

INVASIVE, NONNATIVE THISTLES OF ARIZONA

Christopher Jones

Introduction

Many invasive, nonnative plants have become established throughout Arizona. Of these, many are recognized as noxious weeds: a plant species that has been designated by state, federal or other agricultural or land management authority as economically or ecologically harmful to agricultural or horticultural crops, natural habitats or ecosystems, and humans or livestock. Noxious weeds are regulated by law and merit special attention and coordinated management efforts to prevent their spread and contain existing infestations. Preventing their spread through awareness, detection and rapid removal is of key importance to minimize their real and potential negative impacts.

By increasing our awareness, all of Arizona's residents can play an important role in controlling noxious weeds and those with the potential to become harmful to our state's economy and ecology.

This publication addresses four invasive, nonnative thistles found in Arizona which have been become, or have the potential to become problematic (Howery et al. 2009):

- Musk thistle – *Carduus nutans*
- Canada thistle – *Cirsium arvense*
- Bull thistle – *Cirsium vulgare*
- Scotch thistle – *Onopordum acanthium*

These thistles are native plants of Europe and Eurasia, and have no known natural enemies or control vectors in our state. Each of these plants competes with and can displace native plant species. They are particularly a concern in Arizona rangelands. The spiny foliage and flower parts effectively inhibit livestock from grazing the thistles and surrounding plants, reduce available forage and discourage livestock and wildlife from entering infested areas. Infestations also limit outdoor recreation since the spiny thistles can form impenetrable "fences," making trails and riparian areas inaccessible to people and livestock. With the increase in the extent and severity of Arizona's wildland fire activity, an emerging concern is that noxious thistle infestations can establish in forest and woodland areas after a wildfire.

Although similar in many ways, each plant listed above has unique traits, making their impact and methods for control different. The following sections address each species in more detail. To conclude, a table of appropriate control measures is provided.



Figure 1. Musk thistle rosettes emerge with monsoons rains at higher elevations and with fall and winter rains at lower elevations. Image by Patti Fenner.

Musk thistle – *Carduus nutans*

Habitat Musk thistle can establish on open disturbed sites, overgrazed rangeland and pasture, forest clearings, roadsides, stream banks and ditches. It tolerates a wide range of environmental conditions and soil types. It can be found at high elevations in rich soils as well as in saline soils at lower elevations. Musk thistle is presently confined to spotty infestations in Apache and Navajo counties.

Impacts A dense stand of musk thistle can reach six feet tall and act as a natural barrier because of its spiny leaves. Livestock and other animals avoid musk thistle because it is poor forage, and wildlife have been known to leave areas that have become heavily infested. Livestock will not graze near musk thistle, and sheep will only eat the rosette stage of the plant if there is nothing else to eat. When musk thistle invades scenic areas, trails and waterways, the quality of outdoor recreation opportunities can be downgraded.

Identification Musk thistle is a biennial plant that forms a thick corky taproot and rosette in the first season, which may occur with the summer monsoon rains or fall/early winter rains in Arizona (Figure 1). The rosette can grow to 2 to 4 feet in diameter. In the spring, one or multiple stalks emerge from



Figure 2. Musk thistle stalks are typically multi-branched. Image by Eric Coombs, Oregon Department of Agriculture, bugwood.org.



Figure 3. Musk thistle leaves are hairless and have deep lobes. Image by Eric Coombs, Oregon Department of Agriculture, bugwood.org.

the rosette, reaching 2 to 6 feet or more in height. The stalks may exhibit some branching and are covered with dense, short hairs (Figure 2). Leaves are hairless and have deep lobes (Figure 3). They are usually dark green with a light green midrib, and have a spiny margin. The leaves extend beyond the stem, forming a “winged” stem. In the summer and early fall months, a single plant can produce many large, “powder puff” flower heads (1 ½” to 3” diameter) that contain numerous individual disk flowers that are pink or purple, and sometimes white. The flower head often bends downward to portray a “nodding” characteristic. Below the flower are numerous large spine-tipped bracts (Figure 4).

Reproduction Musk thistle’s only means of reproduction is by seed. An “average” plant can produce 10,000 to 20,000 seeds of which one-third are viable. Most seeds scatter within the immediate vicinity of the parent plant which can lead to patterns of impenetrable clumps of infestation. Seeds are also dispersed by wind and water, as well as animals, recreational vehicles and farm equipment. They can remain viable in the soil for over 10 years.

Canada thistle – *Cirsium arvense*

Habitat Canada thistle can establish on open disturbed sites, rangelands and pastures, forest clearings, roadsides, crop fields, gardens, stream banks and ditches. It can tolerate a variety of soil types and some salinity, but is most competitive in deep, well-drained soils with adequate moisture availability. Canada thistle is known to be present in Apache, Coconino and Yavapai counties. It is not known to occur in the Sonoran and Mojave deserts.

Impacts If left unmanaged, Canada thistle can outcompete crops and native plants and develop into large infestations. It appears to have allelopathic qualities, which inhibit other plants from thriving near its roots. The spiny foliage discourages livestock and wild animals from grazing the thistles and surrounding plants, which reduces available forage and can restrict the use of recreational areas. It can cause infections in livestock due to abrasions. Canada thistle is also a host species for several agricultural insect pests and diseases, including sod web-worm, bean aphid, stalk borer and cucumber mosaic virus.

Identification Canada thistle is an erect perennial flowering plant. From seed, it forms a rosette in its first season (Figure 5). In the spring, slender green stalks grow from 1 ½ to 4 feet tall. Its ridged stems become hairy and branching as they mature (Figure 6). Leaves are 2” – 8” long, alternate, oblong to lance-shaped and irregularly to deeply lobed (Figure 7). The leaf margins are toothed with prickly yellowish spines. Flower heads are ½” wide to 1 ½” long, are unisexual and form clusters of up to five flower heads at the ends of branches (Figure 8). Each flower head contains numerous individual disk flowers that may be pink or purple, and sometimes white. Bracts are dark-tipped. Both flowers and bracts are spineless. Female flowers are fragrant.



Figure 4. Musk thistle blooms are "powder puff" like with numerous spine-tipped bracts below, and may exhibit a nodding characteristic. Image by Mary Ellen (Mel) Harte, bugwood.org.



Figure 6. Canada thistle stalks are slender and green, and branch as they mature. Image by Jeff Schalaus.



Figure 7. Canada thistle leaves are alternate, oblong to lance-shaped and irregularly to deeply lobed. Image by Mary Ellen (Mel) Harte, bugwood.org



Figure 8. Canada thistle flowers grow in clusters of up to five. Both the flower and bracts are spineless. Image by Jeff Schalaus.

Reproduction Unlike most thistles, Canada thistle is a creeping perennial (rhizomatous) plant that spreads through vegetative buds in its root system as well as by seed. New plants can sprout from rhizomes and generate rosette-type shoots throughout the growing season. Horizontal roots may extend 15 feet or more and vertical roots may grow 6 to 15 feet deep. The roots can extend in the spring and fall and whenever soil moisture is adequate. Male and female flowers develop on separate plants (dioecious) and often

grow in circular patches that are one clone and sex. They are pollinated by insects. An "average" plant can produce 1,500 seeds per flowering shoot. Most of the seeds fall near the plant, but local spread is primarily due to vegetative reproduction. Seeds can be dispersed long distances by wind and water, as well as animals, recreational vehicles, shoes, clothing and farm equipment. They can remain viable in the soil for up to 20 years.



Figure 9. Bull thistle rosettes can grow up to three feet in diameter. Image by Patti Fenner.



Figure 10. Bull thistle stalks. Image by Joseph M. DiTomaso, University of California - Davis, bugwood.org



Figure 11. Bull thistle leaves are dark green, alternate, with wavy margins and deeply lobed. Image by John Cardina, Ohio State University, bugwood.org.



Figure 12. Bull thistle flowers have spiny bracts that taper up toward the bloom. Image by Loke T. Kok, Virginia Polytechnic Institute and State University, bugwood.org.

Bull thistle – *Cirsium vulgare*

Habitat Bull thistle can establish on open disturbed sites, overgrazed rangelands and pastures, irrigated pastures, forest clearings, roadsides, fence lines, riparian areas, stream banks and ditches. It tolerates a wide range of soil textures, but does best in soils that are nitrogen rich, have a neutral pH and adequate soil moisture. It primarily occurs in scattered populations at higher, moister elevations above 5,000 feet and irrigated pasture at lower elevations in Arizona. Bull thistle is known to be present in Apache, Cochise, Coconino, Gila, Greenlee and Yavapai counties.

Impacts Bull thistle can invade and colonize rapidly in disturbed areas, and is reported as troublesome in heavily grazed pastures fertilized with nitrogen. It outcompetes native plant species and becomes well established. The spiny foliage discourages livestock and wild animals from grazing the thistles and surrounding plants, which reduces an area's available forage. It is commonly found to be a contaminant of hay (alfalfa and/or grass), which decreases the market value of the forage.

Identification Bull thistle is a biennial plant that forms a short fleshy taproot with several primary roots extending from the root crown. Seed leaves are smooth; their shape varies from round to narrow-based with broad rounded ends. It begins as a rosette in the first season, which may occur with the summer monsoon rains or fall/early winter rains in Arizona (Figure 9). The rosette can grow up to 3 feet in diameter. In the spring, multiple (and occasionally single) stalks bolt from the rosette, reaching 1 to 6 feet in height (Figure 10). Stems are hairy, have spiny wings, and are often branched and have dark purple veins. Leaves are 3" to 12" long, dark green, alternate, have wavy margins and deeply lobed with coarse prickly hairs on the top and wooly hairs underneath (Figure 11). The spines occur on the margins of the leaf, typically on the ends of the lobes, along the length of the leaf and at the tip of the terminal lobe. Flower heads are 1" to 2" in diameter and are often gumdrop-shaped (Figure 12). They usually grow singly at the ends of shoots, but may also in clusters. The flower heads contain numerous individual disk flowers that are typically pink to purple and sometimes magenta-red, but rarely white. They are fragrant. Spiny bracts surround the seed head, and appear tapered and narrow.

Reproduction Bull thistle's only means of reproduction is by seed. Seed production can vary from 100 to 300 seeds per flower and one to over 400 flowers per plant, and may average over 4,000 seeds per plant. Its seeds are readily dispersed by water, wind, animals, human activities, and contaminated hay. Most seeds fall close to the parent plant. They may germinate throughout the growing season depending on soil moisture. Most seeds germinate or die within the first year, but may remain viable for up to 3 years or more if buried deeply.

Scotch thistle – *Onopordum acanthium*

Habitat Scotch thistle can establish on open disturbed sites, rangelands and pastures, forest clearings, crop fields, roadsides, riparian areas, stream banks and ditches. It grows best in disturbed soils with high soil moisture, but it is also considered drought tolerant and can invade drier, nutrient-deficient sites as well. It is present in every northern county in Arizona.

Impacts Bull thistle can invade and colonize rapidly in disturbed areas, and is reported as troublesome in heavily grazed pastures fertilized with nitrogen. It outcompetes native plant species and becomes well established. The spiny foliage discourages livestock and wild animals from grazing the thistles and surrounding plants, which reduces an area's available forage. It is commonly found to be a contaminant of hay (alfalfa and/or grass), which decreases the market value of the forage.

Identification Scotch thistle is a biennial plant that forms a stout corky taproot. It develops a large rosette with spiny leaves that can grow over 2 feet long and a foot wide (Figure 13). Seedlings can emerge throughout the growing season and establish rosettes. In the spring and summer, stems grow up to 4 to 12 feet tall (Figure 14). They are typically numerous and branched, with broad, spiny wings. Leaves are alternate, oblong and large, with margins that are toothed or coarsely lobed with yellow, green or white spines that are sharp and stiff. Both leaves and stems are covered with fine grayish-blue "wooly" hairs (Figure 15). Flower heads contain numerous individual disk flowers, are round and grow up to 2" in diameter, with a "shaving brush" appearance (Figure 16). Flower colors are vibrant purple, violet or reddish, and sometimes white. A single Scotch thistle can produce numerous flower heads (70 – 300 per plant). They grow at the stalk ends as a single flower heads or in clusters, and are surrounded by long spine-tipped bracts.

Reproduction Scotch thistle's only means of reproduction is by seed. An "average" plant can produce up to 14,000 seeds or more. They can germinate throughout the growing season depending on soil moisture, and set flowers throughout much of the season too. Most seeds fall close to the parent plant. Wind, water, wildlife, livestock and human activities aid dispersal. Seeds can remain viable in the soil for seven years and up to 39 years.

Control measures

As illustrated by descriptions, these thistles pose serious real and potential economic and ecological problems in Arizona that merit special coordinated management efforts to prevent their spread and contain existing infestations. Arizona's harsh desert environment should limit the establishment of these



Figure 13. Scotch thistle rosettes can emerge throughout the growing season. Image by Patti Fenner.



Figure 15. Scotch thistle leaves and stems are covered with fine grayish-blue “wooly” hairs. Image by Bonnie Million, National Park Service, Bugwood.jpg



Figure 14. Scotch thistle plants can grow to an impressive 12 feet in height. Image by Jeff Schalau.



Figure 16. Scotch thistle flowers are considered to have a “shaving brush” appearance and have long sharp bracts. Image by Jeff Schalau.

thistles in many areas. However, their presence makes the odds of establishment in richer soils and at higher elevations more likely. Lessons learned from other states with these thistles have demonstrated that prevention and control of their spread is imperative to minimize their negative impacts. **If you see any of these thistles, please contact your local county Cooperative Extension office to get in touch with the appropriate personnel or agency to examine the weed infestation's impact and determine a course of action.**

Integrated Weed Management (IWM) is the most effective way to address invasive and noxious weed issues. IWM is a strategy that is developed in partnership with several concerned agencies and stakeholders, using a combination of preventative, cultural, biological and mechanical control practices, including chemical (herbicide) treatments as necessary to treat any specific weed problem. Through IWM, herbicides can be used in the most efficient way possible to minimize their environmental and health effects while reducing and controlling the targeted weed's population.

As a general strategy, preventing the production and spread of seeds is the key method for controlling musk, bull and Scotch thistles. Because Canada thistle is a rhizomatous perennial, however, the key is to continually cause stress on the plant in order to force it to use up its stored nutrients and energy in the roots, a technique referred to as "carbohydrate starvation." Stress can also be induced by tillage or shoot removal. Alternatively, treating plants at the appropriate time using a systemic, translocated herbicide that kills the roots and rhizomes is usually a more effective for control of Canada thistle. Success often requires a sound management plan implemented over several years.

Two relatively recently registered herbicides, aminocyclopyrachlor and aminopyralid, have been demonstrated to be more effective on thistles than other recommended herbicides. And although the introduction of insects or fungal agents may assist as part of an IWM strategy, they have not been found to be particularly successful in the control of invasive, nonnative thistles in the Southwest to date. Before proceeding with any biological control practice or use of a registered herbicide, consult with an Extension specialist or the proper state or federal agency to assure their use is appropriate and environmental impacts are minimized.

The following table highlights recommended treatments for the four thistles. For detailed herbicide treatments, please refer to the publications listed below.

List of References

- Beck, K. B. 2008. Canada thistle. Colorado State University Extension. Fact Sheet No. 3.108.
- Beck, K. B. 2008. Musk thistle. Colorado State University Extension. Fact Sheet No. 3.102.
- Colorado Department of Agriculture. 2008. List B Species. Colorado Department of Agriculture, Lakewood, CO.
- DiTomaso, J.M., and G.B. Kyser et al. 2013. Weed control in natural areas in the western United States. Weed Research and Information Center, University of California, 544pp.
- Graham, J., W.S. Johnson and K. McAdoo. 2007. Identification and management of bull thistle. University of Nevada Cooperative Extension. Fact Sheet 05-03.
- Graham, J., and W.S. Johnson. 2007. Managing Canada thistle. University of Nevada Cooperative Extension. Fact Sheet 03-43.
- Howery, L.D., E. Northam, W. Meyer, J. Arnold-Musa, E. Carrillo, K. Egen and M. Hershdorfer. 2009. Non-native invasive plants of Arizona. USDA and University of Arizona Cooperative Extension. Publication #AZ1482.
- Kadrmaz, T., and W.S. Johnson. 2007. Managing musk thistle. University of Nevada Cooperative Extension. Fact Sheet 02-55.
- Kadrmaz, T., and W.S. Johnson. 2007. Managing Scotch thistle. University of Nevada Cooperative Extension. Fact Sheet 02-57.
- Whitson, T.D., L.C. Burrill, S.A. Dewey, D.W. Cudney, B.E. Nelson, R.D Lee and R. Parker. 2006. Weeds of the West, 9th Edition. Western Society of Weed Science, University of Wyoming, Jackson. ISBN 978-0-941570-13-8, 630pp.



COLLEGE OF AGRICULTURE
AND LIFE SCIENCES
COOPERATIVE EXTENSION

THE UNIVERSITY OF ARIZONA
COLLEGE OF AGRICULTURE AND LIFE SCIENCES
TUCSON, ARIZONA 85721

CHRISTOPHER JONES
Associate Agent, Agriculture & Natural Resources

CONTACT :
CHRISTOPHER JONES
ckjones@cals.arizona.edu

This information has been reviewed by University faculty.
extension.arizona.edu/pubs/az1628-2014.pdf

Other titles from Arizona Cooperative Extension can be found at:
extension.arizona.edu/pubs

Any products, services or organizations that are mentioned, shown or indirectly implied in this publication do not imply endorsement by The University of Arizona.

Issued in furtherance of Cooperative Extension work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Jeffrey C. Silvertooth, Associate Dean & Director, Extension & Economic Development, College of Agriculture Life Sciences, The University of Arizona.

The University of Arizona is an equal opportunity, affirmative action institution. The University does not discriminate on the basis of race, color, religion, sex, national origin, age, disability, veteran status, or sexual orientation in its programs and activities.

Table of control measures

Species	Prevention	Cultural	Mechanical	Biological	Chemical
Musk thistle <i>Carduus nutans</i>	<ul style="list-style-type: none"> Prevent the introduction and production of seed. Use certified weed-free seed and hay. Ensure vehicles and equipment are cleaned before leaving contaminated areas. Monitor property and adjacent land and eradicate new plants whenever they appear. Develop a grazing management plan to prevent overgrazing. 	<ul style="list-style-type: none"> Practice good forage management in pastures and rangelands. Revegetate after tilling or fire to outcompete thistle reestablishment. Encourage the growth of perennial grasses as appropriate. Grazing by sheep to eat the rosettes and by goats to eat the flower heads. Prescribed fire may be used at part of IWM plan. 	<ul style="list-style-type: none"> Till, hoe, and hand pull rosettes and stalks before flower and seed development, especially smaller and isolated infestations. Sever taproot 2" below ground with a sharpened hoe or shovel. Mow just before first flower buds appear or when blooms first appear, then gather and destroy mowed debris. 	<ul style="list-style-type: none"> The following insects may be available: <i>Trichosiocalus horridus</i> (crown weevil), <i>Cassida rubiginosa</i> (tortoise beetle), <i>Rhinocyllus conicus</i> (head weevil) and <i>Cheilosia corydon</i> (crown fly). <i>Puccinia carduorum</i> (rust fungus) may also be available. As with chemical treatments, consult with an Extension specialist or state or federal agency to assure environmental impacts are minimized. Biological control vectors have not been particularly successful for controlling nonnative thistles in the Southwest to date. 	<ul style="list-style-type: none"> Many selective broadleaf herbicides are registered and some are available, over-the-counter, and can be used as part of an IWM strategy. Read labels, follow directions and use precautions. Products containing aminocyclopyrachlor, aminopyralid, dicamba, picloram, 2, 4-D, clopyralid, fluroxypyr, and triclopyr are most effective at the rosette stage. Products containing metsulfuron, chlorsulfuron, imazapic, imazapyr and sulfometuron can be used before flowering and offer some preemergence control.

Species	Prevention	Cultural	Mechanical	Biological	Chemical
Canada thistle <i>Cirsium arvense</i>	<ul style="list-style-type: none"> Prevent the introduction of seed. Use certified weed-free seed and hay. Ensure vehicles and equipment are cleaned before leaving contaminated areas. Purge livestock by feeding clean hay and allowing 3 to 5 days pass before entering a clean pasture. Monitor property and adjacent land; eradicate new plants as they appear. Revisit infestations to assure eradication. IWM strategies require developing a long-term management plan for sustainable control. 	<ul style="list-style-type: none"> In crops and irrigated pastures, grasses and alfalfa compete well with good management and adequate soil moisture. Alfalfa is only competitive after establishment. Encourage the growth of forage or perennial grasses. Competition alone is seldom effective. Grazing and prescribed burning are not effective. 	<ul style="list-style-type: none"> Frequent grubbing of young and small infestations throughout the growing season to exhaust underground energy reserves. Repeated cutting of alfalfa and forage crops over several growing seasons. Mowing within four days following intense rotational grazing. Tillage can break and spread roots, and encourage new plant growth, so repeat every 3 weeks to be effective; otherwise, it is not recommended. 	<ul style="list-style-type: none"> The following insects may be available: <i>Ceutorhynchus litura</i> (stem weevil), <i>Larinus planus</i> (bud weevil) and <i>Urophora cardui</i> (stem gall fly). <i>Puccinia punctiformis</i> (rust fungus) may also be available. Before introduction or application, consult with an Extension specialist or appropriate state or federal agency to assure environmental impacts are minimized. Biological control vectors have not been found to be particularly successful for controlling nonnative thistles in the Southwest to date. 	<ul style="list-style-type: none"> Because of the extensive the root system, systemic herbicides are recommended as part of an IWM strategy. Read labels, follow directions and use precautions. Products containing amino-cyclopyrachlor, aminopyralid, 2, 4-D, dicamba, picloram, clopyralid, chlorsulfuron, imazapyr, sulfometuron and glyphosate are commonly used under different prescriptions and times of year. Mowing combined with herbicidal treatments can be effective. Re-treatment for 1 to 3 or more years is common.

Species	Prevention	Cultural	Mechanical	Biological	Chemical
Bull thistle <i>Cirsium vulgare</i>	<ul style="list-style-type: none"> Prevent the introduction and production of seed. Use certified weed-free seed and hay. Ensure vehicles and equipment are cleaned before leaving contaminated areas. Monitor property and adjacent land and eradicate new plants whenever they appear. Develop a grazing management plan to prevent overgrazing. 	<ul style="list-style-type: none"> Practice good forage management in pastures and rangelands. Revegetate after tilling to compete with thistle reestablishment. Encourage the growth of perennial grasses as appropriate. Sheep, goats and horses will eat the rosettes; goats will eat the flower heads. Prescribed fire may be used at part of IWM plan. 	<ul style="list-style-type: none"> Till, hoe and hand grub rosettes and stalks before flowers develop, especially smaller and isolated infestations. Sever taproot 2" below ground with a sharpened hoe or shovel. As part of an IWM strategy, mow just before first flower buds appear; or mow as blooms first appear, and gather & destroy mowed debris. 	<ul style="list-style-type: none"> The following insects may be available: <i>Rhinocyllus conicus</i> (head weevil), <i>Urophora stylata</i> (gall fly), and <i>Trichosiocalus horridus</i> (crown weevil). Before introduction or application, consult with an Extension specialist or appropriate state or federal agency to assure environmental impacts are minimized. Biological control vectors have not been found to be particularly successful for controlling nonnative thistles in the Southwest to date. 	<ul style="list-style-type: none"> Many broadleaf selective herbicides are available and can be used as part of an IWM strategy. Read labels, follow directions and use precautions. Products containing amino-cyclopyrachlor, aminopyralid, dicamba, picloram, triclopyr, 2, 4-D, clopyralid, aminopyralid, chlorsulfuron, imazapyr, and metsulfuron are most effective at the rosette stage or when the weed is most actively growing.

Species	Prevention	Cultural	Mechanical	Biological	Chemical
Scotch thistle <i>Onopordum acanthium</i>	<ul style="list-style-type: none"> Prevent the introduction and production of seed. Use certified weed-free seed and hay. Ensure vehicles and equipment are cleaned before leaving contaminated areas. Monitor property and adjacent land and eradicate new plants whenever they appear. Develop a grazing management plan to prevent overgrazing. 	<ul style="list-style-type: none"> Practice good forage management in pastures and rangelands. Revegetate and encourage the growth of perennial grasses. Livestock avoid Scotch thistle; goats will only eat early stage rosettes. 	<ul style="list-style-type: none"> Hoe and hand grub rosettes and stalks before flowers develop, especially smaller and isolated infestations. Sever taproot 2" below ground with a sharpened hoe or shovel. Chop down and properly dispose of mature Scotch thistle plants. Tilling is not appropriate for rangelands and waterways. Mow just before first flower buds appear; or when blooms first appear, then gather and destroy mowed debris. 	<ul style="list-style-type: none"> There are currently no biological control insects or fungi available in the United States. 	<ul style="list-style-type: none"> Herbicidal treatments are most effective at the rosette stage. Products containing amino-cyclopyrachlor, aminopyralid, dicamba, picloram, 2, 4-D, clopyralid, aminopyralid, chlorsulfuron, metsulfuron, and glyphosate are commonly applied postemergence and sometimes preemergence. Read labels, follow directions and use precautions. Mowing combined with herbicidal treatments can be effective. Repeated applications throughout the growing season may be necessary to prevent bolting and seed production.