MANAGEMENT TECHNIQUES

USING COMBINATIONS OF MANAGEMENT TECHNIQUES

Biological control and other treatments
Mowing, grazing, burning and herbicides can complement the use of biological control to control leafy spurge infestations. All of these treatments will reduce litter and open the canopy allowing more sunlight to reach the soil, improving the beetle establishment and development. To avoid damage to the flea beetles, burning should be conducted in fall (October) or early spring (before mid May). Burning in the fall prior to the beetles may improve their establishment. Herbicides should be applied late in the season (after August 15th). Grazing by sheep or goats should not affect establishment.

Chemical Control and Grazing
Grazing sheep and goats can also be used in combination with fall herbicide application to control leafy spurge abundance. For example, grazing combined with a fall application of picloram plus 2,4-D can decrease leafy spurge abundance by 80 percent after the first three years and maintain control for two seasons after the treatment. Just as with all treatments though, it is very important that this is a continuous process.

Chemical Control and Cultural Control
The root buds of the leafy spurge plants develop early and any damage to the plant such as grazing or burning actually stimulates rapid re-growth. Mowing and burning can complement herbicide use by stimulating leafy spurge re-growth and increasing the effectiveness of the herbicide application for controlling stand expansion.

Monitoring
It is important to monitor the effects of any treatment being used to control leafy spurge. Depending on the response of leafy spurge, the treatment may need to be adapted. It is helpful to record your management actions (timing, location, intensity, plant stage) as well as weather conditions and changes in the plant community. Installing permanent markers at the edge of the leafy spurge infestation is one way to determine if expansion is being controlled or reduced. Landscape and ground cover photos as well as plant counts may also be useful for monitoring progress.

SUMMARY
Leafy spurge is an extremely persistent species with many competitive advantages that allow it to out compete native species threatening the biodiversity of many native habitats. Management programs for controlling spurge infestations must use an integrated site-specific approach. It is important to determine which control methods are suitable for your land, and to use the most effective combination of treatments. It should also be noted that long term control of leafy spurge with herbicides is only effective if repeated applications are made. Most likely, in order to see results, reapplication will have to be made. It is often used as a follow up maintenance program for long term control.

Chemical Control
Picloram has been a very effective herbicide for controlling leafy spurge. Usually it is applied in the spring or fall and can provide up to 90-95 percent control after five years. Picloram is not recommended for use in wooded or riparian areas as it is very slow to absorb and break down into the soil. This allows it to leach into groundwater and contaminate fresh water sources. Because of these environmental concerns, Picloram is only available to licensed applicators.

For control of leafy spurge in wooded or riparian areas, glyphosate and 2,4-D is applied in the fall. This application can result in up to 80-90 percent control after the first year. A follow up application of 2,4-D will be required in the spring. The use of 2,4-D reduces top growth, prevents seed production and prevents patch expansion but does not affect the original infestation if used alone. This is why 2,4-D is often used as a follow up maintenance program for long term control.

Herbicides should be applied late in the season (after August 15th) to control leafy spurge. Depending on the response of leafy spurge, the treatment may need to be adapted. It is helpful to record your management actions (timing, location, intensity, plant stage) as well as weather conditions and changes in the plant community. Installing permanent markers at the edge of the leafy spurge infestation is one way to determine if expansion is being controlled or reduced. Landscape and ground cover photos as well as plant counts may also be useful for monitoring progress.

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Leafy spurge is an extremely persistent species with many competitive advantages that allow it to out compete native species threatening the biodiversity of many native habitats. Management programs for controlling spurge infestations must use an integrated site-specific approach. It is important to determine which control methods are suitable for your land, and to use the most effective combination of treatments. It should also be noted that long term control of leafy spurge with herbicides is only effective if repeated applications are made. Most likely, in order to see results, reapplication will have to be made. It is often used as a follow up maintenance program for long term control.

FOR FURTHER INFORMATION ON WEEDS AND WEED CONTROL:
1. Alberta Invasive Plant Council
   (403) 638-3805; www.invasiveplants.ab.ca
2. Alberta Environmentally Sustainable Agriculture
   (780) 427-3885; www.arsa.ca

THANK YOU!
Many thanks to the Saskatchewan Watershed Authority for donating the text and pictures for these fact sheets.

INTRODUCTION
Leafy spurge (Euphorbia esula L.), a native plant species of Central and Eastern Europe, was first introduced to North America in 1827, most likely as a seed grain contaminant. Leafy spurge has since become a major economic and ecological problem throughout most of North America. Since its introduction, leafy spurge has rapidly spread to rangelands, pastures, woodlots and prairies across the United States and Canada, infesting over 1,214,000 hectares (3,000,000 acres).

THE PROBLEM
Native prairie is part of our natural history and is important as a grazing resource, wildlife habitat and for soil and water conservation. Without natural enemies or controls in their new habitat, exotic or introduced species have the ability to out compete many of the native plant species and invade native habitats. Threats such as the invasion of exotic species can degrade our prairie by excluding native species, which reduces biodiversity, carrying capacity, habitat and the aesthetics of our prairie ecosystem.

Leafy spurge is an aggressive perennial weed that has many characteristics that allow it to effectively compete with native prairie species:

- Early spring growth (sometimes as soon as the ground thaws). This allows it to use available water and nutrients.
- An aggressive root system that extends deep into the soil making the plant extremely drought resistant. The vertical roots of the spurge plant can extend to a depth of eight meters (26 feet) and the lateral roots can spread up to five meters (16 feet).
- Both of these roots can grow to shoot buds at almost any point allowing spurge plants to spread at the rate of a few meters per year.
- Although the upper portion of the plant can be killed, the living roots below the soil surface or even detached roots will generate new shoots ensuring the plant persists and spreads.
- Leafy spurge plants produce allelochemicals or toxins that can inhibit or reduce the germination and/or growth of other surrounding plant species.
- The mature spurge plants are relatively tall and can shade surrounding plants, which effectively excludes other species.
- Leafy spurge plants produce a milky liquid substance called latex, which is toxic to most animals. Cattle will avoid forage growing in close proximity to leafy spurge stands.

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2. MANAGING LEAFY SPURGE on Native Grassland

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CONTROLLING LEAFY SPURGE

The key to control is early detection and treatment of the initial invading plants. When small infestations (patches in diameter of less than eight meters or 26 feet) are detected, management should be aggressive as small infestations spread up to 500 times faster than large infestations. Large-scale redistribution, and control, and several of these beetles have become established and suitable for harvest. Signs or indicators that a site has established activity on it include: stunted leafy spurge plants, reduced or delayed spring emergence, delayed flowering, thinning stands of leafy spurge, feeding damage (gutting of leaves or ragged shredded leaves), and observable adult beetles on leafy spurge plants and surrounding grass.

After beetle emergence has been determined, the population should be assessed to determine if there are sufficient numbers of beetles to harvest. Usually it takes 3–4 years for a site to become established and suitable for harvest. Signs or indicators that a site has established activity on it include: stunted leafy spurge plants, reduced or delayed spring emergence, delayed flowering, thinning stands of leafy spurge, feeding damage (gutting of leaves or ragged shredded leaves), and observable adult beetles on leafy spurge plants and surrounding grass.

After beetle emergence has been determined, the population should be assessed to determine if there are sufficient numbers of beetles to harvest. Assessment should take place between early June and mid July (adult phase of life cycle), in warm to hot temperatures on calm, sunny days. It should be noted that every year before harvesting, beetle populations need to be re-assessed to ensure adequate numbers.

Steps to Assessing Beetle Populations:

- Collect beetles using a 15-inch heavily sweept net at the release point and any areas showing signs of activity.
- Sweep using firm broad strokes while walking at a comfortable pace. Sweep only the top half of the vegetation.
- Take between 10 and 15 sweeps then calculate the number of beetles. If you have one to two beetles per sweep or collect more than 500 in 5 minutes you can begin harvesting.

Harvesting beetles

Harvesting should begin as soon as possible there are harvestable numbers of beetles. A site should not wait another year for beetle populations to further increase as sometimes beetles can reproduce rapidly and reduce spurge roots so dramatically that beetle populations may crash. Harvesting should be conducted as frequently as possible during early June to mid July, on warm, calm days.

Steps to Harvesting Beetles:

- Use a 15-inch heavy-duty sweep net in the same way as for assessing beetle populations.
- Periodically dump beetles collected into a spare net or pillowcase.
- A sorter can be used to separate beetles from other insects and vegetation. A sorter can easily be made using PVC tubing with the ends capped and several 0.32-0.78 cm (1/8 or 3/16 inch) holes drilled around the circumference. A threaded rod or metal spike can be inserted as a handle and place it inside a spare net or pillowcase then place it in the sun. The beetles will climb out of the tube toward the light leaving other insects and vegetation behind.
- Count the desired number of beetles using a small graduated bottle (pill bottle). Ten mm is approximately 1000 beetles.

After the beetles have been collected, they should be released as soon as possible. Store beetles in paper bags or unwaxed paper cups. Plastic containers should not be used as condensation can be a problem. Fill the container or bag 1/3 full with leafy spurge plants (do not include seed, flower heads, or roots). Staple or tape the bag or container closed without air holes. Store the beetles in a cool dry location out of the sun. Coolers with ice packs work well but beetles must be kept dry.

When releasing beetles, choose days where the weather is similar to that of collection (warm, sunny, calm days). If weather conditions are cool and rainy at the release site, the beetles can be stored for several days up to a week. If the night temperature drops to 4–7 degrees Celsius.

Keeping record of the species, number of beetles released and location of release is a good idea to determine if the beetles are becoming established and if a particular species of beetle is working well or not. Graze

Grazing can be a sustainable option of control with achievable results, especially if grouped with another control measure. Grazing will reduce the leafy spurge canopy (top growth) and increase the competitiveness of native species. Leafy spurge is grazed for up to 50% of a sheep’s diet in the month of July. In areas with high stocking rates, leafy spurge will not germinate. Grazing will reduce growth but will not affect the underground root system and therefore will not take part in the redistribution process. Grazing, although an effective method does not eliminate leafy spurge. It is a control measure that works best as part of an integrated management system. Grazing will reduce growth but will not affect the underground root system and therefore will not take part in redistribution process. Grazing that works best as part of an integrated management system. Grazing will reduce growth but will not affect the underground root system and therefore will not take part in redistribution. After these activities are conducted, the management area should be assessed. Selective clipping can be used to control small spurge patches but it is difficult to be selective. Burning alone has little impact on leafy spurge populations. Cultural Control

Mowing reduces seed production and repeated mowing will weaken spurge plants but it is difficult to be selective. Burning alone has little impact on leafy spurge populations. Cultural Control

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