, since Roundup is a nonselective herbicide. Do not spray so heavily that herbicide drips off the target species. The herbicide should be applied while backing away from the area to avoid walking through wet herbicide. By law, herbicides may only be applied as per label instructions and by licensed herbicide applicators or operators when working on public properties.

Effort in areas of light infestation

Clumps and individual plants may be hand pulled during June, just after a rain when the ground is soft. All plant parts should be removed from the area. Broken stems and roots left in the ground should be dug up if only a small area is involved. It is more effective to spot-treat the individual plants with herbicide than to pull them, and large clumps can be sprayed with 2% Roundup using a hand sprayer or backpack sprayer. Herbicide treatment may need to be repeated for several years to ensure good control.

Maintenance control

Preferred treatment is hand pulling of individual

plants immediately upon discovery. All plant parts, including rhizomes, must be removed. It may be necessary to hand pull a population several times to obtain control. Surrounding seed sources should be eliminated where possible to prevent continual reinvasion.

RECOMMENDED PRACTICES ON BUFFER AND SEVERELY DISTURBED SITES Initial effort in areas of heavy infestation

Repeated and close mowing kills Johnson grass seedlings, prevents seed production, and reduces rhizome growth and regrowth of shoots. Sites may be tilled where it is practical (e.g. abandoned cropland) and the exposed roots left to winter kill. Repeated tillage (e.g. 6 times at 2-week intervals during the growing season) prevents rhizome development and reduces Johnson grass populations. Limited early season tillage, however, encourages rhizome growth by spreading pieces of the rhizomes. In a monoculture, livestock may be used to eliminate the Johnson grass by grazing. Spraying 2% Roundup on foliage using a tractor and power sprayer provides effective control.

Effort in areas of light infestation

Cutting and removal of seed heads during early July and then spot application of 2% Roundup to the foliage usually will be effective if continued for 3-4 years.

Maintenance control

Preferred treatment is same as given above for high-quality areas. Another treatment is spot application of 2% Roundup to eliminate invading individuals the first year and to eliminate all surrounding seed sources.

FAILED OR INEFFECTIVE PRACTICES

- hand control: too slow and not practical in large areas where infestations are heavy. Rhizomes break easily and are often left in the ground. Large mature plants are almost impossible to pull by hand.
- mowing: usually does not kill or eliminate established plants.
- fire: more research needed. Spring burns may encourage regrowth.
- herbicides: single applications seldom eliminate the species from an area.
- tillage: not practical in many places because of terrain and erosion hazard. It seldom is effective by itself and allows other weedy species to invade. It may also destroy native species present.
- grazing : Grazing increases the potential for introducing other exotic plants. Livestock trample the soil and damage other species.

- manipulating water levels: Johnson grass is not a wetland species, and it is seldom practical to selectively kill it by flooding.

- biological controls: livestock grazing may reduce plant vigor, but has negative impacts (e.g., excessive trampling, damage to other species, soil compaction) associated with it. No other biological controls are known that are feasible in natural areas.

ACKNOWLEDGEMENTS

Dr. Robert M. Mohlenbrock and the Southern Illinois University Press generously permitted use of illustrations from their Illustrated Flora of Illinois.

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195. *Sorghum halepense* (Johnson Grass). a. Inflorescence, X $\frac{1}{2}$. b. Sheath, with ligule, X $\frac{7}{8}$. c. Paired spikelets, X6. d. First glume, X $\frac{7}{8}$. e. Second glume, X $\frac{7}{8}$.

VEGETATION MANAGEMENT GUIDELINE

Moneywort (Lysimachia nummularia)

SPECIES CHARACTER

DESCRIPTION

Moneywort is a low-growing herb with smooth stems that grow to 2 feet (61 cm) long, have a 0.05-0.1 inch (1.2-2.5 mm) diameter, and branch frequently to form a mat-like growth. The leaves are simple, short-petioled, and opposite. The broadly oval leaves, which are obtuse at both ends, resemble small coins and give the plant its name. The 0.6-1 inch (17-25 mm) solitary flowers are wheel-shaped, 5-petaled, and are found in the leaf axils on a stalk as long as the leaves. The yellow flowers growing from the leaf bases are spotted with small dark red dots and bloom June to August. Moneywort should be accurately identified before attempting any control measures. If identification of the species is in doubt, the plant's identity should be confirmed by a knowledgeable individual and/or by consulting appropriate books.

DISTRIBUTION

This plant is a native of Great Britain and much of Europe. It was first introduced as an ornamental. Although initially only widespread in the northeastern U. S. from Georgia to Maine, it now can be found into Canada, throughout the north-central states, and along the west coast. It is distributed throughout Illinois.

HABITAT

Moneywort is most abundant in wet meadows, swamps, disturbed floodplain forests, and stream borders. It prefers moist, rich, shaded soils and is likely to be found in lawns, pastures, and along ditches and streams.

LIFE HISTORY

This rapidly growing perennial reproduces by seed as well as through a creeping growth habit of the stems. The stem creeps along the ground, rooting at each node when it gets the opportunity. Fruit is a globose capsule that opens longitudinally to expose the many seeds inside. Moneywort remains green throughout most of the year in Illinois.

EFFECTS UPON NATURAL AREAS

Moneywort invades floodplain forests, wet and mesic prairies, marshes, and swamps throughout the state. The plant tends to cover the ground with a mat of low-growing vegetation, excluding other herbaceous vegetation. Its

ability to root at nodes enables it to cover large areas.

CONTROL RECOMMENDATIONS

RECOMMENDED PRACTICES IN NATURAL COMMUNITIES OF HIGH QUALITY

Moneywort does not appear to be a problem in high-quality communities. In low wetland woods where it is invading, one possible means of control is by prescribed burning in spring or fall when moneywort is green but most native vegetation is dormant. The plant can be hand pulled where practical. All stems and stem fragments should be removed from the area to prevent the stems from rooting again in the soil.

RECOMMENDED PRACTICES ON BUFFER AND SEVERELY DISTURBED SITES

Same as above for high-quality natural communities. In low-quality buffer areas, prolonged submergence will kill moneywort. At restoration sites, moneywort can be controlled by establishing native grasses to shade it out. Suggested grasses include Cinna arundinacea and Elymus virginicus. Seeding of native grasses should be used only at restoration sites and not at natural areas. Herbicides such as Roundup or Rodeo may be effective control measures, but they have not been tested by Illinois natural area managers.

FAILED OR INEFFECTIVE PRACTICES

Mowing is not effective since moneywort adheres closely to the ground due to its many rooting nodes.

More research is needed concerning the effectiveness of herbicides.

No biological controls that are feasible in natural areas are known.

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VEGETATION MANAGEMENT GUIDELINE

Quaking Aspen (Populus tremuloides Michx.)SPECIES CHARACTER

DESCRIPTION

Quaking aspen is a medium-sized, shade intolerant tree that attains heights of 40-70 feet (12-21 meters), and diameters of 1-1.6 feet (0.3-0.5 meters). This tree has a short, rounded crown, and trunks up to about 23 inches (60 cm) wide. Young trees have smooth chalk-white to yellow-green bark. With age, the bark becomes thick, roughened by warty bands, and divided into flattened ridges. Branches are slender and slightly drooping, with hairless red-brown twigs during the first season. Leaves are alternate, deciduous, simple, and broadest near the ovate to heart-shaped base. They are 0.8-3 inches (2-8 cm) long and 0.7-2.8 inches (1.8-7 cm) wide. A short pointed tip found on each leaf has 20-40 pairs of fine teeth along the edges. Leaves are a dark shiny green above and a dull green beneath, and turn golden in autumn. The tree obtained its name because the leaves flutter in the slightest breeze due to long, flattened, slender leafstalks.

SIMILAR SPECIES

Quaking aspen is distinguished from other aspens, poplars and cottonwood by its finely toothed, ovate leaves that lack a white felt of hairs on the under surface and by its whitish bark. Big-tooth aspen has coarsely toothed, nearly circular leaves and bark that is grayish-green. White poplar, an alien tree, has coarsely toothed, ovate leaves that are covered by a white felt of hairs on the lower surface and has grayish-whitish bark. Cottonwood has triangular leaves that are nearly flat across the bottom and gray bark. Quaking aspen should be accurately identified before attempting any control measures. If identification of the species is in doubt, the plant's identity should be confirmed by a knowledgeable individual and/or by consulting appropriate books.

DISTRIBUTION

Quaking aspen has one of the widest distributions of any tree in North America. This aspen can be found from northern Alaska to Newfoundland, south to Pennsylvania, Missouri, northern Mexico, and lower California. In Illinois, it is recorded from 38 counties and is most common in the northern half of the state.

HABITAT

This tree grows in many diverse soils, including shallow rocky soil, clay soil, rich soil, or nutrient deficient sandy soil. Best growth occurs in rich, porous, limy soils.

LIFE HISTORY

This rapidly growing tree is one of the most aggressive of the pioneer species. It quickly colonizes recently burned or bare areas and soon establishes dense stands of young trees. Quaking aspens reproduce sexually by seeds and asexually by sending suckers from their extensive lateral roots, forming stands that are clones. Apparently establishment of quaking aspen by seed is uncommon. Establishment of stems by root suckering is much more common. Quaking aspens begin to produce seed at 15-20 years of age and continue for about 50 years, although good seed crops are produced only every 4-5 years. Flowers or catkins appear in April and May before the leaves, and fruits ripen 4-6 weeks later. Male and female catkins grow on separate trees and reach lengths of 2.5-10 cm. Fruit is in elongated clusters of drooping catkins with 0.2 inch (6 mm) long, light green capsules, each of which contains numerous seeds with cottony hairs that allow the seeds to become airborne. Rarely, trees live to be 150 years old.

EFFECTS UPON NATURAL AREAS

Aspen is a problem in some disturbed prairie areas where it forms large clones. It tends to exclude prairie species and provides favorable conditions for other trees and shrubs to become established.

CONTROL RECOMMENDATIONS

RECOMMENDED PRACTICES IN NATURAL COMMUNITIES OF HIGH QUALITY
Initial effort in areas of heavy infestation

Girdling is the preferred management technique if practical. Girdled trees die slowly over the course of 1 to 2 years and girdling minimizes resprouting. Girdling is easiest in late spring or early summer when the sap is flowing and the bark readily peels away from the sapwood. Girdling also may be attempted at other times of the year, although one must be more careful not to girdle too deeply into the sapwood. When girdling a tree, the bark and phloem must be removed from a band around the tree trunk and the xylem must remain intact. If girdled too deeply, the tree will respond as if it had been cut down and will resprout from the roots.

Girdling can be done with an ax, saw, or chainsaw. Two parallel cuts 3-4 inches apart, cutting through the bark slightly deeper than the cambium are needed. The bark is knocked off using a blunt object like the head of an ax. The

girdles should be checked every several weeks at first to make sure bark does not develop over the cut area. When big stems are girdled, it is important to cut any small stems present. This minimizes the amount of resprouting. If the trees are too small to be girdled practically, cutting twice in one year is sometimes effective.

A common mistake is to cut down large trees without any other treatment. This should not be done, as it results in vigorous resprouting creating hundreds of small stems. However, resprouting of cut trees can be controlled with herbicide application as discussed below.

Initial effort in areas of light infestation

Girdling or cutting twice in one year should be done as given above.

Maintenance control

A continuous burning program (with burns approximately every other year), will control aspen within a few decades. Late spring (1-2 weeks after aspen flowering) seems to be an especially effective time to burn. Successful burning requires a sufficient quantity of leaf litter and/or grass to provide the fuel base to carry a fire thoroughly under aspen groves. Cutting canopy trees to eliminate shade and produce fire fuels may be necessary in conjunction with burning to achieve adequate control.

RECOMMENDED PRACTICES ON BUFFER AND SEVERELY DISTURBED SITES

Initial effort in areas of heavy infestation

Same as in high-quality areas except that managers may prefer to cut stems and treat the stumps with herbicides if there is not enough labor to pursue the preferred mechanical treatments listed above. Stems should be cut and the stumps treated with Roundup (a formulation of glyphosate) within 2-3 hours after cutting. While the Roundup label recommends a 50-100% concentration of Roundup for stump treatment, a 10-20% concentration has proven effective. Roundup can be applied either by spraying individual stumps with a low pressure hand-held sprayer or else by wiping each stump with a sponge applicator (sponge-type paint applicators can be used).

In addition, fosamine (tradeneme Krenite) is an effective herbicide for small saplings and root suckers when applied as a foliar spray according to label directions. Thorough cover with a soft water carrier is required and a nonionic surfactant will improve results. Coverage of foliage should be complete. Krenite should be applied only in July-September. No effects will be observed during the autumn season following application. Slight regrowth may occur the following season but saplings will die during summer. Fosamine kills only woody species and is non-volatile.

If either herbicide is used, care should be taken to prevent contacting nontarget plants with the herbicide. The herbicide should be applied while backing away from treated areas so as not to walk through the wet herbicide. By law, herbicides only may be applied according to label instructions and by licensed herbicide applicators or operators when working on public properties.

Initial effort in areas of light infestation

Same as in high-quality areas, although managers may prefer to use herbicides as described above for buffer and severely disturbed sites.

Maintenance control

Prescribed burning as described above. Nearby seed sources should be removed if possible.

FAILED OR INEFFECTIVE PRACTICES

No effective biological controls that are feasible in natural areas are known.

ACKNOWLEDGEMENTS

Dr. Robert M. Mohlenbrock and the Southern Illinois University Press generously permitted use of illustrations from their Illustrated Flora of Illinois.

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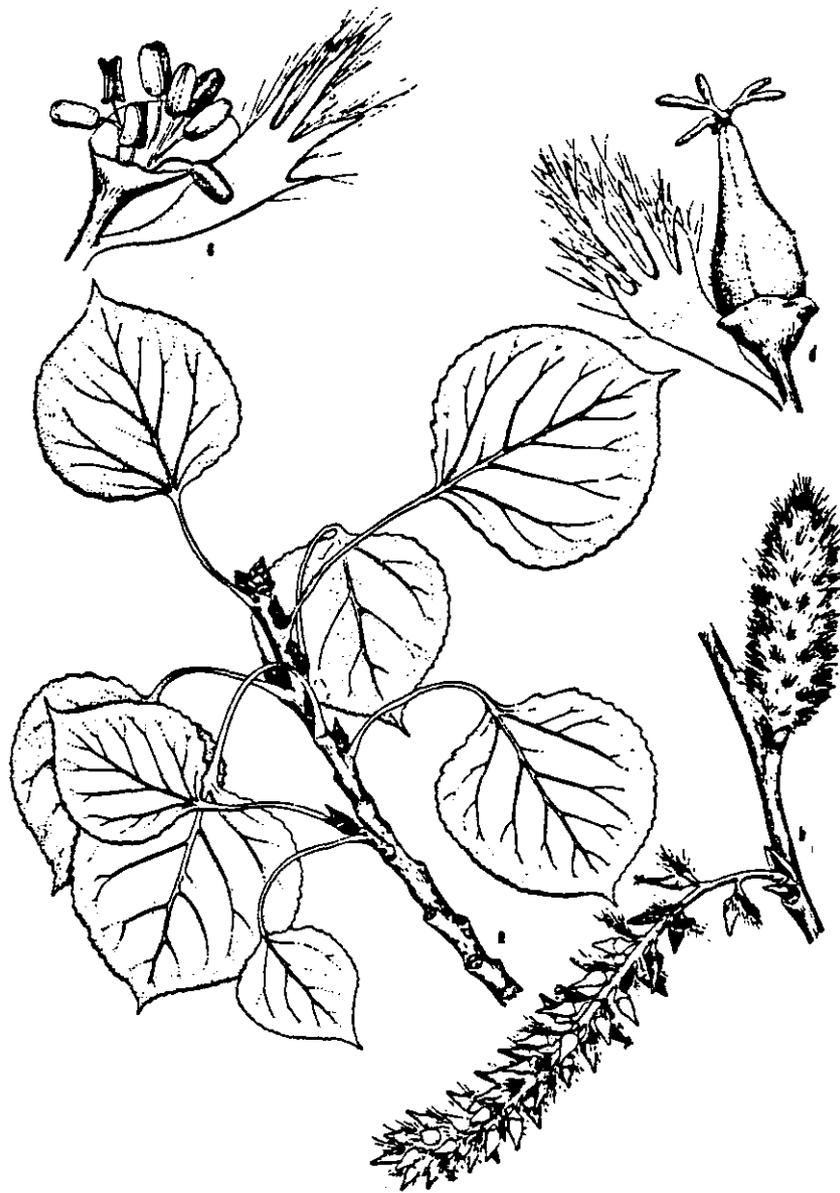
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32. *Populus tremuloides* (Quaking Aspen). a. Vegetative branch, X $\frac{1}{4}$. b. Branch with staminate ament (above) and pistillate ament (below), X $\frac{1}{4}$. c. Staminate flower, X6. d. Pistillate flower, X6.

VEGETATION MANAGEMENT GUIDELINE

Reed canary grass (Phalaris arundinacea)SPECIES CHARACTER

DESCRIPTION

This large, coarse grass has erect, hairless stems, usually from 2 to 6 feet (0.6-1.8 meters) tall. The ligule is prominent and membranous, 1/4 inch (0.6 cm) long and rounded at the apex. The gradually tapering leaf blades are 3 1/2-10 inches (8.9-25.4 cm) long, 1/4-3/4 inch (0.6-1.9 cm) wide, flat, and often harsh on both surfaces. The compact panicles are erect or sometimes slightly spreading and range from 3-16 inches (7.6-40.6 cm) long with branches 1/2-1 1/2 inches (1.2-3.8 cm) long. Single flowers occur in dense clusters in May to mid-June or August. Inflorescences are green or slightly purple at first, then become tan. Seeds are shiny brown.

The species growth form is highly variable. Reed canary grass is considered native to Illinois, but a Eurasian ecotype has been introduced widely. Plant size, panicle shape, and panicle size are not correlated to geographic distribution.

SIMILAR SPECIES

It is extremely difficult, if not impossible, to distinguish the native and non-native ecotypes. Reed canary grass closely resembles orchard grass (Dactylis glomerata). It differs from orchard grass in that reed canary grass's leaves are much wider, the inflorescence is more narrow and pointed, and the individual flowers have a different shape. The glumes and lemmas (scales that are part of the spikelet) of orchard grass are hairy, while those of reed canary grass are glabrous. Reed canary grass should be accurately identified before attempting any control measures. If identification of the species is in doubt, the plant's identity should be confirmed by a knowledgeable individual and/or by consulting appropriate books.

DISTRIBUTION

This grass is found throughout the world except Antarctica and Greenland. The Mediterranean region is the center of diversity of the genus. It is locally common in Illinois wetlands, particularly in the northern part of the state where it frequently occurs in wet meadows and marshes.

HABITAT

This species occurs in wetlands, including marshes, wet prairies, wet meadows, fens, stream banks, and swales. It has been planted widely for forage and for erosion control.

LIFE HISTORY

Reed canary grass is a coarse, sod-forming, cool-season, perennial grass, native to temperate regions of Europe, Asia, and N. America, and adapted to much of the northern half of U.S. It occurs from wet to dry habitats with best growth on fertile and moist or wet soils (shores, swales, meadows). Reproduction is from seed and vegetatively by stout, creeping rhizomes. It begins growth in early spring, growing vertically 5-7 weeks after germination, and then expands laterally. Growth peaks in mid-June and declines in mid-August. Vegetative vigor is related to maximum root and shoot production. Seeds ripen in late June and shatter when ripe. The native reed canary grass is not thought to be aggressive as is the Eurasian ecotype.

EFFECTS UPON NATURAL AREAS

It is a major threat to marshes and natural wetlands because of its hardiness, aggressive nature, and rapid growth. Native wetland and wet prairie species are replaced after several years of reed canary grass presence. It is of particular concern because of the difficulty of selective control.

CONTROL RECOMMENDATIONS

RECOMMENDED PRACTICES IN NATURAL COMMUNITIES OF HIGH QUALITY

Fire can help control the spread of reed canary grass and keep it out of high quality wetlands. Repeated late autumn or late spring burning for several years can control this species. Annual burning may be needed for 5-6 years before good control is apparent. Burning is most effective where other species are present or in the seed bank, since fire allows native, fire-adapted species to compete successfully. Fire is not very effective in dense monocultures of this grass where seeds or plants of native species are absent.

The native reed canary grass should not be totally eliminated, but no reliable method for telling the difference between the forms is known. Control measures should be implemented when reed canary grass degrades the natural quality or diversity of a community.

RECOMMENDED PRACTICES IN BUFFER AND SEVERELY DISTURBED SITES

Prescribed fire as described above should be used in areas that will burn. Hand removal for control may be feasible in small stands. There is evidence that hand chopping the culms at flowering time may kill small clones.

Certain herbicides are effective where there is no real concern for damage to surrounding native species. Rodeo, a formulation of glyphosate designed for use in wetlands, will kill reed canary grass, especially young plants, when applied to foliage according to label recommendations.

Rodeo should be applied in early spring when reed canary grass is green and most native wetland species are still dormant. The area should be checked after spraying, and any surviving reed canary grass should be sprayed the following spring. Dalapon and Amitrol also reportedly kill canary grass, although no Illinois natural area managers were found that have experience with these herbicides. All 3 herbicides are licensed for use in aquatic areas. **Rodeo and Amitrol are nonselective herbicides that will kill all vegetation contacted.** Dalapon selectively kills grasses and monocots, but not broadleaf plants. Spraying foliage with Roundup (a formulation of glyphosate) mixed according to label instructions and subsequent burning of dead residue has been moderately effective in northern Illinois. However, Roundup is not licensed for use in aquatic areas and should only be used in areas without standing water. When using any herbicide, precautions should be taken to avoid contacting nontarget species. **Do not spray so heavily that herbicide drips off the target species.** The herbicide should be applied while backing away from the treated area to avoid contacting wet herbicide. By law, herbicides only may be applied as per label instructions and by licensed herbicide applicators or operators when working on public properties.

Where practical, it can be useful to sow in seed of nearby native grasses and forbs after reed canary grass has died (due to control efforts) or gone dormant. Seed of nearby native grasses and forbs should be collected when ripe and then raked into the sod as soon as the reed canary grass has died.

FAILED OR INEFFECTIVE PRACTICES

- hand control: very slow and too labor-intensive for large stands.
- mowing: probably not effective as a control measure.
- herbicides: probably none that are selective enough to be useful in high quality areas.
- grazing: probably not a practical method of control in wetland areas where canary grass usually is a problem.
- tillage: not usually practical in wetlands and not appropriate for high quality sites.
- restoring water levels: many Illinois wetlands are drier now than historically, and restoring water levels needs more research.
- biological controls: none known that are feasible in natural areas.
- introduction of competitive species: probably few native species can compete with reed canary grass in wetlands if burning is not used also. It reportedly will even crowd out cattails. Prescribed burning allows native

species that are present or seeded-in to compete successfully.

- heavy equipment: removal with construction equipment is ineffective, as reed canary grass responds quickly by growing back from rhizomes and seeds remaining in the soil. Use of heavy equipment is not appropriate in good quality natural communities.

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Dr. Robert M. Mohlenbrock and the Southern Illinois University Press generously permitted use of illustrations from their Illustrated Flora of Illinois.

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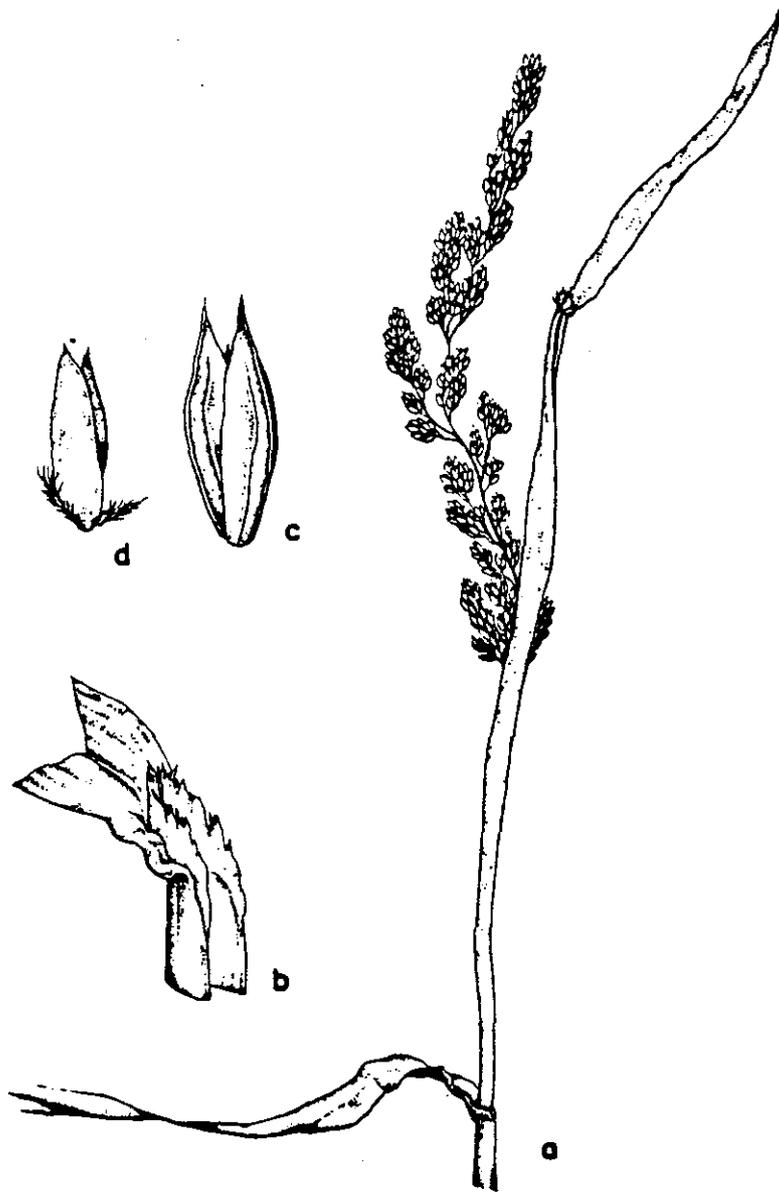
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198. *Phalaris arundinacea* (Reed Canary Grass). a. Inflorescence, X $\frac{1}{2}$. b. Sheath, with ligule, X $\frac{1}{2}$. c. Spikelet, X6. d. Lemmas, X6.

VEGETATION MANAGEMENT GUIDELINE

Round-leaved bittersweet (Celastrus orbiculatus Thunb.)

SPECIES CHARACTER

DESCRIPTION

Round-leaved bittersweet is a deciduous twining vine (older individuals become spreading, trailing shrubs) with alternate, round, toothed, glossy leaves. The small greenish flowers occur in a cluster terminating the small branches, with terminal flowers blooming first. The green, globose fruit is born in clusters of 1-3 in July and later becomes orange in color.

SIMILAR SPECIES

This vine is distinguished from purple winter creeper (Euonymus fortunei) which has opposite, elliptic leaves. It differs from climbing bittersweet (Celastrus scandens) which has elliptic or ovate leaves that are usually not as round as those of round-leaved bittersweet. Round-leaved bittersweet should be accurately identified before attempting any control measures. If identification of the species is in doubt, the plant's identity should be confirmed by a knowledgeable individual and/or by consulting appropriate books.

DISTRIBUTION

Originally native to eastern Asia, round-leaved bittersweet occurs from New York to Virginia and southwestward in the U.S. It is a problem in Great Smoky Mountain National Park. It occurs at scattered localities near homesites in several counties in Illinois, but is a serious problem at Giant City State Park in Jackson County. It also occurs along a roadside at Cave Hill in Saline County, Illinois.

HABITAT

Round-leaved bittersweet mainly is associated with old homesites where it has escaped from cultivation into surrounding natural communities. It occurs in a variety of forest types, including undisturbed mesic and dry-mesic forest. It also is found in disturbed open areas such as roadsides.

LIFE HISTORY

This aggressive, perennial, woody vine climbs on rocks and trees and sometimes covers the ground and vegetation. Round-leaved bittersweet spreads vegetatively by underground roots that form new stems. It spreads rapidly into openings

and undisturbed woodland and reproduces prolifically by seed. It is shade tolerant, and seedlings may stay suppressed for some time before released by disturbance.

EFFECTS UPON NATURAL AREAS

At Fern Rocks Nature Preserve in Jackson County, Illinois, it has covered the ground and vegetation, actually eliminating native ground-cover species in mesic and dry mesic woods. In the south, it climbs up to 60 feet in trees and reaches 4 inches in diameter. This vine constricts trees and shrubs and eventually kills them by shading. It is a serious potential threat because it spreads rapidly, invades mesic woods, and replaces spring ephemerals.

CONTROL RECOMMENDATIONS

RECOMMENDED PRACTICES IN NATURAL COMMUNITIES OF HIGH QUALITY

Where practical, individual vines should be pulled up by the roots and removed from the area by hand. If hand removal is not feasible (e.g. large populations), vines should be cut by hand and cut stems spot-treated with 100% Roundup (a formulation of glyphosphate) just after the last killing frost. A squirt bottle may be used to spot-treat the cut stumps or else herbicide can be wiped on each stump with a sponge applicator. Treatment should be prior to emergence of spring ephemerals. The herbicide applicator should carefully avoid contacting nontarget plants when applying herbicide, because Roundup is nonselective. By law, herbicides only may be applied as per label instructions and by licensed herbicide applicators or operators when working on public properties.

To maintain control, round-leaved bittersweet should be totally eradicated from the surrounding area where possible.

Invading individuals should be pulled immediately and removed upon discovery.

RECOMMENDED PRACTICES ON BUFFER AND SEVERELY DISTURBED SITES

Same as above in areas where hand labor is available and practical. For large populations in severely degraded sites, foliar spraying with Crossbow (a mixture of 2,4-D and triclopyr), using backpack sprayers, will reduce the population. Crossbow should be mixed according to label instructions for foliar application. As with Roundup, care should be taken to avoid contacting nontarget plants with herbicide. Do not spray so heavily that herbicide drips off the target plant. The herbicide should be applied while backing away from the treated area to avoid walking through the wet herbicide. Crossbow is effective when applied in mid-late October.

FAILED OR INEFFECTIVE PRACTICES

- hand control: slow and labor-intensive.
- fire: often not desirable in mesic woodland environments.
- herbicides: should not be used during growing season when spring ephemerals and other native species likely are to be affected.
- no biological controls are known that are feasible in natural areas.

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VEGETATION MANAGEMENT GUIDELINE

Siberian elm (Ulmus pumila L.)SPECIES CHARACTER

DESCRIPTION

Siberian elm is a fast-growing, small to medium-sized tree with an open, round crown of slender, spreading branches. It generally measures 50-70 feet (15-21 meters) tall with a spread equal to three-fourths its height. Its rough bark is gray or brown and shallowly furrowed at maturity. Both the small, blunt buds and slender, smooth twigs are nearly hairless. This elm is distinguished by its small, elliptic, smooth, singly-toothed leaves, that reach lengths of approximately 0.8-2.6 inches (2-7 cm). Blades of the alternate, simple leaves are short-pointed at the tip and tapering or rounded at the asymmetrical base. The short-petioled leaves are dark green and smooth above, paler and nearly hairless beneath, and yellow in autumn. Foliage is slightly pubescent when young, and firm at maturity. Flowers are greenish, lack petals, and occur in small drooping clusters of 2-5. The winged fruit of this hardy tree is a 1-seeded, smooth, circular or rather obovate samara that is 0.4-0.6 inch (10-15 mm) wide and hangs in clusters.

SIMILAR SPECIES

Siberian elm is distinguished from American elm (Ulmus americana) and slippery elm (Ulmus rubra) based on the following characteristics. Siberian elm has relatively small leaves (rarely more than 2 inches or 5 cm long) that are symmetrical or nearly so at the base and are once-serrate. Both American and slippery elm have leaves typically over 2.8 inches (7 cm) long that are strongly asymmetrical at the base and are usually twice-serrate. Siberian elm should be accurately identified before attempting any control measures. If identification of the species is in doubt, the plant's identity should be confirmed by a knowledgeable individual and/or by consulting appropriate books.

DISTRIBUTION

Siberian elm is native to northern China, eastern Siberia, Manchuria, and Korea, and was introduced to the U.S. in the 1860's. It is the hardiest of all elms and does well even in areas with cold winters and long periods of summer droughts. Often planted in recent decades because of its fast growth, it is now established at least from Minnesota south to Arkansas and west to Utah.

HABITAT

Because this elm tolerates a variety of conditions, such as poor soils and low moisture, it is found in dry regions, along roadsides, in pastures, in grasslands, as well as in moist soils along streams. It invades dry and mesic prairies, including sand prairies.

LIFE HISTORY

The tree flowers in spring before leaves begin to unfold. The samaras follow quickly and are disseminated by wind, allowing the species to form thickets of hundreds of seedlings in bare ground. Seeds germinate readily and seedlings grow rapidly.

EFFECTS UPON NATURAL AREAS

If there is a nearby seed source, the tree can invade and, in a few years, dominate prairie areas, particularly if they have been subjected to past disturbance.

CONTROL RECOMMENDATIONSRECOMMENDED PRACTICES IN NATURAL COMMUNITIES OF HIGH QUALITY
Initial effort in areas of heavy infestation

Girdling trees is the preferred management technique where practical. Girdle large trees in late spring to mid-summer when sap is flowing and the bark easily peels away from the sapwood. Girdled trees die slowly over the course of one to two years and do not resprout. When girdling a tree, the bark and phloem must be removed from a band around the tree trunk and the xylem must remain intact. If girdled too deeply, the tree will respond as if it had been cut down and will resprout from the roots. Girdling can be done with an ax, saw, or chainsaw. Two parallel cuts 3-4 inches apart, cutting through the bark slightly deeper than the cambium are needed. The bark is knocked off using a blunt object like the head of an ax. The girdles should be checked every several weeks at first to make sure they are good and bark does not develop over the cut area.

If girdling is not an option, trees can be cut, and any resprouts that occur subsequently should also be cut. If time constraints prevent cutting the new sprouts, the stumps created by the initial tree cutting can be treated with Roundup (a formulation of glyphosate) to prevent resprouting. While the Roundup label recommends a 50-100% concentration of Roundup for stump treatment, a 10-20% concentration has proven effective. Roundup can be applied to the cut stump either by spraying the stump with a low pressure hand-held sprayer or wiping the herbicide on the stump with a sponge applicator to prevent resprouting. Herbicides should be avoided except when there is not enough time to go back and cut the sparse resprouts. Care should be taken to prevent contacting nontarget plants with the

herbicide. By law, herbicides only may be applied as per label instructions and by licensed herbicide applicators or operators when working on public properties.

Seedlings can be pulled out by hand and small trees can be removed carefully by grub hoe. Elm seeds blowing in from nearby areas are often a greater threat than resprouting of established elms. Managers should eliminate nearby Siberian elms whenever possible.

Initial effort in areas of light infestation

Same as given above for heavily infested areas.

Maintenance control

A regular fire regime should control Siberian elm in fire-adapted communities. Siberian elms should be controlled in areas surrounding a preserve whenever possible.

RECOMMENDED PRACTICES ON BUFFER AND SEVERELY DISTURBED SITES

Initial effort in areas of heavy infestation

Same as above except that labor-saving chemical methods may be preferred.

Initial effort in areas of light infestation

Same as above except that labor-saving chemical methods may be preferred.

Maintenance control

A regular fire regime should control this species in fire-adapted communities. Annual mowing may be appropriate in some situations, especially where nearby seed sources cannot be removed.

FAILED OR INEFFECTIVE PRACTICES

No biological controls are known that are feasible in natural areas.

ACKNOWLEDGEMENTS

Dr. Robert M. Mohlenbrock and the Southern Illinois University Press generously permitted use of illustrations from their Illustrated Flora of Illinois.

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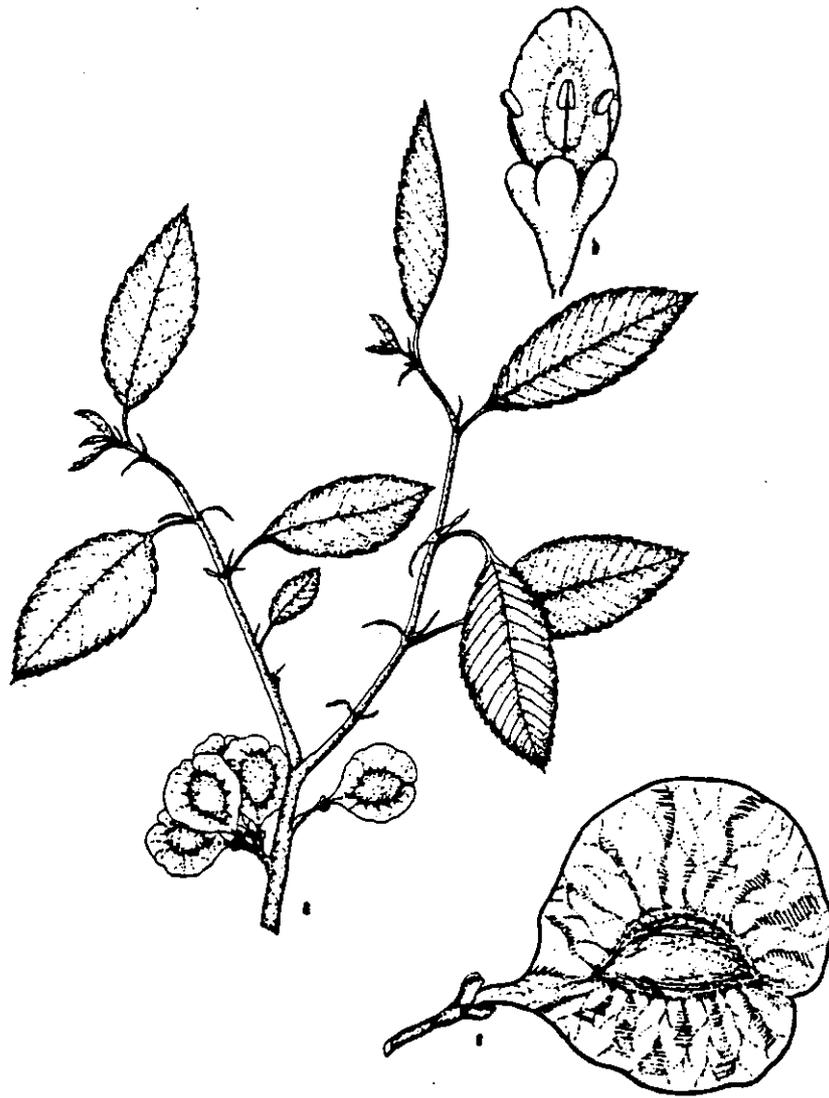
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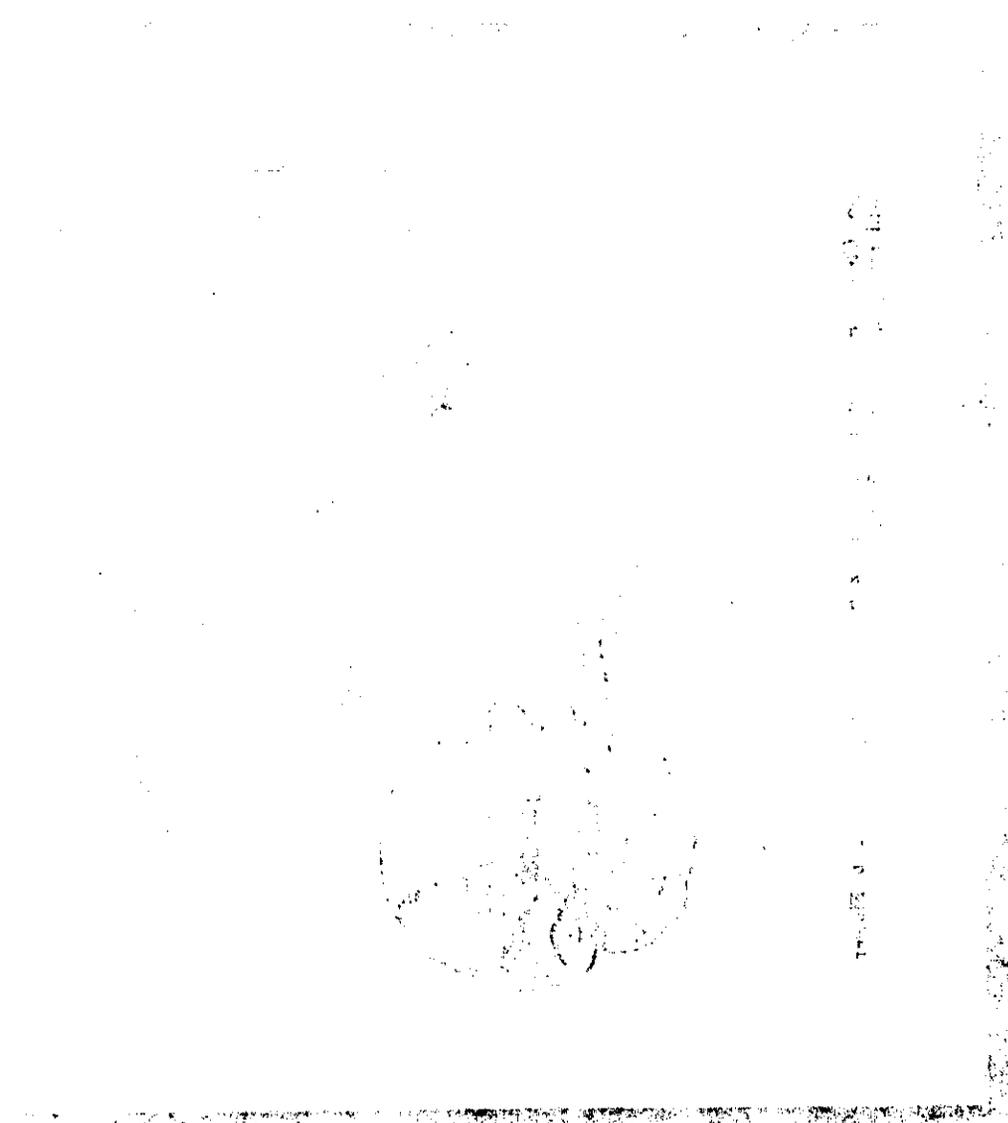
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30. *Ulmus pumila* (Siberian Elm). a. Leafy branch, with fruits, $\times 1$. b. Flower, with emerging fruit, $\times 5$. c. Fruit, $\times 5$.



VEGETATION MANAGEMENT GUIDELINE

Smooth Sumac (Rhus glabra L.)

SPECIES CHARACTER

DESCRIPTION

This shrub or small tree reaches up to 20 feet (6.1 meters) tall and has a spreading crown. The bark is light brown and smooth on young plants. Twigs are stout, angular, smooth, and covered with a whitish coat that can be wiped off. Leaves are pinnately compound with 7-31 leaflets that are green on upper surface and nearly white on lower surface. Leaves turn red in autumn. The small, numerous flowers occur in much branched clusters. The fruit is a cluster of red drupes. Each drupe (a fleshy fruit with a hard or stony center) is round, has short hairs and contains a single seed.

SIMILAR SPECIES

Black walnut is a tree that often has the end leaflet lacking. Winged sumac has winged leaf stalks. Staghorn sumac has velvet covered twigs. Smooth sumac should be accurately identified before attempting any control measures. If identification of the species is in doubt, the plant's identity should be confirmed by a knowledgeable individual and/or by consulting appropriate books.

DISTRIBUTION

Smooth sumac is native to and occurs throughout the U.S. and into southern Canada, but is most common in the eastern U.S. It occurs throughout Illinois but is not as common in southern counties as winged sumac.

HABITAT

This species is usually found on disturbed sites, abandoned fields, railroad edges, fence rows, rights-of-way, etc.

LIFE HISTORY

This native but sometimes aggressive shrub occurs in clumps and spreads by seeds and rootstocks. It flowers from late May until mid-August. Seeds are formed by September. It sprouts easily, grows rapidly, and aboveground stems are relatively short-lived while roots persist and form new stems.

EFFECTS UPON NATURAL AREAS

Smooth sumac is known to shade and replace prairie plants and endangered species. It is one of the primary woody invaders that moves into glades and hill prairies in much of Illinois, where its dense clones eliminate other native species.

CONTROL RECOMMENDATIONS

RECOMMENDED PRACTICES IN NATURAL COMMUNITIES OF HIGH QUALITY

Managers first must decide what part of the population should be removed. In general, sumac should be left in ravines and draws within prairie communities. It should not be eliminated totally from communities where it occurred in presettlement times, but should be controlled where it has invaded or spread to the detriment of other native vegetation.

Stems should be cut with an ax, lopper, or sharp blade in July or shortly after flowering. Sprouts then should be cut in August. Spot-treating cut stumps with Roundup (a formulation of glyphosate) will minimize resprouting. While the Roundup label recommends a 50-100% concentration of Roundup for stump treatment, a 10-20% concentration has proven effective. Roundup can be applied to cut stumps either with a low pressure hand-held sprayer or else by wiping it on the stump with a sponge applicator (similar to paint applicators). The herbicide applicator must be extremely careful not to contact nontarget species with Roundup since this herbicide is nonselective and will kill most photosynthetically active plants when the herbicide is applied in July or August. By law, herbicides only may be applied as per label instructions and by licensed herbicide applicators or operators when working on public properties.

If sumac is intermingled with many other native plants, Roundup should not be used and the sumac should be cut twice, once in July and once in August. Cutting at the appropriate time is crucial for effective control. Double-cutting (once in July and once in August) may need to be repeated for several consecutive years to achieve effective control in dense populations.

Where fire will carry through a stand, burning in August will often kill mature plants, but sprouts must be cut. In glades and prairies, an occasional August burn should be sufficient.

For maintenance control, edge individuals that provide the source of young plants invading high-quality prairie or glade communities should be cut and the stumps spot-treated with Roundup, as described above. An occasional August fire should be sufficient to keep the sumac population in check. Midsummer (July or August) mowing or cutting of sumac can reduce its vigor.

RECOMMENDED PRACTICES ON BUFFER AND SEVERELY DISTURBED SITES

The control procedures recommended above for high quality natural areas are also applicable to buffer and severely disturbed sites. In addition, foliar applications of Garlon 3A (a selective translocated herbicide that is a formulation of triclopyr) or 1-2% Roundup applied according to label instructions also are effective. If herbicides are used, great care should be taken to avoid contacting nontarget plants with

the herbicide. In addition, do not spray so heavily that herbicide drips off the target species. The herbicide should be applied while backing away from the treated area to avoid walking through the wet herbicide. Large smooth sumac clones should not be allowed to develop next to naturally open communities.

INEFFECTIVE OR FAILED PRACTICES

- hand control: fall or winter cutting has little effect.
- mowing: early- or late-season mowing has little effect and is not practical on all sites, particularly steep glades and hill prairies. As mentioned above, midsummer mowing or cutting is an effective control.
- fire: early spring fires can actually increase sprouting and encourage the spread of smooth sumac. Dormant season (late fall, winter) fires do not control sumac.
- herbicides: are not as effective during the dormant season.
- grazing: encourages sumac growth and spread.
- biological controls: none are known that are feasible in natural areas.

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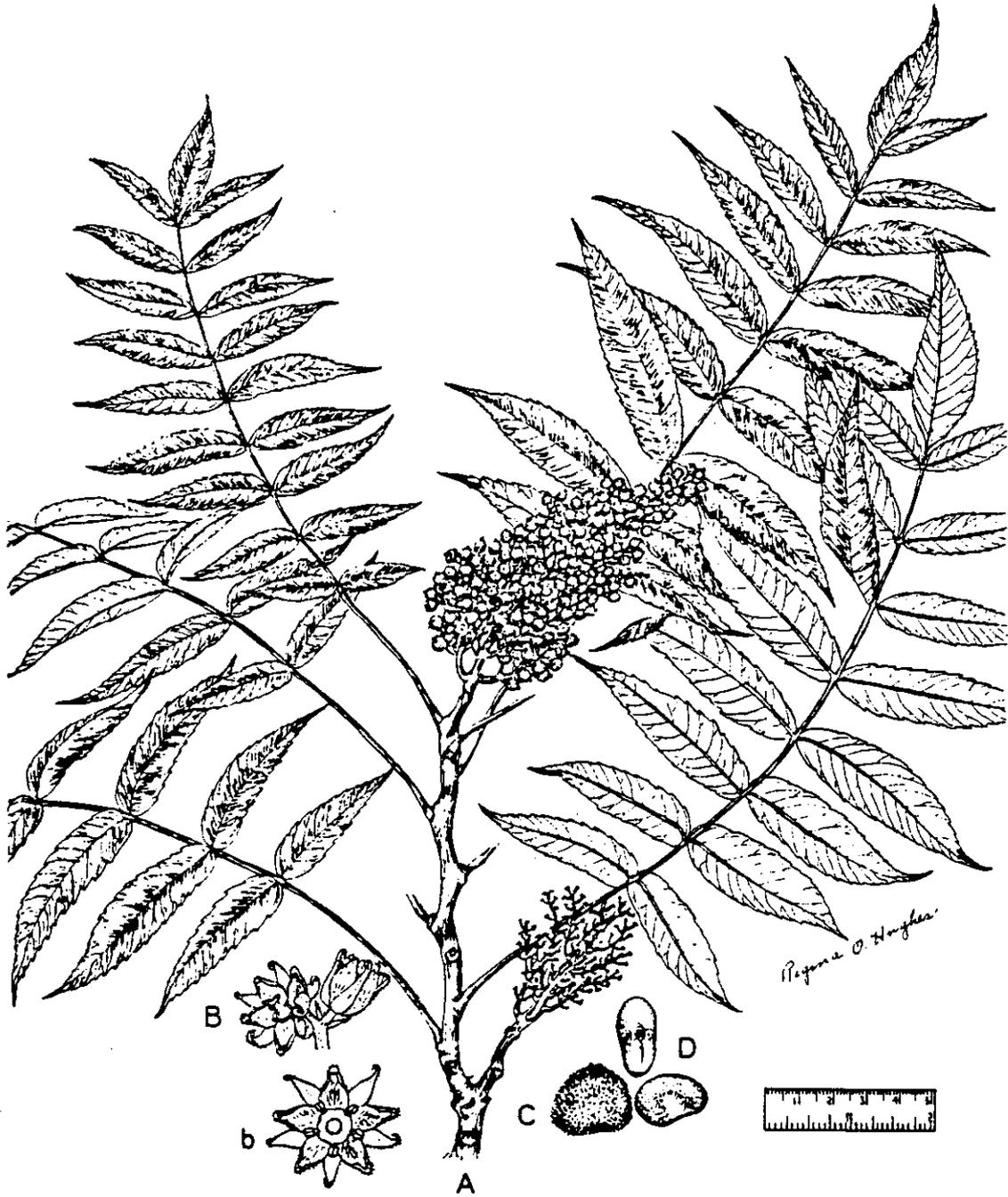
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Rhus glabra L. Smooth sumac. A, Habit— $\times 0.5$; B, flowers— $\times 5$; b, diagram of flower to show disk with stamens— $\times 6$; C, fruit— $\times 2.5$; D, seeds— $\times 2.5$.

VEGETATION MANAGEMENT GUIDELINE

Wild Parsnip (Pastinaca sativa L.)

SPECIES CHARACTER

DESCRIPTION

The thick taproot of the wild parsnip is long, conic, and fleshy. Branching from the fleshy root is the light green, hollow, deeply-grooved stem that stands erect at 2-5 feet (0.6-1.5 meters) tall. Leaves are alternate, pinnately compound, and branched with saw-toothed edges. Each leaf has 5-15 ovate to oblong leaflets with variably toothed edges and deep lobes. The petiolate lower leaves are often 1.5 inches (3.8 cm) long, while upper leaves are sessile and much reduced. The small, 5-petaled, yellow flowers are arranged in 2-6 inch (5-15 cm) broad umbels at the top of slender stems and branches. Each compound flat umbel has 15-25 primary rays that contain yellow blossoms during the June-September flowering season. The blossoms give rise to a fruit termed a schizocarp that is broadly oval and 0.25 inch (6 mm) long. The abundant 0.25 inch (6 mm) mericarps (segments of the fruit) of this parsnip are flat, round, smooth, straw-colored, and have low ribs across them.

SIMILAR SPECIES

Wild parsnip is distinguished from other species in the parsley family by its yellow flowers and its pinnately compound leaves that are divided once into more than five leaflets. Wild parsnip should be accurately identified before attempting any control measures. If identification of wild parsnip is in doubt, the plant's identity should be confirmed by a knowledgeable individual and/or by consulting appropriate books.

DISTRIBUTION

This member of the parsnip or umbel family has escaped from cultivation and is common throughout the northern United States and Canada, from British Columbia to California and Vermont, and south to Florida. In Illinois, wild parsnip has become a serious problem in some mesic prairies, and it has been recorded from every county.

HABITAT

Although this Eurasian native thrives when growing in rich, alkaline, moist soils, it can survive under almost any conditions. Wild parsnip commonly can be found along roadsides, in pastures, and in fields.

LIFE HISTORY

Wild parsnip is a perennial that exists as a basal rosette for at least one year and then flowers and dies. Like its relative the carrot, wild parsnip produces a rosette of large, grooved, upright leaves and stores reserves in a large, fleshy taproot during the first year. A hollow flowering stem whose leaves are much smaller is sent up from the center of the rosette in a subsequent growth season. Wild parsnip often flowers and sets seed during its second year, although it may not flower until subsequent years.

The edible roots of wild parsnip were consumed in ancient Greece and Rome and cultivars are still grown for food today. The root develops its sweet taste after being exposed to cold. Some people are sensitive to the touch of the leaves and soon develop a rash if their skin contacts the leaves or plant sap in the presence of sunlight. A very painful rash can develop that in some people leaves scars that can persist for several months or longer. Wild parsnip is most irritating at the time of flowering.

EFFECTS UPON NATURAL AREAS

Well-established prairies are not likely to be invaded by parsnip, but it can become quite abundant on prairie edges and in disturbed patches within otherwise high-quality prairies. Once established at the edges, parsnip can spread into adjacent high-quality areas.

CONTROL RECOMMENDATIONS

Warning -- Care should be taken to avoid skin contact with the toxic sap of the plant tissues by wearing gloves, sleeves, and long pants.

Although eradication of this exotic is desirable from a human safety as well as ecological standpoint, in some situations the best control measure is to do nothing. In high-quality prairies, aggressive growth by other species sometimes can outcompete and eventually displace the parsnip.

Mechanical

The best control is achieved mainly through hand-pulling. Plants should be pulled and removed so that seeds do not develop and plants do not resprout. Wild parsnip is easiest to pull right after a good rain or during a drought when the root shrinks. Another effective practice involves cutting the plant below the root crown before seed set during spring of the second year. The best time is as soon as blooms show, but have not matured. Since the plants do not all flower at once, the area should be rechecked several weeks after the first cutting and the following 2-3 years for newly flowering plants. After a spring burn, wild parsnip rosettes are among the first plants to emerge and may be detected

easily and dug out to control its abundance along prairie edges. Seeds do not remain viable if dormant in the ground more than 4 years, so the species can be controlled if there is no outside seed source. Although the practices of hand-pulling, cutting, and digging have been successful in small areas with scattered plants, these practices can become difficult and time-consuming if patches containing hundreds of plants have been allowed to spread unchecked.

Mowing or cutting the base of the stem with a scythe can be effective if it takes place after flowering the second year when the plant is mature and blooming, but before seed set. Parsnip must be removed or recut often and checked later for small bloom shoots near the ground. Poorly timed mowing, as is likely along roadsides, may increase both number of seedlings and percentage surviving to maturity. Mowing probably favors parsnip maturation by allowing more sunlight to reach immature parsnip plants, which are too low to be damaged by the mower. Mowing also reduces the density, height, and flowering of other species that are potentially good competitors against parsnip, such as common goldenrod.

Chemical

If mechanical methods have failed to control wild parsnip or are not feasible, a 2% spot application of the herbicide Roundup (glyphosate) to basal rosettes is a recommended treatment. Roundup should be applied to individual plants with a hand sprayer in late fall after most native vegetation is dormant. Late fall application minimizes the potential harm to nontarget species. It may be necessary to treat the same area again annually until missed plants and plants originating from the seed bank are eliminated. Roundup is a nonselective herbicide (kills all vegetation) and should not be used in high-quality natural communities during the growing season because of the possibility of harming nontarget plants.

The herbicide 2,4-D (available under a variety of trade names) mixed according to label directions and applied to individual parsnip basal rosettes between March-May or August-October is effective. This herbicide should only be used on buffer or severely disturbed sites, and not in high-quality natural communities if it is applied during the growing season. Repeated early spring applications of this chemical before the flower stalk begins to elongate will reduce infestation of wild parsnip.

Care should be used to avoid contacting nontarget plants when applying either herbicide. Do not spray so heavily that herbicide drips off the target species. Native non-target species will be important in recolonizing the site once the parsnip dies. The herbicide should be applied while backing away from the treated area to avoid contact with wet herbicide. By law, herbicides only may be applied according to label instructions and by licensed herbicide applicators

or operators when working on public properties.

FAILED OR INEFFECTIVE PRACTICES

Burning does not successfully control parsnip because it removes litter and taller plants, providing favorable conditions for parsnip rosettes to develop. However, periodic burning maintains the vigor of native plants, allowing them to compete with parsnip.

The parsnip webworm damages some individual plants severely, but is not known to eradicate whole patches and is not likely to be useful as a biocontrol agent.

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WILD PARSNIP

5 of 5

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VEGETATION MANAGEMENT GUIDELINE

Wintercreeper or Climbing Euonymus (Euonymus fortunei)

SPECIES CHARACTER

DESCRIPTION

Wintercreeper Euonymus is an evergreen vine forming a dense ground cover or climbing or trailing to 20 or more feet (6.1 or more meters) high. It has aerial rootlets and leathery opposite elliptic leaves that are veiny beneath. Numerous cultivars exist that exhibit a range of leaf sizes and colors. Branches are densely covered with minute warts.

The small greenish flowers occur in clusters, with a long flower stalk. Fruits are globose and smooth in an orange capsule, maturing in June and July.

SIMILAR SPECIES

This vine differs from bittersweet (Celastrus sp.) which has alternate leaves, and from other Euonymus spp. in that it is a vine. Wintercreeper Euonymus should be accurately identified before attempting any control measures. If identification of the species is in doubt, the plant's identity should be confirmed by a knowledgeable individual and/or by consulting appropriate books.

DISTRIBUTION

Wintercreeper Euonymus occurs infrequently in the eastern U.S. It was introduced from Asia as a ground cover. In Illinois, it is found mostly near urban centers, with reports from several sites in the East St. Louis area. It is common throughout Giant City State Park in Jackson County, Illinois and spreading rapidly into surrounding woodland areas. It is also locally common near Karnak in Pulaski County.

HABITAT

This species occurs as a cultivated plant at home sites. It has spread into several types of forest, including floodplain, mesic and dry-mesic forest. It invades natural openings and relatively undisturbed forests.

LIFE HISTORY

Wintercreeper Euonymus is a very aggressive perennial woody vine that climbs on rocks and trees. It tolerates full sun, heavy shade, and most soil moisture conditions, except extremely wet conditions. It appears to be spread by birds that eat its seeds.

EFFECTS UPON NATURAL AREAS

At Fern Rocks Nature Preserve in Jackson County, Illinois, it has covered the ground and vegetation in many places, actually eliminating native ground-cover species in mesic and dry mesic woods. It is a serious potential threat because it spreads so rapidly and replaces spring ephemerals.

CONTROL RECOMMENDATIONS**RECOMMENDED PRACTICES IN NATURAL COMMUNITIES OF HIGH QUALITY**
Initial effort in areas of heavy infestation

Vines should be cut by hand and each cut stem sprayed with Roundup (a formulation of glyphosate) just after the last killing frost. While the Roundup label recommends a 50-100% concentration of Roundup for stump treatment, a 20% concentration has proven effective. A squirt bottle may be used for spot treatment or else individual stumps can be painted by hand using a sponge applicator. Treatment should be in late autumn when most native vegetation is dormant and prior to emergence of spring ephemerals. Care should be taken to avoid contacting nontarget species with the herbicide. By law, herbicides only may be applied as per label instructions and by licensed herbicide applicators or operators when working on public properties.

Effort in areas of light infestation

In small areas, where practical, individual vines should be pulled up by the roots and removed from the area by hand.

Maintenance control

The most effective control is to totally eradicate the species from the surrounding area where possible. Invading individuals should be pulled and removed as soon as possible after recognition.

RECOMMENDED PRACTICES ON BUFFER AND SEVERELY DISTURBED SITES
Initial effort in areas of heavy infestation

Same as above in areas where hand labor is available and where area affected is relatively small. In large areas, foliar spraying with Crossbow (mixture of 2,4-D and triclopyr) in autumn after the first frost can reduce the population. Crossbow should be mixed according to label instructions for foliar application and applied as a foliar spray. Spraying should be prior to emergence of spring ephemerals. Care should be used to avoid contacting nontarget plants with herbicide. The herbicide should be applied while backing away from the treated area to avoid walking through the wet herbicide.

Effort in areas of light infestation

Same as described for high-quality natural areas.

Maintenance control

Same as described for high-quality natural areas.

FAILED OR INEFFECTIVE PRACTICES

- hand control: slow and labor intensive, making it impractical for large infestations.
- mowing: ineffective without chemical treatment and not practical in woodland.
- fire: often not desirable in mesic woodland.
- herbicides: should not be used during growing season when spring ephemerals and other native species are likely to be affected.
- manipulating water levels: not practical on sites where it occurs.
- no effective biological controls are known that are feasible in natural areas.
- introduction of competitive species: no native species known that can compete.

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