

LONG TERM LEAFY SPURGE MANAGEMENT IN AN OAK SAVANNA SETTING. Jerry D. Doll, Weed Scientist Emeritus, University of Wisconsin, Department of Agronomy, Madison, WI 53706, and J. Kim Mello, Biologist, Wildlife Management Program, Department of Defense, Ft. McCoy, Sparta, WI 54656.

Leafy spurge continues invading new areas in Wisconsin. It provides a particularly difficult management problem in prairie habitats where neither mowing nor managed grazing are normally practiced. One such site is Fort McCoy in Monroe Co. Wisconsin. The oak savanna habitat is found on much of their 60,000 acres and it seems ideally suited for leafy spurge invasions which threaten the warm season grasses and forbs. Herbicide trials were initiated in 1999 and an integrated project that combines insects, mowing and herbicides began in 2003.

The first trial compared fall applied imazapic (Plateau) and spring applied quinclorac (Paramount) in two locations. Imazapic was applied at 0.125 lb/a. Quinclorac rates were 0.56 lb/a in 1999 and 2000 and 0.375 in 2001 and beyond to comply with label changes. Diflufenzopyr enhances the activity of several herbicides on leafy spurge. As this molecule is not sold separately, 2 oz/a (commercial product) of a premixture containing 20% diflufenzopyr and 50% dicamba (Distinct) were added to both the imazapic and quinclorac treatments. Recommended additives were used with each product. Replicated plots were 20 by 40 ft in size. Herbicides were applied with a CO₂ sprayer fitted with flat fan nozzles. Frequency of application varied and included one, two and three applications in varying patterns (for example, imazapic was applied only in 1999, in 1999 and 2001, or in 1999 and 2002). Spurge populations were determined by counting all live stems 2x2-ft quadrats in five predetermined sites on a diagonal line across each plot each spring and fall.

In September 1999, the plots treated with quinclorac that spring were nearly devoid of leafy spurge. A year later, a noticeable population of leafy spurge plants (63 to 188 stems/100 ft²) appeared in plots that received quinclorac. The 1999 fall-applied imazapic treatments had spurge populations of 6 to 88 plants/100 ft² in the spring of 2000. Most plants seemed to have originated from seed because they were quite small. The site was burned as part of the oak savanna management strategy in 2001. This triggered abundant spurge reinfestation, primarily via seed germination. Thus, all plots with two or more planned applications of quinclorac or imazapic were treated in 2001. Leafy spurge populations in Sept. 2001 following quinclorac applications in the spring were greatly reduced.

In 2002, leafy spurge populations remain very high in the areas that received quinclorac or imazapic only in 1999. Quinclorac applied in 1999 and 2001 had relatively low leafy spurge populations in June, 2002 and a moderate population in September. Quinclorac applied in 1999 and 2002 had a moderate spurge population in the fall, reflecting the reduced spurge control at the 0.375 lb/a rate (as per a label change) and this rate may not give the level of suppression as compared to the 0.56 lb/a rate needed to achieve consistent spurge control.

Imazapic applied in the fall of 1999 and 2001 resulted in no leafy spurge plants in June 2002 and a low population in Sept. The untreated plots show an interesting pattern of higher leafy spurge populations in June than Sept. (avg. of 1080 plants/100ft² in the spring and 770 in the fall).

The key observations from this study are that leafy spurge required two or more herbicide applications to maintain populations at acceptable levels over the 5-yr period of this study; applications would be on an every other or every third year frequency; burning allows (promotes?) spurge reinfestations. Therefore, on sites where burning is practiced, burn before applying herbicides; spurge populations vary naturally over the season with highest populations in the late spring and much lower densities noted in the fall. The pattern of spurge populations being higher in June than Sept. was true every year. Averaged over 5 years, the spring population was 1188 plants/100 ft² and the fall population was 685 plants/100 ft² in the check plots.

The second trial is an integrated management study that started in 2003. It includes insects (*Aphthona* spp.), mowing and imazapic alone and in all combinations for a total of eight treatments.

Sites were located over a wide distance as we needed to select areas where insects had been released and established over a 5- to 10-year period prior to 2003 and other sites where they had never been released. Mowing was done in June when spurge was flowering to minimize seed production and weaken plants. Imazapic was applied in the fall of 2003 (0.156 lbae/a) with recommended additives to areas no less than 2000 ft² (average of 3185 ft² per plot). Treatments were replicated three times and the herbicide was applied with a lever-activated backpack sprayer fitted with six flat fan nozzles. Imazapic was only applied in subsequent years when the spurge population exceeded 175 plants per 100 ft². Spurge populations were monitored in the early summer and fall by counting live stems in four 2x2-ft quadrats in the center region of each plot in a systematized manner. Adult beetles were sampled periodically in May and June with a standard sweep net swept 16 times (four in each ordinate direction) in the center region of selected plots.

Early summer spurge populations ranged from 221 to 535 stems per 100 ft² in the non-treated areas and were essentially unchanged from 2003 through 2006. Imazapic alone has reduced populations to an average of less than 22 stems per 100 ft². Spurge populations are declining with mowing alone (from 573 per 100 ft² in 2003 to 273 per 100 ft² in 2006). Insects alone show only a slight drop in spurge populations over the 4 years of the study. Combining imazapic with either mowing or insects was no more effective than imazapic alone. The same is true with the use of insects, mowing and herbicide.

The beetle populations varied from 15 to 50 per 16 sweeps the summer of 2003 before mowing or herbicides were implemented. No beetles were found in the beetle region in 2004 following the imazapic treatment in the fall of 2003. This is logical as spurge populations in the treated areas were near zero, eliminating the host plant for the insect. In 2005, 8 to 18 beetles per 16 sweeps were collected in the herbicide treated regions while 50 to 60 were found in the non-treated areas. A similar beetle population pattern was noted in 2006. Beetle density in the insect only areas increased over time, reaching the maximum beetle population of 84 beetles per 16 sweeps in 2006. However, spurge populations were seldom affected by beetles alone during this time period. Mowing generally reduced beetle populations but also suppressed spurge abundance.

It appears that herbicides provide the fastest and most consistent spurge suppression. To date, we see little advantage to mowing or insects in the battle. However, the study is only in the fourth year and will continue for several years to see if additive or synergistic effects appear. Or we may reach a point where we stop using herbicides to see if insects alone or in combination with mowing can continue suppressing leafy spurge in this oak savanna habitat.