

# Leafy Spurge *News*

Agricultural Experiment Station  
NDSU Extension Service  
North Dakota State University, Fargo, ND 58105

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## From The Editor's Desk

Montana State University Extension Service came out in July 1995 with a new 25 page bulletin "Leafy Spurge, Biology, Ecology and Management. It is authored by several well known specialists from various universities, S. Lajeunesse, R. Sheley, R. Lym, D. Cooksey, C. Duncan, J. Lacey, N. Rees and M. Ferrell. It contains excellent color photographs, tables and graphs as well as an appendix listing the currently approved insect biocontrol agents - habitat requirements, biology and collecting/releasing suggestions. A list of 12 references is included. I am sure that many of you will find it quite useful.

By the way, for those of you with computers with CD-ROM capabilities, a comprehensive collection of literature on leafy spurge is contained on CD-ROM, "**Purge Spurge, Leafy Spurge Database**", demo v. 2.5 1995. USDA Agricultural Research Service in cooperation with Montana State University-Bozeman. A copy can be obtained from Janet Petroff 408 Culbertson Hall, MSU, Bozeman, MT 59717-0056, Ph (406) 586-0831, FAX (406) 587-339

I would like to thank Dow-Elanco for their financial help. Their grant allows us to do the layout, print and pay the postage for each issue of the **Leafy Spurge News**. I also would like to thank the many contributors who submitted information to me this past year. Without your input there would be little material in each issue. Please keep sending information.

In early April I received a letter from the National Agricultural Library (NAL) requesting to be added to the mailing list as well as all the old copies that were available. This means that we have "arrived", and have finally been recognized as having a useful function.

The October 1995 issue of **Leafy Spurge News** mentioned that Christopher Knorr, a student at Velva High School, was first runner-up at the N.D. State Science Fair in April 1995. He was a contestant again this year in Bismarck, April 11-12 and this time won First Place. He also won \$50 from the Farmer's Union for the Best

Agricultural Project, and the Kodak Award - cameras and film. He also won a \$10,000 Scholarship to Jamestown College. Congratulations Chris. As the North Dakota winner, he was able to go to Tucson, AZ, all expenses paid, to compete in the Biology Division of the International Science Fair, May 5-11, 1996. He did not win any awards but he said that it was a tremendous experience. His mentor for his project, entitled "Let's Say Goodbye to Leafy Spurge", was Dr. David G. Davis, USDA/ARS, Biosciences Research Lab. Fargo, ND. An abstract of his project will be in the October issue of **Leafy Spurge News**. This proves that even a noxious weed has some hidden benefits!

You will note that the call for papers and the form you are to send in for registration to the **Leafy Spurge Symposium - 1996** to be held at the Victoria Inn, Brandon Manitoba, Aug 13-15, 1996 is in this issue, please fill it out and send it by 12 July. You will save money, \$20 if you do. See you all there!

Anytime you wish to contact me please send your inquiries or any mail for that matter to my home address **1827 N 3rd Street, Fargo, ND 58102-2335** and not to NDSU as that really delays my getting your mail.

**C.H. Schmidt, Editor**

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## Leafy Spurge Control With PLATEAU

Leafy spurge is a competitive and widespread perennial weed on rangeland in the northern Great Plains. It is rapidly becoming a major pest on grasslands in Nebraska and other central Great Plains states. Ranchers view this weed as a significant threat because it reduces the quality and productivity of the grassland resource upon which livestock enterprises rely. Leafy spurge reduces rangeland carrying capacity by competing with desirable forages and rendering infested areas undesirable to

cattle. Leafy spurge threatens native grassland communities by displacing native species, thereby reducing native plant and animal diversity.

TORDON (picloram) and 2,4-D have traditionally been used to control leafy spurge on rangeland. Annual fall and spring treatments of 2,4-D are recommended to reduce leafy spurge seed production, but do not kill established plants. TORDON at 2 lbs active ingredient (ai)/acre controls leafy spurge for 24 to 36 months when applied in the fall, but the high cost of this treatment limits its use to small infestations.

PLATEAU (AC 263,222), is an imidazolinone herbicide that has potential to control leafy spurge. Experiments were initiated on range sites near Ainsworth and Tilden, Nebraska and Jamestown, North Dakota to determine the response of leafy spurge to PLATEAU. PLATEAU was applied on August 31, 1994 at 2 and 4 oz ai/acre at Jamestown and in late September 1994 at 2, 3, and 4 oz ai/acre at Ainsworth and Tilden. The combination of TORDON at 0.5 lb ai/acre + 2,4-D at 1 lb ai/acre was applied at Jamestown and Tilden at the same dates as PLATEAU and at Ainsworth in June 1995. PLATEAU was applied again at Ainsworth and Tilden sites in June 1995 to previously non-treated areas and to half of the areas treated in September 1994 with PLATEAU.

Visual estimates of leafy spurge control on a scale of 0% (no control) to 100% (complete control) were determined at 11 months after treatment (MAT) in the fall at sites in Nebraska and 12 MAT at Jamestown. PLATEAU applied in the spring to previously non-treated areas provided no better than 60% leafy spurge control. Application of PLATEAU at 2 oz ai/acre in the fall provided better than 80% leafy spurge control at Nebraska sites and 65% control at Jamestown. Fall applications of PLATEAU at 3 and 4 oz ai/acre or fall + spring applications at 2 and 3 oz ai/acre resulted in greater than 95% control of leafy spurge. In contrast, fall applications of TORDON + 2,4-D provided less than 35% leafy spurge control at the Jamestown and Tilden sites. Application of TORDON + 2,4-D in the spring resulted in 90% leafy spurge control at Ainsworth.

PLATEAU provided good to excellent control of leafy spurge. PLATEAU applied in the fall only or fall followed by spring application provided better leafy spurge control than spring-applied PLATEAU alone. Leafy spurge control with fall-applied PLATEAU was as good as TORDON + 2,4-D applied in the spring and better than TORDON + 2,4-D applied in the fall. Additional research is needed to assess the effect of PLATEAU on quality and yield of desirable forages growing on leafy spurge-infested rangeland.

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## **Redistribution of *Aphthona Nigriscutis* in Wyoming**

*Aphthona nigriscutis* was first released in Wyoming in 1989-90 at several sites in Crook and Fremont Counties. Those initial release sites have developed into productive insectaries and the potential for massive redistribution became possible. In 1993, the Wyoming Weed and Pest Council formed the Wyoming Biological Control Steering Committee to coordinate that project. The Wyoming Department of Agriculture supported redistribution with a grant of \$84,500 from funds raised by an increase in pesticide registration fees.

Counties with leafy spurge, developed weed distribution maps and established release locations during the spring of 1994. Site information, including latitude and longitude, was recorded on state release forms to be turned in at the collection site. Several districts constructed insect sorters out of stove pipe, window screen, and a funnel. Sweep nets were purchased. Sites in Crook and Fremont Counties were designated for collection and personnel from other county weed and pest districts congregated early in the morning on designated days in late June and early July to collect. The insects were measure volumetrically to provide releases of 1000 beetles or more. Filled containers were placed in ice chests for transport and the collection teams were on their way home by noon. Additional personnel were waiting to take the collected insects out to the predetermined release sites. In most cases the insects were release within 24 hours of collection. The maps and release site data were sent to the Cooperative Agricultural Pest Survey (CAPS) coordinator at the University of Wyoming who entered the information into their GIS computer.

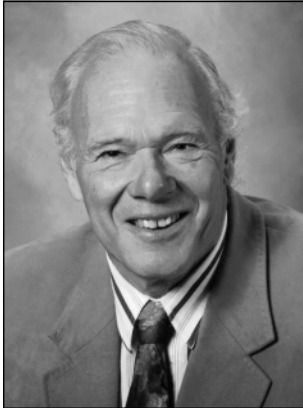
The same procedure was followed in the summer of 1995. In 1994, 850,000 beetles were redistributed and in 1995 the number grew to 1.2 million. A helicopter was used in Crook County to fly infested drainages. Containers were opened and dropped every quarter mile while the GPS in the helicopter recorded the locations. Hundreds of releases were made in one day over some very difficult terrain. At 1000 beetles per release, about 2000 substantial releases were made in Wyoming during the two years. By overlaying the release sites onto the leafy spurge distribution map, an easy task with GIS, it is possible to see the progress. Additional collections are planned for the spring of 1996. By the end of this season less than 10% of the leafy spurge in Wyoming will be more than one mile from a release of *Aphthona nigriscutis* and every county with leafy spurge will have its own insectary site from which it can continue to collect to meet future needs.

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# Leafy Spurge Honoree

## Spurge Biocontrol - The Canadian Experience



**Dr. Peter Harris**

Most of the biocontrol agents that have been introduced for biocontrol of leafy spurge in North America were first cleared for release by the Canadian program. In 1960, Dr. Peter Harris, as a newly hired scientist with the Research Branch of Agriculture Canada (now Agriculture & Agri-Food Canada), initiated a research program on the biocontrol of leafy spurge. Under his leadership the program gradually

evolved, and became much more effective, by the involvement of other organizations, agencies, scientists and extension personnel. The program now has four main aspects. 1) Collection of candidate agents and research on their host specificity by the International Institute of Biological Control (IIBC) at Delemont, Switzerland, under the direction of Drs. Helmut Zwolfer (retired), Dieter Schroeder and Andre Gassmann. 2) The distribution of approved agents, which is mostly done by provincial agencies and input from Dr. Harris regarding their site preferences and expected impact. 3) Research to improve screening protocols to assess the host specificity of candidate agents so as to address concerns about the possible impact on native plants. 4) Efforts to obtain funding for both the work in Canada and that done by the IIBC. The key process was a series of meetings in the 1980's with various Canadian and US agencies concerned about leafy spurge which resulted in a consensus accommodating the needs and priorities of each. The development and implementation of the leafy spurge biocontrol program was a learning experience in both understanding insect-plant interactions and the political complexities of organising an applied research program.

The spurge biocontrol program had its beginning with a survey that identified six possible biocontrol insects that attacked spurge in Switzerland. The search for new biocontrol agents had since shifted to the Eurasian steppes which are the climatic counterparts to the problem areas in North America. Dr. Harris obtained approval to release the first spurge biocontrol agent in 1965. This was the spurge hawk moth, *Hyles euphorbiae*, which is a large and beautiful insect with a voracious appetite for spurge leaves, but ineffective as a biocontrol agent since spurge is relatively tolerant of defoliation. This species has become established in Ontario and New York, where it defoliates patches of cypress spurge, and in small numbers in Montana on leafy spurge. However, in most of

Canada, the summers are too cool and the predation losses too high for it to persist.

The second insect cleared for release, in 1970, was the root-boring moth *Chamaesphecia empiformis*. In spite of literature records to the contrary, this insect proved to be specific to cypress spurge. The confusion about its host range arose because a number of *Chamaesphecia* species were lumped together. This problem has now been resolved by Dr. I. Tosevski, who showed that there are ten species of *Chamaesphecia* associated with European spurges, all with a narrow host range and site requirement. Subsequently *Chamaesphecia tenthrediniformis* from an European population of *Euphorbia esula* (leafy spurge) was then cleared, but it did not accept North American leafy spurge. The lesson is that although North American leafy spurge is called *E. esula*, many insects respond differently to it and European *E. esula*, so the acceptability of our spurge to a candidate biocontrol agent should be checked before starting detailed investigations. We now know that *Chamaesphecia* spp. from *E. virgata* and *E. lucida* accept our spurge more readily than those from *E. esula*. However, there are still problems to be solved in establishing these moths which are the main agents controlling spurge in some steppe habitats.

The breakthrough in biocontrol of leafy spurge came with the release of root-feeding beetles in the genus *Aphthona*. *Aphthona cyparissiae* and *A. flava* were cleared in 1982, and *A. nigriscutis* in 1983. All are able to reduce leafy spurge from a 100% cover to less than 5% if released in the appropriate habitat. *Aphthona flava* needs more degree days than is found in most regions of Canada, but the original colony in Montana has reduced leafy spurge at that site to the point where the colony is no longer a useful source of beetles for redistribution. Following several years of adaptation and population increase, colonies of *A. cyparissiae* at Maxim, SK and *A. nigriscutis* at Spruce Woods Park, MB have supplied most of the beetles for successful releases throughout North America. Indeed, so many beetles were removed from the Spruce Woods Park site by Canadian and US collectors for distribution that the spurge started to recover. This problem was resolved by the establishment of many secondary colonies in both Canada and the USA. More recently, *A. czwalinae* and *A. lacertosa* have been achieving control of leafy spurge on heavier soils. An insect that has proven very successful on an intractable site at Brandon, MB is the leaf-tying moth *Lobesia euphorbiae*, which in conjunction with *A. nigriscutis*, is causing the leafy spurge to decline. This insect, which was originally from Italy, has taken a long time to adapt to the prairies. Hopefully, other introduced species that are still at low densities will also adapt.

The initial rate of clearing candidate insects for release was slow. However, this was accelerated in the 1970s by obtaining funds from other agencies to supplement the Research Branch support for the IIBC activities. In 1985 the funding sources were further expanded by formation of the Leafy Spurge Consortium. Membership in the consortium has changed slightly over the years, but the main sponsors have been Agriculture & Agri-Food Canada, Alberta Agriculture, Saskatchewan Agricultural Developmental Fund, Canada Department of National Defense, and State and County agencies in Montana, North Dakota, South Dakota and Wyoming. This consortium has been responsible for maintaining the momentum needed for a viable program in spite of government cut-backs.

Not all the insects approved for release have been effective biocontrol agents, but the program has provided the species to reduce leafy spurge abundance over most of its North American range. The program has also taught lessons that are applicable to weed control as a whole. To finish the job on leafy spurge, an agent is needed to control leafy spurge in forest. Unfortunately the *E. esula-virgata-lucida* complex does not occur in European forests, so the problem is to find an insect from a less-closely related forest-dwelling spurge that will accept North American leafy spurge, but not attack native spurges. The difficulty is confounded because the traditional no-choice test used to determine agent safety often results in development on closely related plants even though they are not attacked under field conditions. In 1995, Dr. Harris and a visiting Chinese scientist, Dr. F-H Wan developed a risk analysis procedure, that if adopted, would unblock the presently stalled program for approving the release of spurge biocontrol agents.

Dr. Harris is recognized internationally as a leader in classical weed biocontrol research and as a result of his

### Agents cleared for Release under the Canadian Spurge Biocontrol Program

Agents	Release Year	Funding Agency
<i>Hyles euphorbiae</i>	1965	Ag. Can.
<i>Chamaesphecia empiformis</i>	1970	Ag. Can.
<i>Ch. tenthrediniformis</i>	1971	Ag. Can.
<i>Oberea erythrocephala</i>	1979	Ag. Can. & Sask.
<i>Aphthona cyparissiae</i>	1982	Alberta
<i>A. flava</i>	1982	Alberta
<i>A. nigriscutis</i>	1983	Ag. Can.
<i>Lobesia euphorbiae</i>	1983	Ag. Can.
<i>Aphthona czwalinae</i>	1985	Ag. Can.
<i>Pegomya euphorbiae</i>	1988	Alberta
<i>P. curticornis</i>	1988	Alberta
<i>Minoa murinata</i>	1988	Ag. Can.
<i>Aphthona lacertosa</i>	1990	Consortium
<i>Chamaesphecia hungarica</i>	1991	Consortium
<i>Ch. astatifomis</i>	1993	Consortium
<i>Ch. crassicornis</i>	1994	Consortium

efforts the Canadian weed biocontrol program has been one of the world's most successful. Although recently retired, he continues to be active in writing and reviewing scientific publications. His advice is frequently sought by other weed biocontrol workers and he serves an important role as tutor of the next generation of biocontrol workers at Lethbridge.

## Western Weeds Coordinating Committee Meets With Other Groups

A meeting was sponsored by the North Dakota Weed Control Association, the North Dakota Department of Agriculture and the Montana Department of Agriculture on April 1, 1996, in Denver, Colorado. The purpose of the meeting was to establish a network of interested parties with workable ideas for the regulations of biological control agents of weeds into the United States and between states.

The participants of the meeting which included 20 state and federal regulatory officials and affected state and federal agencies. This group identified an immediate need for the Secretary of Agriculture to intervene in four major areas within USDA.

The Secretary needs to stop the Advanced Notice of Proposed Rulemaking currently proposed by USDA – APHIS – PPQ. This process only serves to delay decisions that are best adopted from two documents.

Second, USDA – APHIS – PPQ should use the ideas contained in, "Options for Change in Biological Control Regulations and Guidelines in the United States: A "Strawman" For Comment and Peer Review" and "Biological Based Technologies For Pest Control, Office of Technology Assistance as the guiding documents as guiding documents for this issue.

Third, there is a need for USDA agencies ARS, APHIS and the National Biological Control Institute to begin meeting jointly on a regular basis to better plan a systematic approach for biological control technologies.

Finally, the USDA should begin a collaborative process to draft and gain acceptance of enabling biological control legislation for this country. Following the collaborative process, the legislation should be handed back to some of the states to take to Congress.

**Cindie S. Fugere**  
Chairman of WWCC  
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## Biological Control Education Day

In spite of some severe winter weather, the Leafy Spurge Biological Control Day was held on Tuesday, February 27, 1996, at the Kelly Inn in Bismarck, ND. Participants drove on bad roads from all across North Dakota to better prepare themselves for the upcoming leafy spurge biological control season. Many of the students and instructors ended up staying an extra night when I-94 closed at Jamestown, ND.

The one-day education course was designed to teach people, who actively manage their own biological control program, more about the biology of the different

species: monitoring; selecting and releasing insects; collecting and transporting; record keeping; and transferring the technology to landowners.

At the end of the day, participants received copies of the monitoring files for the FIS monitored through the Cooperative Agricultural Pest Survey. If you did not attend the course, but would like to have the monitoring files for your county in North Dakota sent to you, please call Cindie.

**Cindie S. Fulgere**  
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## Economic Analysis of Herbicide Control of Leafy Spurge in Rangeland

Leafy spurge, a troublesome weed in untilled land, spreads rapidly, resists control, and reduces land outputs, presenting longterm problems to land managers in the Upper Midwest. A variety of intensive herbicide treatment problems, currently the mainstay of combating the weed, has been effective in controlling, but not eradicating, the weed. Thus efforts to control and restrict the spread of leafy spurge require long-term commitments; however, trade offs between control costs and returns from control have until now remained unquantified.

Under some rangeland conditions found in the Upper Great Plains, long-term (20 years) herbicide control of leafy spurge can produce positive returns. Returns, however, vary across a variety of factors, but those having the greatest influence on returns from longterm herbicide control include infestation size, spread rate, land productivity, and frequency and rate of herbicide applications.

Generally, herbicide treatments provided positive discounted returns when applied to small (0.5 acres or less) infestations. However, as infestations became larger and more established, returns diminished quickly, and in many cases, treatment became economically questionable. Current herbicides (and prices) cannot provide long-term positive returns from leafy spurge control in all situations in the Upper Great Plains. However, in most situations, long-term control of leafy spurge using herbicides is a viable economic alternative to no treatment.

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## Leafy Spurge Task Force Sponsored by WSSA

The weed Science Society of America, at its annual meeting on February 4-8, 1996, unanimously approved the Leafy Spurge Task Force as a subcommittee of the Federal Noxious & Invasive Weeds Committee. The WSSA recognizes that the Leafy Spurge Task Force, which sponsors the annual Leafy Spurge Symposium, has been a successful coordinating organization and hopes that this group can serve as a model for addressing other specific weed science topics in the future.

The Leafy Spurge Task Force was sponsored for many years by the Great Plains Agricultural Council, which was a consortium of state and federal agricultural agencies from 10 Great Plains states from Montana and North Dakota to Texas and New Mexico. The GPAC was disbanded in 1995, so the WSSA was approached as a logical sponsor. The WSSA includes membership from Canada and the United States, including both the North Central and Western Regions of the state agricultural experiment stations system. Thus, WSSA is an inclusive affiliate for the task force.

Although details are being finalized, it is anticipated that either the chair or vice chair of the Leafy Spurge Task Force will be an ex-officio member of the WSSA Federal Noxious and Invasive Weeds Committee. The Task Force will prepare an annual report of activities and will have access to WSSA programs, such as the WSSA liaison activities in Washington, DC.

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# Summary of Biocontrol of Leafy Spurge in Wyoming During 1995

During 1995, 1,061 releases of bioagents were made for leafy spurge. A majority of the individuals released were *Aphthona nigricutis*, as seen in Table 1. The movement of bioagents was accomplished with the cooperation from the following agencies USDA-APHIS-PPQ, County Weed and Pest Districts, Bureau of Land Management, USDA Forest Service, and National Park Service.

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U.S. Postage  
**Paid**  
Permit No. 818  
Fargo, N.D.

**Table 1. Bioagents Released for Leafy Spurge in 1995**

Species	Number of Sites	Number Released
<i>Aphthona cyparissiae</i>	9	3,750
<i>Aphthona flava</i>	6	4,300
<i>Aphthona lacertosa\czalinae</i>	9	7,200
<i>Aphthona nigricutis</i>	1,032	1,509,400
<i>Oberea erythrocephala</i>	2	200
<i>Spurgia esulae</i>	3	200
<b>Total</b>	<b>1,061</b>	<b>1,525,050</b>

Of the 1,509,400 *Aphthona nigricutis* released 1,411,150 were collected from sites within Wyoming. Table 2 presents the number of *Aphthona nigricutis* collected from sites within five counties.

**Table 2. Collection Counties within Wyoming**

County	Number Collected
Campbell	28,000
Crook	888,350
Fremont	455,300
Johnson	12,500
Sheridan	27,000
<b>Total</b>	<b>1,411,150</b>

In the last three years the number of insects released has increased.

**K. Zimmerman**

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