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Leafy spurge and the GPAC-14 Leafy Spurge Task Force: An historical perspective

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In 1934 the control method of choice for leafy spurge was sodium chlorate – 4 pounds per square rod in June and 2 pounds per square rod six to eight weeks later (Barnett & Hanson, 1934). That's a total of 960 pounds per acre. Cost was a limiting factor – \$8 per 100 pound drum would cost \$768 an acre. This control method was only recommended for very small areas. Researchers were also looking at cultivation, mowing, hoeing, and replanting areas – so the concept of an integrated approach is not new.

By 1955 2,4-D herbicide plus Ammate (ammonium sulfamate) was recommended at a rate of 4 pounds D and 100 pounds of Ammate for the best control of leafy spurge (Krall, 1955). Several cropping systems were also being tested at this time, with delayed cultivation one year, followed by heavy seeding of winter wheat and a 2,4-D application the next, for a period of four years, giving the best control. Weed scientists have always been into this integrated approach for perennial noxious weeds.

Today scientists are recommending Tordon as the most effective long-term herbicide treatment, but it's not economical at high rates on large infestations because the herbicide cost is often eight to ten times higher than the cash rent value of the land (Lym & Messersmith, 1994). Researchers today are looking at herbicide treatments, revegetation, grazing, and the use of insects and pathogens as biocontrol agents. The rate of increase of spread of leafy spurge has slowed in North Dakota, probably due to long-term herbicide and cultural practices and scientists are recommending long-term management programs that include herbicides, insects, and other biocontrol agents (Moran, 1994).

The changes we have seen in leafy spurge control since the first research in the 30's includes much more effective and environmentally safe use of herbicides. We obviously use much lower rates now. We've seen a more specific approach to the development of competitive vegetation and revegetation efforts. A whole new field of biological control of weeds with insects has developed since the 30's, including more weed scientists working with entomologists to get a better understanding of both biological systems. We're seeing today more work on the development of specific plant pathogens for the control of leafy spurge. In this time period, we've seen researchers take a serious look at what sheep and goat grazing really does to leafy spurge.

We've come a long way, but we're not there yet

Those of you who were not able to attend the Montana Weed Control Association Meeting last November missed hearing a history making leafy spurge talk by the world famous time traveller – Dr. Rodney Lym. Quoting from the National Enquirer article from the year 2001 titled “I broke root bud dormancy and developed a specific chemical for leafy spurge control,” he noted that a massive effort by scientists and local, state, and federal land managers in the late 1990’s led to the implementation of a truly integrated weed management program. Dr. Lym reports that in the year 2020, leafy spurge is generally only a problem in isolated, remote areas (Lym, 1993).

This future solution to the leafy spurge problem in the West did not come about from the discovery of a miracle herbicide or from the establishment of one or two species of especially hungry insects. It came about because successful integrated programs were designed for specific land uses and locations, using many tools developed by researchers over the years.

You are those researchers and your job is not done

Keep in mind that leafy spurge (*Euphorbia esula*) has had over 160 years to adapt to living in North America. And well-adapted it is. Since the first record of the plant in Newbury, MA in 1827, it has moved across the United States and is found in all 48 contiguous states.

The GPAC-14 Leafy Spurge Task force has spent 15 years prioritizing leafy spurge research, extension/education, and coordinated control work. Scientists working on leafy spurge have been remarkably successful in combating this long-lived and tenacious weed.

Starting in 1979, a group of dedicated researchers, educators, and agency personnel have worked together to determine what leafy spurge research would best benefit the Great Plains and western States. An overview of progress up until 1979 showed research had been done on 24 herbicides, but many were not appropriate or effective for use against leafy spurge.

At that time, two insects had been cleared for release into the United States, with one more very close to release. The leafy spurge hawkmoth and a clear-wing moth had been released but had not established well or been particularly effective. The *Oberea* beetle was reported as being very close to release in 1979 and actually released in 1980.

Some research had been done on cultivation and cropping of leafy spurge, but was limited due to the perennial nature of the plant and limitations in the range, woodland and pasture settings where leafy spurge is generally found.

Every new herbicide released since 1979 has been tested against leafy spurge -- 11 new herbicides have been researched, with limited success in finding new, effective chemicals. In addition, research has included the use of different types of application equipment (rope wick, ATV’s), surfactants, combinations of herbicides, and variation in application timing and sequential timing of herbicide applications. All of this research

has given land managers the best information available of the use of herbicides to control leafy spurge.

Reports from 1979 indicated that more than 25 species of *Aphthona* flea beetles that attacked spurge were waiting in Europe, along with 10 other potential insect biocontrol agents. While some of these insects were not appropriate or cleared for release into the United States, to date there are 9 insects that have been released into the United States, with 14 more currently undergoing testing in Europe. It is expected that all foreign screening will be completed within the next three years. Insects have established and scientists have seen a reduction in the density of spurge in some established sites. Research on plant pathogens is also showing promise.

Grazing of spurge with sheep and goats has given land managers an alternative control that can be effective and economical. Research in the use of competitive species is showing promise. Electrocuting is showing less promise, but at least you're being creative.

Since 1979 we have seen an increase in research on the basic biology of leafy spurge, including genetic diversity and root bud dormancy. This research is aimed at getting a better understanding of the plant to more effectively control it.

Lots of research had been completed, more is currently underway, but keep in mind that our time traveller from 2020 tells us that poor management and use of only "politically popular" weed control techniques in the mid-1990s led to the overthrow of those espousing the "one control is best" philosophy.

There is an increasing interest in the research community, as well as from land managers, to tie all effective control programs together into an integrated approach for leafy spurge management. The GPAC-14 Task Force has been extremely effective in targeting specific research problems to solve real world problems. It must continue with this work. This can best be done by continuing the Leafy Spurge Task Force as a forum for scientists to meet, discuss, and plan research for the future.

Questions to be answered:

1. Are herbicides and biocontrol agents compatible?
2. Can biocontrol agents be established in areas with a long-term history of herbicide use?
3. Can herbicides be used effectively prior to release of biocontrol agents to aid in establishment?
4. Can herbicides be used after establishment of biocontrol agents without impacting the agents but causing further stress on the spurge plants and making insect stress more effective?
5. Can insects and diseases be used together more effectively?

6. Can native plants be used to compete effectively with leafy spurge after herbicide treatment, in combination with herbicide treatment, or after establishment of bio-control agents?
7. Does sheep or goat grazing actually reduce spurge infestations, or just allow use of the plant?
8. Can we develop grazing systems for land managers who are managing specifically for leafy spurge control?
9. Can we develop effective controls in sensitive riparian areas?
10. Can fire really be used as an effective set-up treatment for better control with herbicides?
11. Do biocontrol agents cycle with the weed species, cause “good” spurge years or “good” bug years or will the insects reduce the spurge to an “insignificant member of the plant community?”

Research on some of these topics is underway. Other may still need to be addressed. Some may be totally irrelevant. It is imperative that these topics be discussed among GPAC-14 members during the Thursday group sessions and the results recorded.

Contrary to a recent news release, the imminent demise of leafy spurge is not a foregone conclusion based on the success of the *Aphthona* flea beetle. Some researchers firmly believe this. Others feel that several control methods will always be needed to keep spurge in check. Only good research and time will tell. These diverse opinions are what have made this Task Force effective over the years and will add to its continued success.

Always remember, the leafy spurge problem is not solved until it is not spreading and infesting more and more acres in the West and until the populations we have are suppressed. This calls for an integrated research and management approach.

Insects will not stop the spread of spurge, they may suppress infestations. Herbicides can stop the spread of spurge when used in an effective containment program but are not economical and often not particularly effective on large infestations. Sheep and goats will utilize spurge and may suppress it. When spurge has been suppressed, competitive vegetation may help to prevent a resurgence. A healthy plant community with proper grazing may prevent the infestation of spurge.

Landowners must be reminded that leafy spurge management is a long-term commitment that means looking for the plant in out of the way areas where wildlife, birds, man, or livestock may move it. Researchers need to be reminded that leafy spurge isn't just an interesting research topic, but an economic threat to Western lands. Land managers must have effective, economic solutions.

The working members of this Leafy Spurge Task Force have shown the effectiveness of working together to answer questions about leafy spurge and its control. You must be as effective in developing integrated weed management programs on leafy spurge.

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