

ON THE ROAD AGAIN WITH LEAFY SPURGE AND TEASEL¹

Many biennial and perennial weeds seem to appear first in non-disturbed sites like roadsides. Such is the case of the biennial teasel (*Dipsacus* spp.) and the perennial leafy spurge (*Euphorbia esula* L.). Teasel is a new arrival and is appearing in several areas of southern Wisconsin. Leafy spurge has been here for decades, is found in many areas of Wisconsin and is invading new areas more rapidly than in the past. In this paper, I will describe the concern, give the plants' key characteristics, review their biology, and discuss the management practices to control them.

Teasel is a biennial that originated in Europe. It was introduced into the United States perhaps in the 1700s so that their fruiting heads with spiny bracts could be used to raise the nap on woolen cloth. Plants were grown by the textile industry and the dried flower heads were placed on spindles to "tease" the cloth and this gave rise to the plant's common name. Today, teasel is dried and used in ornamental flower arrangements. Wherever it occurs, it can soon spread into new areas. Missouri recently added both common (*Dipsacus laciniatus*) and cutleaf teasel (*D. sylvestris*) to their noxious weed list showing their level of concern with its invasiveness. Cutleaf teasel is more invasive than common teasel (Glass, 1990) and most of the teasel in Wisconsin seems to be cutleaf teasel.

Teasel has very distinctive characteristics. As with all true biennials the first year's growth is composed of rosette leaves. The rosette leaves are relatively large and oblong, shiny when young and becoming hairy at later growth stages. The lateral veins on leaves curve forward near the leaf margin and join the next vein above it. Plants develop taproots in the rosette phase that can be one inch in diameter at the crown. Roots behave somewhat like dandelion roots in that cutting the crown often causes adventitious buds on the root to develop new shoots.

The second year, plants form angled, prickly stems that are 4 to 7 feet tall. Stems often branch in the upper section. The leaves are opposite, toothed and prickly on the margins and often on the midveins below and clasp the stem. Individual flowers are small and with four lilac or white petals in dense egg-shaped heads (spikes) with many slender bracts that become stiff-hooked prickles when ripe. Flowering is unique in the teasel family. The first flowers open in a "belt" around the center of the spike and then new flowers open daily toward the top and bottom of the spike, giving two bands of flowers. Numerous narrow involucre bracts (modified leaves) arise at the base of the flower heads and extend past the spikes. They become stiff and prickly when dry.

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Both cutleaf and common teasel are alike in that they are biennials with only rosette growth the first year, the leaves of neither species have a petiole, and the flowers and fruits are very similar. The main differences between them are that cutleaf teasel indeed has leaves that are deeply lobed and its leaves are fused at the base to form a “cup” that holds water around the stem after it rains. When flowering, common teasel usually has purple flowers while cutleaf teasel has white flowers.

As for all biennials, teasel propagates only by seed so stopping seed production is the key to eradicating it. How seeds spread to a particular site is seldom known. Once in a region, seed movement on mowing equipment can occur; possibly birds feed on teasel seeds and disseminate them to new locations. If our noxious weed law allowed for adding new species, teasel would be a likely candidate to declare as a prohibited noxious weed in Wisconsin. Infestations are limited and declaring teasel a noxious weed could at least contain it to present locations and perhaps eradicate it from some or many sites. Alerting your town or county highway personnel of teasel infestations you find is advised.

Mowing after plants have bolted but before seeds are produced is highly encouraged. This will ensure that infestations have been detected. Make a map (or better yet record the coordinates with a global positioning unit (GPS)) so that the exact site can be found for future monitoring, mowing, or herbicide application. Mowing timing is critical; if plants are mowed just as the stems begin to elongate, additional stems will develop later; if flowering starts before mowing is done, viable seeds can develop in the cut heads (Glass, 1990). Removing cut flower heads from the site is recommended if flowering has begun.

Teasel can be controlled with several herbicides that act as growth regulators including 2,4-D and dicamba. The key as always with biennial species is to treat in the fall (preferred) or spring when plants are in the rosette stage. Glyphosate is also effective but because it is non-selective, it should be used with great caution so that desired vegetation is not completely killed.

Leafy spurge. Leafy spurge is a deep rooted perennial broadleaf weed found in right-of-ways, wastelands, parks and some pastures. Years ago it was declared a noxious weed in Wisconsin in recognition of 1) its potential to become a widespread and serious weed problem, 2) the limited area of infestation at the time and 3) the great difficulty of controlling it in extensive areas. The invasiveness of this weed was well known when Wisconsin adopted its noxious weed law as it is one of the three species in the law (Doll 1991).

Classifying leafy spurge as a noxious weed may have slowed its spread in the state but certainly has not eradicated it. Leafy spurge is encroaching into new areas in several regions. Infestations are most noticeable along roadsides and now often spread into adjacent pastures and other non-disturbed sites such as land enrolled in the Conservation Reserve Program (CRP acres). We need to take appropriate measures to prevent leafy spurge from becoming more widespread. The increase in leafy spurge along roadsides in recent years has lead several local highway departments to spray known patches.

Leafy spurge is a native to Europe and Asia where it is seldom a weed of economic importance. It was found in Massachusetts in 1827 and in North Dakota in 1909 and probably reached Wisconsin also in the early 1900s. The greatest abundance of the weed is in the northern great plains of the United States and the prairie provinces of Canada. In North Dakota alone it infests more than 900,000 acres, is found in every county in the state. Direct and indirect business losses exceed \$86 million per year in North Dakota, including an \$8 million loss in this state's wildlands (Leitch et al. 1994). These losses occur because leafy spurge displaces desirable forages and is not consumed by livestock nor wildlife animals. All plant parts contain a milky sap which can cause severe irritation to human skin and sickness to livestock if consumed. It is also a vigorous competitor with crops if found in cultivated land.

Leafy spurge plants are long-lived, deep-rooted perennials that spread by an extensive root system and also by seeds. Roots are tough and woody with numerous buds capable of producing stems. Some roots may penetrate to 12 feet deep. Vegetative buds occur on both the roots and underground portions of shoots, with the greatest numbers just below the soil surface. Only a few buds actually develop shoots; the majority remain dormant and sprout when old shoots are weakened or killed. New shoots are capable of emerging through 2 feet of soil and occasionally from 3 feet.

Leafy spurge flowers in mid to late May and continues in the main stems until late June or July. Some flowering also occurs in late August and September. The fruits are 3-celled and explode when ripe, shooting the seeds up to 15 feet away. Each inflorescence produces 10 to 50 fruits with 25 to 150 seeds. Most plants develop from buds on roots and crowns but leafy spurge infestations can arise from seed germination.

Once seedling plants have six or more leaves, most are capable of regrowing if stems are cut, which means that they are now perennial, capable of vegetative reproduction. By the 10-leaf stage, all plants originating from seed behave as perennials. Within 90 days after emergence, vegetative buds are found on the roots. Within 16 months, a single plant can produce a 5-foot vertical root, 32 feet of lateral roots, 70 feet of branch roots and more than 1700 buds! A patch of 7 square feet may spread to cover 2700 square feet in 5 years. Thus, if left unchecked, leafy spurge has a tremendous ability to invade field pastures and non-cropland areas.

Leafy spurge control must focus on destroying the roots either with repeated tillage or systemic herbicides. Along roadsides, tillage is not a practical option and we have very limited herbicide choices. Picloram (a component in Tordon, Pathway and other non-crop herbicides) is the best herbicide to control leafy spurge (Lym 1999, 2000), but the risks of ground and surface water contamination and off-site movement to broadleaf vegetation (crops, trees, wildflowers, etc.) due to picloram's relatively high solubility and long soil life mean that products with picloram must be used with great caution. This is highlighted by the fact that a groundwater advisory statement is on products that contain picloram and most formulations are restricted use

products.

For roadsides in Wisconsin, Plateau (imazapic) is a much safer alternative. Results from other states and Wisconsin have shown its effectiveness on leafy spurge. Plateau is most effective when applied in the early fall. Table 1 shows that summer treatments of imazapic averaged 72% leafy spurge control while fall applications averaged 89%. The label recommends treatments be made from late August to mid-October and before a killing frost. Markle and Lym (2001) applied imazapic on five dates from mid-August to mid-October in North Dakota and found that Sept. 15 gave the best leafy spurge control.

Table 1. Plateau (imazapic) applied in the summer and fall for leafy spurge control (Lym 1999 and 2000).

	Fall control (%)				
	97	98	99	00	avg.
Summer-applied (96, 97, 98)	59	89	81	57	72
Fall-applied (96, 97, 98)	94	91	95	77	89

Our trials on leafy spurge management began at Ft. McCoy in 1999 and include early summer applications of Paramount (quinclorac) and early fall applications of Plateau. The objective is to compare the performance of these products when applied once, twice or three times on leafy spurge. Distinct (2 oz/acre) and the recommended additives were included with both products. The second and third applications are made on an “as needed basis” and this is determined by counting spurge stems in each plot in early summer and fall each year. Treatments are made at two sites at Ft. McCoy. Both are managed as native prairies and have moderate to high leafy spurge populations but differ in burning times and grass density. The State Natural Area has a thin native grass stand and was burned in April 1999. The Badger Drop Area has a moderate to dense native grass stand and was burned in April 2001. Only data for Plateau are presented as Paramount is not available in Wisconsin.

Table 2 shows spurge populations through the fall of 2001. The population counts in May 1999 were taken before any treatments were made. Plateau applied in the fall of 1999 gave outstanding leafy spurge control at both sites. No additional treatments were made at the Badger Drop Area until 2001 (following the burn of that year) while a second application was made to two treatments at the State Natural Area in 2000; this reflects the lack of a competitive stand of desired species at this site which allows spurge to reinfest.

Each burning event has been followed by an explosion of leafy spurge plants. Many arise from seed germination but others reappear from buds that sprout on the spreading roots. This presents a serious leafy spurge management challenge in prairies as burning is a common practice in these environments. Such is not the case along roadsides and the effects of a single

or repeated Plateau application in non-burned sites should be evident for several years after application.

Table 2. Long-term management of leafy spurge with Plateau (imazapic) at Ft. McCoy, Wisconsin¹.

Site	Plateau applied in:	<u>Leafy spurge pop. (stems/100 ft²)</u>			
		5/99	5/00	6/01	9/01
Badger Drop Area²	Fall 99	345	9	580	340
	Fall 99 & 01	580	0	350	385
	Fall 99, 01, & ??	305	0	200	200
State Natural Area³	Fall 99	1625	45	1505	1195
	Fall 99 & 00	275	0	350	295
	Fall 99, 00 & ??	1140	0	0	70

¹ All treatments applied with 2 oz/a Distinct to have diflufenzopyr in the treatment. Plateau rate was 8 fl oz/acre of the liquid formulation of Plateau for all treatment dates.

² This area was not burned in 1999 or 2000 but was burned in April, 2001. It has moderate to good grass and forb coverage (Avg. of 82%).

³ This area was burned in April 1999 but has not been burned since. It has poor grass and forb coverage (Avg. of 46%).

In summary, when leafy spurge appears in non-crop sites, Plateau seems to be the product of choice. Treat from mid to late September and use the recommended additives. Including Distinct with Plateau may enhance the performance and is a legal option as the Distinct label includes using this product in non-crop sites. Scout the roadsides during the growing season and map the locations with leafy spurge to ensure that all are found and treated in the early fall. GPS technology would be ideal to accomplish this and also to monitor the results each year after treatment.

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