



Leafy Spurge News

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NDSU Extension Service
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Special *TEAM Leafy Spurge* edition

We are pleased to bring you this special issue of the *Leafy Spurge News*, which focuses on The Ecological Area-wide Management (TEAM) Leafy Spurge. TEAM Leafy Spurge is funded and led by USDA-Agricultural Research Service (ARS) in partnership with USDA-Animal & Plant Health Inspection Service (APHIS). The goal of the program is simple – the development and transfer of economically and ecologically proven leafy spurge management technologies to farmers, ranchers and land managers.

Unfortunately, accomplishing this goal won't be easy. Effective leafy spurge management requires coordinated efforts at the national, state and local level and a wide range of pest management tools. TEAM Leafy Spurge is a step in that direction, as it focuses federal, state and private research and leafy spurge management activities within an entire region – the Little Missouri River drainage of North and South Dakota, Montana and Wyoming.

The program is expected to provide nearly \$4.6 million over a five-year period to this effort. All funds are USDA-ARS base funds set aside specifically to facilitate the development of partnerships and interagency

See WELCOME, page 14

TEAM Leafy Spurge co-principal investigators Lloyd Wendell (top) and Gerry Anderson say that partnerships and teamwork are key components of TEAM Leafy Spurge.



From the Editor's Desk

Since the June issue of *Leafy Spurge News* contained bad news – cancellation of the 1998 Leafy Spurge Symposium in Colorado Springs – we decided to bring you some good news.

This special issue of LSN is devoted to TEAM Leafy Spurge, a USDA-ARS research and demonstration program targeted at the entire Little Missouri River drainage region. Included is an overview of the program and its components as well as descriptions of its individual research and demonstration projects.

As you can see, this issue is a bit larger than usual. That's because we're going out of our way to bring you TEAM Leafy Spurge information in a clear, concise and timely manner. Future issues of *Leafy Spurge News* will keep you posted on TEAM Leafy Spurge, and we plan on publishing one special section a year to update the program's status and results from its research and demonstration projects.

As Gerry Anderson, co-principal investigator of TEAM Leafy Spurge, pointed out in a previous issue of The Leafy Spurge news, the primary objectives of the program are:

- To develop and integrate sustainable leafy spurge management methods in a broad demonstration project

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This TEAM is really a team

Cooperate: 1) To act or work with another or others to a common end; 2) To act together, to produce and effect jointly; 3) To associate with another or others for mutual, often economic, benefits.

As just about anyone and they'll tell you that the ability to work with others, to cooperate, is almost always a key to success. If that ability guarantees success, then TEAM Leafy Spurge – or, to be more precise, the recipients of the technologies it develops – has a very bright future.

“Cooperation is one of the foundation blocks TEAM Leafy Spurge was built on,” said Neal Spencer, research leader at the USDA-ARS Northern Plains Agriculture Research Laboratory in Sidney, MT.

“The large number of players involved is one of the really neat things about TEAM Leafy Spurge. It enables ARS and APHIS to share resources and expertise with a diverse collection of other entities and work towards a common goal.”

Bob Richard, leader of TLS operations and director of the USDA-APHIS Plant Protection & Quarantine in Bozeman, MT., shares those sentiments.

“There aren't many programs, federal or otherwise, that are this collaborative,” he said. “There are a lot of players who are making significant contributions to TEAM Leafy Spurge. It's a good thing, too, because leafy spurge is quite a formidable opponent.”

The benefits of such extensive cooperation are numerous.

For one, it has enabled TLS to assemble a collection of the nation's most experienced and knowledgeable sources about leafy spurge. Some of the program's project leaders have been

working on leafy spurge research and management for decades, and the result is a list of TLS players that reads, quite literally, like a “Who's Who” of leafy spurge researchers.

Cooperation also allows the funding agency, the USDA-ARS, to get the most bang for its buck. ARS dollars are sometimes supplemented with funding from other sources, including other federal and state agencies. One project, for example, has obtained additional funding from the National Park Service, USGS, NASA, a private organization that promotes bio-control of noxious weeds and a private conservation group interested in rangeland health.

The most valuable benefit, however, is that cooperation helps TEAM Leafy Spurge provide tangible assets to the ranchers, landowners and land managers who are waging the war against leafy spurge.

Landowner Dennis Dietz of Sentinel Butte, N.D., is but one example. The lifelong rancher hopes to someday pass his cattle

grazing operation – which is situated on land with spurge infestations ranging from light to heavy – on to his son, Kevin.

Dietz has used herbicides for years, and is all too familiar with the economic toll leafy spurge has taken on his operation.

“I've been battling spurge for years without making any real progress,” Dietz said. “But now, on any given day, I might work with people from ARS, APHIS, NDSU, SDSU, MSU, the state Department of Agriculture or local weed supervisors. It's really satisfying to see so many people working together to try and help make ranching more profitable for guys like me. We can finally see some light at the end of the tunnel.”

Chad Prosser, TEAM Leafy Spurge coordinator, said ranchers and landowners like Dietz are the most important TLS members.

“Ranchers like Dennis and Kevin are exactly why we're here,” he said. “Our only real goal is to make their operations more profitable, to help keep them on their family farms and ranches.”

TEAM's team

One of TEAM Leafy Spurge's most valuable assets is its people, which come from a diverse group of federal, state and local agencies as well as private organizations and landowners. TEAM Leafy Spurge is proud to have the following entities as team members:

- USDA-ARS
- USDA-APHIS
- U.S. Forest Service

- U.S. Geological Survey
- National Park Service
- Bureau of Land Management
- Bureau of Indian Affairs
- NASA
- State of Wyoming
- State of Montana
- State of South Dakota
- State of North Dakota
- Montana State University
- North Dakota State University
- University of Wyoming
- South Dakota State University
- Central Missouri State University
- University of California-Davis
- Private Landowners
- Rocky Mountain Elk Foundation
- National Biological Control Institute
- Upper Midwest Aerospace Consortium Remote Sensing Group

Contents

*The components of
TEAM Leafy Spurge are:*

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Operations

Principal Investigators: Bob Richard, director, USDA-APHIS PPQ/Bozeman Station; and Lloyd Wendel, TEAM Leafy Spurge co-principal investigator, USDA-APHIS PPQ/Mission Station.

Project Description: As leader of TEAM Leafy Spurge operations, Richard was in charge of all TLS-related insect collection and redistribution efforts. Bob and his APHIS group developed, designed, constructed and tested field equipment specifically designed for high-volume sorting and packaging of biocontrol agents used in the project. Richard and Don Mundal, a biological control research specialist from the NDSU Department of Entomology, along with biocontrol technician Connie O'Brien and TLS coordinator Chad Prosser, collected, packaged and distributed nearly two million flea beetles to TEAM Leafy Spurge researchers in four states. Richard also played a key role in planning and conducting an "in the field, hands-on" training seminar for TLS assessment teams and in providing technical expertise for insect sampling and release methods. TLS operations additionally developed, and refined with user input, scanner-ready data collection forms used by the assessment teams to record biological and environmental factors associated with the plants and environmental conditions at insect release sites.

Team Members: Connie O'Brien, biocontrol technician.

Contact: Bob Richard, USDA-APHIS PPQ, 1648 S. 7th Ave., Bozeman MT 59717. Phone: 406/994-5033. Fax: 406/994-6591. Email: a348brichard@attmail.com

Assessment & Inventory

Extensive assessment and inventory work was completed at four areas in North and South Dakota, Montana and Wyoming. The intent of the assessment and inventory work was to develop consistent, comparable baseline data for each site. The data will be used to determine the effectiveness of control strategies demonstrated at the various sites, and particularly to measure the establishment and effectiveness of biocontrol agents and help better define the elements of a "good release site."

Specific assessment and inventory work performed at

the sites included:

- COAST digital imaging: Pictures of vegetative ground cover were taken at randomly selected points at each site using the COAST (Camera On A Stick) digital imaging system developed specifically for TEAM Leafy Spurge. The images will be used to determine the percent cover of leafy spurge and the other types of vegetation present. The images will be compared to images taken in the future so that differences in the amount of leafy spurge and other vegetation can be quantified. The COAST system is being used to speed up the data collection process. Images that are collected quickly in the field can be analyzed during the winter months. This allows the assessment teams to evaluate more sites, which provides a much more complete picture of changes occurring across the study areas.

- Vegetative sampling: Daubenmire samples were taken at each site to provide supplemental information on the percentages of leafy spurge and/or other plant species present.

- Range site characterization: Determining the distinctive kind of rangeland based on similar soil and environmental conditions capable of producing certain kinds and amounts of native herbage.

- Flea beetle sampling: Each site was swept to document the number and types of flea beetles at each site. The sampling protocol used will allow assessment teams to analyze flea beetle densities as a function of distance from the release point and slope. Flea beetles collected at the sites will be used to study flea beetle sex ratios, genetics, genotypical preferences and establishment.

- Flea beetle releases: TLS personnel released a total

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Rose Kirby found a summer job working for her dad, Don, on TLS's North Dakota assessment team. Don is a professor in the Department of Animal & Range Science at North Dakota State University.



Rancher Dennis Dietz, left, has been fighting leafy spurge for years and is now host of a TLS multi-species grazing demonstration at Sentinel Butte, N.D. The life-long rancher says the teamwork he sees is encouraging, and he hopes TLS can help make ranching more profitable for his son, Kevin (right).

of 1.6 million brown (*Aphthona nigriscutis*) and black (*A. czwalinae/lacertosa*) flea beetles, and distributed another 300,000 flea beetles to landowners and land managers in the region.

- Geo-referencing: All sites were geo-referenced using hand-held GPS units. The GPS information will ensure that the same sample site is sampled each year and it allows the location of each site to be accurately mapped.

- Soil analysis: Soil samples will be collected at each site in 1999 to determine soil physical properties and nutrient contents. This data will be used to supplement and validate the ecological barriers research effort.

Data collected by the assessment and inventory teams will also be used in numerous research projects being conducted by other TLS program participants.

Assessment teams and team members are:

Demonstration Sites Assessment Team

Principal Investigator: Roger Sheley, Montana State University Extension Service/Noxious Weed Specialist, and professor, Montana State University Department of Plant, Soil & Environmental Sciences.

Team Members: Jim Jacobs, post-doctoral research technician; and Matt Rinella, graduate student, Montana State University.

Special area of investigation: Assessment of TLS demonstration sites.

Contact: Roger Sheley, Montana State University Department of Plant, Soil & Environmental Science, Leon Johnson Hall, Bozeman, MT 59717-3020. Phone: 406/994-5686. Fax: 406/994-3933. E-mail: ussrs@msu.oscs.montana.edu

North Dakota Assessment Team

Principal Investigator: Don Kirby, professor, North Dakota State University Department of Animal & Range

Science.

Team Members: Dean Cline, graduate student, and seasonal technicians Mark Hayat and Sarah Miller.

Special area of investigation: Documentation native plant species recovery at demonstration sites where biocontrol agents or other management tools have "opened up" rangeland.

Contact: Don Kirby, North Dakota State University Department of Animal & Range Science, Hultz Hall, Fargo, ND 58105. Phone: 701/231-8386. Fax: 701-231-7590. E-mail: dkirby@ndsuxt.nodak.edu

South Dakota & Montana Assessment Team

Principal Investigator: Jack Butler, assistant professor, Central Missouri State University Department of Biology.

Team Members: Matt Parker, graduate student.

Special area of investigation: Determining the spatial distribution of leafy spurge seed bank levels perpendicular to drainage channels.

Contact: Jack Butler, Central Missouri State University, Department of Biology, Warrensburg, MO 64093. Phone: 660/543-8877. Fax: 660/543-4843. E-mail: jb8877@cmsu2.cmsu.edu

Wyoming Assessment Team

Principal Investigator: David Kazmer, assistant professor, Department of Biology, University of Wyoming.

Team Members: Ray Hunt, professor, University of Wyoming Department of Botany; and Amy Parker, graduate student.

Special area of investigation: Documentation of temporal changes in spurge densities resulting from the introduction/impact of biocontrol agents.

Contact: David Kazmer, University of Wyoming Department of Biology, Aven Nelson Building, Laramie, WY 82071-3165. Phone: 307/766-5199. Fax: 307/766-2851. E-mail: djkazmer@uwyo.edu

Assessment Team Steering Committee

The assessment team steering committee is responsible for establishing protocol to measure changes that take place at each research and demonstration site because of TLS-initiated management and control activities.

Assessment Team Steering Committee members include: Gerry Anderson, USDA-ARS Northern Plains Agriculture Research Laboratory; Bob Richard, USDA-APHIS PPQ/Bozeman; Jack Butler, Central Missouri State University Department of Biology; David Kazmer, University of Wyoming Department of Entomology; Don Kirby, North Dakota State University Department of Animal & Range Science; and Roger Sheley, Montana State University Extension Service.

Remote Sensing

Principal Investigator: Gerry Anderson, TEAM Leafy Spurge Co-PI & ad hoc committee member.

Project Description: Anderson's project utilizes remote sensing (aerial photography and videography), GIS & GPS technologies to map leafy spurge within the North Dakota and Wyoming study areas. The project, which builds on a cooperative venture initiated at Theodore Roosevelt National Park in 1993, has generated a great deal of interest. "It's an exciting area of exploration," Anderson said. "It should help

us understand the usefulness of remote sensing in mapping leafy spurge and other noxious weed infestations, and how GIS and GPS can be used to identify areas that are susceptible to infestation." In addition to mapping leafy spurge infestations within the overall study area and at the specific demonstration sites, data obtained through remote sensing will eventually be combined with existing and developing GIS/GPS information on soil types, vegetation, moisture, elevation, aspect, etc., to create new GIS "layers."

Another separate but complimentary effort is a collaborative project between TEAM Leafy Spurge, Theodore Roosevelt National Park, the U.S. Geological Survey, NASA and the University of California-Davis designed to evaluate the ability of sophisticated hyperspectral imaging systems to improve leafy spurge detection in mapping efforts. Hyperspectral imagery – which uses specific wavelengths of light to identify leafy spurge or other types of noxious weeds – may help provide more accurate and timely information concerning noxious weed populations across large regions.

Project Status: Weather conditions during the peak of the leafy spurge growing season were less than desirable, however, normal color and color infrared (CIR) aerial photographs were acquired of the North Dakota and Wyoming study areas. The images will be photo-interpreted this winter and the leafy spurge information incorporated in a GIS database for each location. Preliminary evaluation of the images indicates that CIR photography was superior to normal color film in identifying leafy spurge and less susceptible to the misidentification of yellow sweet clover as leafy spurge. The acquisition of hyperspectral imagery by NASA was canceled due to bad weather; additional attempts will be made next summer.

Team members: Theodore Roosevelt National Park/National Park Service; U.S. Bureau of Land Management/ Department of Interior; U.S. Geological Survey; NASA; and the University of California-Davis.

Contact: Gerry Anderson, USDA-ARS Northern Plains Agricultural Research Laboratory, 1500 N. Central Ave., Sidney, MT. 59270. Phone: 406/482-9416. Fax: 406/482-5038. Email: gerry@mail.sidney.ars.usda.gov

Technology Transfer

Principal Investigator: Neal Spencer, research leader, USDA-ARS Northern Plains Agricultural Research

A real TEAM player

There are a lot of hard-working players involved with TEAM Leafy Spurge who deserve recognition for their work, but there's one who deserves extra recognition.

Connie O'Brien, who works as a biocontrol technician for U S D A - A P H I S PPQ/Bozeman director Bob Richard and the operations team, racked up a lot of hours and miles this spring and summer with her involvement in numerous aspects of TEAM Leafy Spurge. Her

knowledge of the area and local landowners, experience with biocontrol programs and strong work ethic helped get the program's first field season off to a good start.

"I can't say enough about the role Connie played," said Gerry Anderson, TLS co-principal investigator. "She was absolutely instrumental, and we're glad to have her as part of our team."

In addition to collecting, packaging and distributing flea beetles for the TLS research and demonstration sites, O'Brien provided insects for local land-owners and assisted with pre-release sampling of TLS research and demonstration sites. She also helped locate and set-up sites for the TLS assessment teams and for Rod Lym's herbicide demonstrations, delivered materials to TLS partici-



Biocontrol technician Connie O'Brien provided valuable assistance to TEAM Leafy Spurge program participants this spring and summer.

pants and took part in a field training seminar for the assessment teams.

Richard said TEAM Leafy Spurge was lucky to get someone like O'Brien.

"Connie is well-known and well-liked by landowners in the region, and they know she's a reliable resource," he said. "She was a valuable asset for our people in the field."

Prior to working for Richard and TLS, O'Brien was a biocontrol technician for the Badlands Leafy Spurge Control Program, which was based in Billings and Golden Valley (N.D.) counties.

Good job, Connie – here's a tip of the collective TEAM Leafy Spurge hat for your hard work and efforts!

Laboratory.

Project Description: The primary goal of the tech transfer team is to take information developed through TLS research and demonstration projects, collate it into an easily useable format and distribute user-friendly information to ranchers, landowners, land managers and other PAIs (potentially affected interests). A secondary, but equally important, goal is stimulating increased public awareness of and interest in Integrated Pest Management.

The TLS tech transfer team plans on using a variety of

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tools to achieve these goals, including newsletters; news releases; pamphlets and brochures; multi-media presentations; CD-ROMs; web sites; open houses, field days and tours of TLS demonstration sites; documentary-style videos; displays for various events (fairs, etc.); etc.

Project Status: The tech transfer team initiated a number of activities this summer, including this newsletter; developing a format, schedule and distribution method for weekly TLS press releases; building various data bases for distribution of TLS information; collecting baseline photographic images of TLS research and demonstration sites; and collecting baseline video footage of TLS research and demonstration sites for use in documentary-style videos and other video-based informational projects.

Several activities are slated for this fall and winter, including the development of TLS brochures; planning/scheduling tours of TLS research and demonstration sites for the spring/summer of 1999; revising and upgrading the TLS website; working on a series of TLS/leafy spurge/noxious weed public service announcements; conducting an extensive literature review to upgrade the "Purge Spurge" CD; publication of TLS information in trade organization publications (stockgrowers, wool growers, etc.); and developing/integrating various TLS databases into a master data base of PAIs.

Team Members: Lars Baker, Fremont County (Wyoming) Weed & Pest coordinator; Jim Brice, USDA-APHIS Plant Health Director/Montana; Dan Duerre, Golden Valley Extension agent, North Dakota State University Extension Service; Kevin Fridley, director of Agriculture Services, South Dakota Department of Agriculture; Cindy Fugere, state weed coordinator, North Dakota Department of Agriculture; Bruce Helbig, USDA-APHIS Plant Health Director/South Dakota; John Larsen, USDA-APHIS Plant Health Director/Wyoming; Dan Nudell, Extension Specialist, North Dakota State University Extension Service/Hettinger Research Extension Center; and Keith Winks, USDA-APHIS Plant Health Director/North Dakota.

Contact: Neal Spencer, USDA-ARS Northern Plains Agricultural Research Laboratory, 1500 N. Central Ave., Sidney MT 59270. Phone: 406/482-9407. Fax: 406/482-5038. E-mail: nspencer@sidney.ars.usda.gov

Program Management Ad Hoc Committee

An ad hoc committee consisting of representatives from collaborating agencies and organizations has been assembled to guide TEAM Leafy Spurge activities, ensure efficient program management and assist TEAM Leafy Spurge program participants. The ad hoc committee meets twice annually: In October to review progress made during the preceding year and evaluate research/demonstration proposals for the upcoming year, and in January to discuss and select research/demonstration projects of the upcoming year. The ad hoc committee was specifically designed to include representation from a diverse group of participating entities and potentially affected interests, including landowners and land managers.

Ad hoc committee members include:

- Gerald Anderson
TEAM Leafy Spurge co-principal investigator
USDA-ARS Northern Plains Agriculture Research Laboratory
- Lloyd Wendel
TEAM Leafy Spurge co-principal investigator
USDA-APHIS, Mission Plant Protection Center
- Lars Baker
Fremont County (Wyo.) Weed & Pest Coordinator
- Nancy Curriden
Forest Supervisor, Custer National Forest
- Dennis Dietz
Landowner & rancher
- Dan Duerre
Golden Valley County Extension Agent/North Dakota State University Extension Service
- Ernest Delfosse
National Program Leader/Weed Science, USDA-ARS
- Robert Faust
National Program Leader/Field & Horticulture Crop Entomology, USDA-ARS
- Kevin Fridley
Director, Agriculture Services, South Dakota Department of Agriculture
- Cindie Fugere
Noxious Weed Coordinator, North Dakota Department of Agriculture
- Barb Mullin
Weed Coordinator, Montana Department of Agriculture
- Bob Richard
Director, USDA-APHIS PPQ/Bozeman Station
- Neal Spencer
Research Leader, USDA-ARS Northern Plains Agriculture Research Laboratory

THE AD HOC COMMITTEE would like to thank to Bob Carlson of the North Dakota State University for his role as an alternate ad hoc committee representative at the January, 1998, committee meeting.

Administration

Administrative support for TEAM Leafy Spurge is provided by:

Team members: Lloyd Wendel, TEAM Leafy Spurge co-principal investigator, USDA-APHIS PPQ/Mission Station; Gerry Anderson, TEAM Leafy Spurge co-principal investigator, USDA-ARS Northern Plains Agriculture Research Laboratory; Charlotte Anderson, administrative officer, USDA-ARS Northern Plains Agriculture Research Laboratory; Lana King, biological science technician, USDA-ARS Northern Plains Agriculture Research Laboratory; Chad Prosser, TEAM Leafy Spurge program coordinator, USDA-ARS Northern Plains Agriculture Research Laboratory; Jim Quarantino, contract officer, USDA-ARS Northern Plains Area; and Neal Spencer, research leader, USDA-ARS Northern Plains Agriculture Research Laboratory.

Contact: Chad Prosser, USDA-ARS Northern Plains Agriculture Research Laboratory, 1500 N. Central Ave., Sidney MT 59270. Phone: 406/482-9403. Fax: 406/482-5038. E-mail: chad@mail.sidney.ars.usda.gov

Supporting Research & Demonstrations

Insect & Pathogen Syngery

Principal Investigator: Tony Caesar, research plant pathologist, USDA-ARS Northern Plains Agricultural Research Laboratory.

Project Description: This project is targeted at researching relationships between biocontrol insects and naturally occurring soil-borne pathogens. Tony's theory is simple: Insects create a wound in the root, which allows the pathogen(s) to enter the plant and cause disease. Past research in controlled situations has documented dramatic acceleration of spurge mortality when both insects and pathogens have been present, and successful insect release sites are often found to be infected with soil-borne pathogens. "We have evidence showing that sites where insects make a high impact generally have one or more soil-born pathogens present," he said. "We now need to look at sites where insects establish but fail to make an impact. Are there enough pathogens present? Are they virulent enough? There is a lot of unexplored territory we need to look at."

In addition to the synergistic relationship between biocontrol insects and plant pathogens, Tony is also researching the genetic propensity for pathogens to react with insects. In other words, insects and pathogens must be compatible for a beneficial synergistic relationship to occur – i.e., the pathogen cannot cause mortality, toxicity or deleterious effects to vector insects.

Project Status: All of the equipment necessary for the project has been ordered but has not yet arrived. Efforts at producing sufficient quantities of granular pathogens for distribution at several demonstration sites is geared toward next year.

Team Members: Neal Spencer, research leader, USDA-ARS Northern Plains Agricultural Laboratory; Barbara Frederick, post-doctoral research assistant; Bob Kremer, microbiologist, USDA-ARS, Columbia, Mo.; Department of Interior/Bureau of Land Management; Department of Interior/Bureau of Indian Affairs.

Contact: Tony Caesar, USDA-ARS Northern Plains Agricultural Research Station, 1500 N. Central Ave., Sidney, MT. 59270. Phone: 406/482-9412. Fax: 406/482-5038. E-mail: caesara@sidney.ars.usda.gov

Aphthona spp. Establishment

Principal Investigator: Bob Carlson, professor, North Dakota State University Department of Entomology.

Project Description: The main thrust of this project focuses on refining and collating data collected during the past 12 years of Carlson's leafy spurge/biocontrol agent research efforts. The key objective is enhancing the leafy spurge biocontrol database currently used by scientists, researchers, biological control consultants, Extension agents, land managers and landowners.

Also included is a study of leafy spurge root structure and its relationship, if any, to *Aphthona spp.* establishment and population increases. Carlson theorizes that root structure can impact instar larvae, which need to find feeder, or "hair,"



Rod Lym, a professor of weed science at North Dakota State University, measures a plot for one of his TLS herbicide research and demonstration sites. A pioneer in the field of leafy spurge management and integrating herbicides with biocontrol agents, Lym will be a featured speaker at TEAM Leafy Spurge's Second Annual Meeting, Oct. 7-8 in Rapid City, S.D. For more information on Lym's projects, see page 11.

roots immediately after hatching. Specifically, he believes that leafy spurge with strong tap roots and little branching impedes the establishment and subsequent growth of flea beetle populations because of stress caused to instar larvae. The study is based on an attempt to characterize root samples taken from more than 40 previously established insect release sites with success rates ranging from none to good. In addition, the root study could potentially provide useful information on how leafy spurge root structures are affected by herbicide treatment, burning and grazing.

A third portion of the project is additional research into the preferred habitats of *A. lacertosa* and *czwalinae*. Carlson is especially interested in the reasons why one of the two species – which appear to be similar in all aspects of appearance and behavior – will sometimes fare better than the other at a particular release site. If some environmental or other factor(s) that favor one species or the other can be identified, the information can then be used to increase the potential for success when considering *Aphthona* species and/or sites for release.

Project Status: The data on root structure has been obtained from all but a few release sites, and summarization and analysis of the information is in progress. The study of habitat preference (within a localized area) of *A. lacertosa* and *A. czwalinae* has been completed and is

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currently being written up by Carla Jordan, a graduate research assistant.

Team Members: Don Mundal, biological control research specialist, North Dakota State University Department of Entomology, and Carls Jordan, graduate research assistant.

Contact: Bob Carlson, North Dakota State University Department of Entomology, Hultz Hall, Fargo, ND 58105. Phone: 701/231-7906. Fax: 701/231-8557. Email: rcarlson@ndsuxt.nodak.edu

Multi-Species Grazing Trial

Principal Investigator: Tim Faller, director, NDSU-Hettinger Research Extension Center

Project Description: Faller's project is a three-pronged approach to studying multi-species grazing, grazing systems and livestock management as tools for range improvement and leafy spurge control.

- **Assessment of Multi-Species Grazing on Leafy Spurge and Native Rangeland Plant Communities:** A large pasture of approximately 1,000 acres was divided into four equal quadrants for this multi-species grazing trial. One quadrant is being utilized for season-long multi-species grazing by both sheep and cattle; the other three are being used to study a twice-over grazing system. Non-grazed enclosures are being used as controls. Control and reduction of leafy spurge will be monitored, as will changes in plant species composition and diversity.

- **Evaluation of Nitrogen Fertilizer on Leafy Spurge Utilization by Grazing Animals:** This replicated, multi-species study is designed to study the impact of nitrogen fertilizer on the level of aversive chemicals in leafy spurge and the subsequent increase, if any, in the palatability and utilization of leafy spurge.

- **Evaluation of Fertilization & Grazing on Insect Populations:** Both study sites will be monitored to study the impact of grazing and fertilization on biocontrol agents that have been released at the study sites.

Faller's grazing team believes multi-species grazing offers advantages in addition to the control of leafy spurge. "It's our feeling that one ewe could be added for each cow in most well-managed grazing operations without negatively impacting beef production," Faller said. "We think multi-species grazing could be used to increase ranch profitability, especially if a consistent method of fall lambing can be developed. We hope our project demonstrates that multi-species grazing can be used to control leafy spurge while improving overall range health and giving ranchers a way to make more money."

Project Status: All of the fencing for the project has been completed, all of the grazing components are in place and "everything seems to be working as prescribed," Faller said.

"We're seeing good leafy spurge consumption but it's not yet at the level we'd like to see." Based on past experience with similar grazing trials at Mandan, Faller theorizes that increased spurge consumption by the sheep can be expected next season.

Team Members: Kevin Sedivec, North Dakota State University Extension Service/Range Specialist, and assistant professor, North Dakota State University Department of Animal & Range Science; Jerrold Dodd, chairman, North Dakota State University Department of Animal & Range Science; Scott Kronberg, associate professor, South Dakota State University Department of Animal & Range Science; and landowner/ranchers Dennis Dietz, Maurice Lardy and Dale Maus.

Contact: Tim Faller, NDSU-Hettinger Research Extension Center, Box 507, Hettinger ND 58639. Phone: 701/567-4323. Fax: 701/567-4327. E-mail: tfaller@ndsuxt.nodak.edu

Spring Grazing on Perennial Grasses

Principal Investigator: Mark Ferrell, Pesticide Coordinator/Weed Specialist, University of Wyoming Cooperative Extension Service.

Project Description: Ferrell's project is based on previous research demonstrating that perennial, cool-season grasses can be used in IPM scenarios to control leafy spurge. Ferrell theorizes that once initial leafy spurge control is achieved, perennial, cool-season grasses can be seeded and used to suppress spurge reestablishment.

The demonstration involves 23 acres of spurge-infested range in Crook County, Wyo. It includes four treatments of three replications each on 1.9-acre parcels. The treatments are: 1) Luna pubescent wheatgrass seeded at 10 pounds pls/acre on leafy spurge treated glyphosate (Roundup Pro at two quarts/acre) and tilled prior to seeding. Spring cattle grazing at 85 percent utilization will be allowed for two years after the wheatgrass is established; 2) The same as #1, except cattle grazing will be limited to 50 percent utilization; 3) The same as #1 & 2, except with

no cattle grazing; and 4) No treatment except cattle grazing at 50 percent utilization (control).

Three parameters will be used for measuring the effectiveness of using Luna pubescent wheatgrass to replace leafy spurge, including measurements of canopy cover prior to herbicide application/tillage and before and after grazing; annual plant clippings to measure biomass; and weighing cattle and comparing weight gains from the treatment areas to weight gains made on untreated areas adjacent to the demonstration site.

In addition to demonstrating the use of cool-season grasses to control leafy spurge, the study should help determine and develop proper grazing strategies for leafy

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Web links needed!

A major revision of the TEAM Leafy Spurge web site is in the works, and TEAM Leafy Spurge members and other leafy spurge researchers are being asked to provide pertinent links.

If you have or know of a website that ranchers, land managers or leafy spurge researchers might be interested in, call Steve Merritt at 406/483-9440, or e-mail at steve@mail.sidney.ars.usda.gov

Surveys target landowners, land managers

Leafty spurge is considered a “major” problem by twice as many ranchers as any other weed, according to the results of a TEAM Leafy Spurge (TLS) survey.

The survey is part of “The Socio-Economics of Leafy Spurge,” a TLS research project being conducted by Larry Leistritz, a professor of Agriculture Economics at North Dakota State University, and NDSU research scientists Randy Sell and Dean Bangsund. The project, which also includes a survey of “decision makers,” is aimed at producing a model to help ranchers and land managers choose the most cost-effective leafy spurge control tools.

Sell said the surveys will help gauge perceptions ranchers, landowners and land managers have about leafy spurge and the control tools that are available.

“We need to know how people feel about leafy spurge, the management tools that are available, and why they use or don’t use those tools,” he said. “Knowing how people perceive the problem and possible solutions will help us figure out how TEAM Leafy Spurge can best demonstrate effective, cost-efficient control technologies.”

The survey, which was directed at ranchers in five counties with leafy spurge (Carter County, Mont.; Crook County, Wyo.; Harding County, S.D.; and Billings and Golden Valley counties, N.D.), yielded some encouraging results, Bangsund said.

“It’s clear that ranchers, even those who currently do not have infestations, consider leafy spurge as a serious threat to their operations,” he said. “They recognize the problem, and that’s important.”

When asked to indicate which weeds were a *major, minor or not a problem*, respondents listed leafy spurge as a *major* problem twice as often (49 percent) as any other weed (25 percent for thistles and field bindweed). When asked to rank the *single most important weed*, an even greater percentage of respondents – 57 percent – named leafy spurge.

Bangsund said the survey also indicates that ranchers understand no one tool – including herbicides – will provide effective control in every situation.

“Nearly all of the respondents have used herbicides, for example, and 100 percent said they plan on using herbicides in the future,” he said. “Yet only one-third of the respondents ranked herbicides as a *very effective* control.”

Herbicides, as expected, were the most commonly used control tool. Biocontrol agents were the next most popular, with more than half (54 percent) of the respondents indicating that they plan on using biocontrol agents in the future. The least popular control tools were grazing with sheep and/or goats and tillage/reseeding.

TLS coordinator Chad Prosser said information obtained through the surveys is already helping shape TLS outreach efforts.

“It will help provide some direction,” he said. “The first survey told us we don’t have to educate ranchers about the leafy spurge threat – they already understand that. But it also told us that we can do more in terms of promoting Integrated Pest Management and providing

By The Numbers

- **The problems:** Respondents ranked livestock prices, adverse weather conditions and cost of inputs, respectively, as their three biggest problems. Noxious weeds ranked as the next biggest problem.

- **Invasive weeds:** Leafy spurge was ranked as a “major” problem by 49 percent of the survey respondents. The next most commonly mentioned weeds, thistles and field bindweed, were mentioned by just 25 percent of the respondents.

- **How it spreads:** Respondents believe leafy spurge most commonly spreads from adjoining land, because it’s not recognized as a threat until too late, because of a lack of cost-effective control tools and because of man’s actions.

- **What they’ve used & plan to use:** Of the control tools available, 97 percent had used herbicides, 54 percent biocontrol, and one-third grazing or tillage. Those numbers mirror what respondents plan on using in the future: 100 percent said herbicides, 54 percent biocontrol and 25 percent grazing or tillage.

- **Herbicides:** Seventy-seven percent of the respondents believe herbicides are an economical leafy spurge control tool. Reasons for not using herbicides were environmental restrictions (62 percent), acreage of infestations too large (52 percent), excessive expense (46 percent) and inaccessibility of infested land to sprayers (42 percent). Only five percent of ranchers with leafy spurge ranked herbicides as *very ineffective* while one-third ranked herbicides as *very effective*.

- **Biocontrol:** Two-thirds of the respondents felt biocontrol is economical, but less than 20 percent rated biocontrol as *very effective*. Reasons for not using biocontrol included “it takes too long” (48 percent); limited access to agents (45 percent); not knowing where to collect agents (36 percent); and not knowing how to use agents (30 percent).

- **Sheep & goats:** Only 20 percent of the respondents with leafy spurge thought grazing with sheep or goats would provide *very effective* leafy spurge control. Reasons for not using sheep or goats were lack of proper equipment (72 percent), competition for same forage utilized by cattle (44 percent), lack of expertise (41 percent) and lack of time (40 percent).

- **Tillage, etc.:** Of the control tools available, respondents were least interested in tillage, reseeding, mowing, burning, etc. Reasons for not using these control tools were unsuitable land for tillage (85 percent), ineffectiveness (36 percent), lack of time (27 percent) and lack of proper equipment (22 percent).

information about biocontrol.”

Sell, Bangsund and Prosser are looking forward to focus groups meetings which will be held in the counties that were surveyed to collect additional information. “Sitting down and talking with the people who are most directly affected is always a great way to learn more,” Prosser said.

Information gathered through the surveys and focus group meetings will be used to develop an economic decision-making tool, Sell said, designed to help ranchers choose the most cost-effective control tools for their specific situation. “Our ultimate goal is to provide people with a computer model they can use to determine what control tools will work best for them,” he said. “The model will provide recommendations specific for their situation and show them how to get the most bang for their buck.”

See SURVEY, page 11

Continued from page 8

spurge control. For example, the replications with 85 percent grazing utilization should provide useful data on the reestablishment of leafy spurge when rangeland is overgrazed and the abilities of grasses to compete with leafy spurge are reduced.

Project Status: The study site has been selected, surveyed and prepared for seeding. Luna pubescent wheatgrass will be seeded in late October, 1998.

Team Members: Tom Whitson, IPM Coordinator, University of Wyoming Cooperative Extension Service; Gene Gade, Crook County Extension agent, University of Wyoming Cooperative Extension Service; and David Kazmer, assistant professor, University of Wyoming Department of Biology.

Contact: Mark Farrell, University of Wyoming Cooperative Extension Service, PO Box 3354, Laramie, WY 82071. Phone: 307/766-5381. Fax: 307-766-5549. E-mail: farrell@uwyo.edu

Leafy Spurge Palatability

Principal Investigator: Scott Kronberg, associate professor, South Dakota State University Department of Animal & Range Science.

Project Description: This grazing trial/demonstration is designed to determine if leafy spurge grown on fertile soils is more palatable to grazing sheep and cattle than leafy spurge grown on less fertile soil. The trial is based on past research suggesting that fertilized spurge contains less of the aversive/toxic chemicals that cattle, and to a lesser degree, sheep are sensitive to. If data to support this theory can be documented, fertilizer application could potentially be used to improve the palatability of leafy spurge and thus increase the use of grazing animals as an effective IPM control tool.

The demonstration involves several large pastures subdivided and fenced for containment of four different treatments: 1) Sheep grazing; 2) Nitrogen fertilizer with sheep grazing; 3) Cattle grazing; 4) Cattle grazing with fertilizer; 5) Fertilizer with no grazing; 6) No fertilizer or grazing (control). Leafy spurge and other vegetation was measured before and after treatment.

The demonstration sites are located at TLS projects located on the South Fork of the Moreau River in Harding County, S.D.; at Sentinel Butte in Billings County, N.D.; and at the Devil's Tower site in Crook County, Wyo.

Project Status: Data from the three sites is still being evaluated. Kronberg said cattle at the fertilized site in North Dakota appeared to consume slightly more spurge but the same amount of grass compared to cattle on the adjacent non-fertilized area. Cattle at the fertilized site in Wyoming appeared to have consumed the same amount of spurge but much less grass compared to cattle on adjacent non-fertilized land. Kronberg stressed that the data is preliminary and is still being analyzed.

Team Members: Tim Faller, director, North Dakota State University-Hettinger Research Extension Center; Kevin Sedivec, Range Specialist, North Dakota State University Extension Service, and assistant professor, North Dakota State University Department of Animal & Range Science; Jerrold Dodd, chairman, North Dakota State University Department of Animal & Range Science; Ken Nelson, Harding County

Extension agent, South Dakota State University Extension Service; Tom Melum, Harding County Weed supervisor; and ranchers Matt Johnson and Larry Nelson.

Contact: Scott Kronberg, South Dakota State University Department of Animal & Range Science, Brookings, SD 57007. Phone: 605/688-5412. Fax: 605/688-6170. E-mail: kronbers@mg.sdstate.edu

Socio-Economic Impacts

Principal Investigator: Larry Leistritz, professor of agricultural economics, NDSU.

Project Description: Leistritz's project takes a multi-faceted approach to studying the economics of leafy surge by: 1) Assessing the socio-economic impacts of leafy spurge reduction and rangeland restoration; 2) Evaluating costs and benefits of various IPM control strategies in order to develop a user-friendly economic decision-making tool for landowners and land managers; and 3) Evaluating managerial, institutional and social factors that influence the use of various leafy spurge control strategies, developing approaches to counter factors that inhibit the use of effective control strategies, and assessing the impact of TEAM Leafy Spurge demonstrations on the perceptions of landowners, land managers and decision makers.

The goal, Leistritz says, is being able to forecast the economic impact of leafy spurge in terms of control expenses and increased profitability due to rangeland restoration, and ultimately in "being able to show landowners and land managers how to get the their investment."

The project builds on several earlier research efforts, including an economic study of leafy spurge reduction and rangeland restoration (Leistritz, Leitch & Bangsund, 1994), Bangsund's economic analyses of herbicide controls (1996, 1997), and a APHIS-funded analysis of the economic benefits of biocontrol techniques (1997). Information gathered by other TEAM Leafy Spurge participants will be instrumental in helping Leistritz fine-tune his economic decision-making model, which should nicely compliment Roger Sheley's work on developing a leafy spurge decision-making tool.

Project Status: The first portion of the project – a survey of landowners – went extremely well. "The response rate was very good," he said. "About 40 percent of the landowners and an even higher percentage of the land managers and decision-makers responded." A second series of surveys of landowners, land managers and decision-makers will be conducted during the project's final year so that changes in perceptions about IPM control techniques can be measured. *For more information on the preliminary landowner survey, see the related article on page 9.*

The next few months will be spent compiling data from the landowner survey, starting work on the economic decision making model and conducting "focus group" meetings to gather additional background information for development of the model. "Things are moving along nicely," he said. "We've got some data to work with now, and are looking forward to gathering more input from landowners, land managers and decision makers.

Also noteworthy: Leistritz said the economics of leafy spurge has captured public attention. "My sense is that the

level of awareness has increased dramatically the past few years," he said. "We have people's attention – they understand that this is a serious problem with huge financial implications, and we now need to follow up with good information to help them solve it." In the past year, Leistritz and his colleagues have made presentations on the economics of leafy spurge at statewide weed association meetings in Colorado, Manitoba, Montana, Nebraska, North Dakota; he anticipates that the interest in leafy spurge economics will continue to grow.

Team Members: Jay Leitch, dean, North Dakota State University College of Business; Dean Bangsund, research scientist, North Dakota State University Department of Agricultural Economics; Randall Sell, research scientist, North Dakota State University Department of Agricultural Economics; and Extension Service specialist, and Dan Nudell, Extension Specialist, North Dakota State University Extension Service/Hettinger Research Extension Center.

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Herbicide Controls, etc.

Principal Investigator: Rod Lym, professor, North Dakota State University Department of Plant Sciences.

Project Descriptions: Rod and his crew initiated three TEAM Leafy Spurge projects this spring and summer. Following are brief descriptions of each.

- **Demonstration of Leafy Spurge Control with Herbicides:** Rod's crew was very busy this spring selecting and establishing plots to demonstrate leafy spurge control with various herbicides. Demonstration plots will include both fall and spring applications of various herbicides, including picloram (Tordon); picloram plus 2,4-D; dicamba (Banvel); glyphosphate (Roundup); glyphosphate plus 2,4-D (Landmaster MW); fosamine (Krenite); and imazapic (Plateau). Goals include demonstrating the most cost-effective herbicides, which herbicides provide the best long-term treatment and which herbicides are most appropriate for use near water or under trees. Test plots, which are located in the Medora area on land owned by Roger Meyer, will be marked with signs identifying the herbicide used and the per acre cost of treatment.

- **Integration of Herbicides with *Aphthona* spp. Flea Beetles for Leafy Spurge Control:** Past research has shown that *Aphthona* spp. establishes well at some sites but not at others, that the level of control provided by established populations varies, and that little or no increase in grass production occurs at some sites where *Aphthona* spp. is providing leafy spurge control. This combination of findings indicates that flea beetles alone will not provide effective control in all situations and that an IPM approach must be developed if practical leafy spurge control, and the subsequent return of desirable forage, is to be achieved. This project will study and evaluate the relationship of biocontrol agents in combination with various herbicide treatments as control tool. Sites for the study were based on areas where *Aphthona* spp. established but failed to provide

SURVEY, from page 9

Results from the survey of land managers and decision-makers are now being compiled, Sell said, and a final report should be available this fall. He added that both surveys will be repeated in three years to see how TLS research and demonstrations influenced leafy spurge control efforts.

To obtain a summary of the survey findings or a copy of the full survey report, contact Carol Jensen at the NDSU Department of Agriculture Economics, PO Box 5636, Fargo, N.D., 58105-5636 (phone 701-231-7441; e-mail at cjensen@ndsuxext.nodak.edu). The summary and full report are also available on the WorldWideWeb at <http://agecon.lib.umn.edu/ndsu.html>

effective control. Herbicides to be evaluated include picloram (Tordon) plus 2,4-D, imazapic (Plateau) and quinclorac (Facet). It is hoped that biocontrol agents will be more effective in some situations when used in combination with herbicides, and vice-versa, thus making herbicides more cost-effective to use.

- **Effect of Leafy Spurge Genotype on *Aphthona* spp. Establishment:** Past research has documented varying degrees of success in the establishment of *Aphthona* spp. and significant genetic variability of leafy spurge. The goal of this project is to determine if there is a relationship between leafy spurge genotypes and *Aphthona* spp. establishment and/or life cycle processes. Some foundation work completed in controlled greenhouse situations suggested no genotypical preference by *A. cyparissiae* or *A. nigriscutis*; that *A. czwalinae/lacertosa* feeds slightly less on a genotype from Manitoba; and that *A. flava* feeds slightly less on genotypes from Nebraska and North Dakota. The number of eggs produced by adult *Aphthona* spp. in these controlled situations were similar regardless of leafy spurge genotype; however, since attempts to rear *Aphthona* in greenhouse conditions have been unsuccessful, field studies to further study the relationship between leafy spurge genotype and *Aphthona* spp. establishment/survival/reproduction will be required.

- **Project Status:** The initial applications for the herbicide demonstrations were made in June. The insect/herbicide IPM demonstration site has been selected, and the study to determine the interaction of leafy spurge genotype and *Aphthona* spp. establishment is underway.

Team Members: Bob Carlson, professor, North Dakota State University Department of Entomology; Bob Nowerski, professor, Montana State University Department of Entomology; David Kazmer, assistant professor, University of Wyoming Department of Biology; Kathy Christianson, technician/research assistant; Jeff Nelson, North Dakota State University Ph.D. student at NDSU; Denise Markle, Master's student, North Dakota State University.

Contact: Rod Lym, North Dakota State University Department of Plant Sciences, Loftgard Hall/474B, Box 5051, Fargo, ND 58105. Phone: 701/231-8996. Fax: 701/231-8474. E-mail: lym@plains.nodak.edu

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Ecological Barriers to Insect Establishment

Principal Investigator: Bob Nowierski, professor, Montana State University Department of Entomology.

Project Description: The primary goal of this multi-faceted project is identifying ecological factors that may influence or impede the establishment of *Aphthona* flea beetles. In short, it examines an extremely important question: Why do flea beetles establish and provide good leafy spurge control at some release sites but not at others? Five potentially limiting factors will be evaluated in an attempt to provide some answers:

- **Flea beetle/leafy spurge habitat associations:** This effort to better define preferred, or requisite, habitat characteristics for *Aphthona* spp. includes studies of soil micro- and macronutrients, physical/chemical soil properties, chemical properties of spurge foliage and roots, plant productivity and the relationship, if any, of these factors to *Aphthona* spp. establishment and impact. Providing a more precise definition for preferred habitats would reduce some of the guess work involved with making biocontrol releases and thus increase the potential for establishing a successful release site.

- **Genetic variation of leafy spurge:** It has long been suspected that the genetic variability of leafy spurge may be a factor in *Aphthona* spp. establishment. Two studies are now underway to examine this potential limitation. The first involves studies of leafy spurge grown in greenhouse conditions from spurge seeds and/or root-stock collected at field sites. The plants will then be exposed to flea beetles, with their performance to be monitored.

In the second study, modern molecular genetics techniques will be used to reconstruct the invasion and post-colonization history of leafy spurge. North American and European leafy spurge accessions are available for this study, and homologous DNA variants of known sequence will provide the phylogenetic information. By correlating the results of this study with the first, we will be able to identify insect-resistant biotypes throughout the North American range of leafy spurge.

- **Ecological amplitude:** By collecting various types of data that can be used to define leafy spurge habitat (soils, moisture, elevation, aspect, etc.), researchers can more accurately estimate how much of the U.S. is susceptible to leafy spurge invasion. This study will use previously collected data as well as data collected by other TLS participants and TLS assessment teams.

- **Leafy spurge root structures:** It has been theorized that lateral root depth can influence *Aphthona* establishment. This study will help determine if leafy spurge management strategies that produce a shallow lateral root hair depth can be developed to increase the potential for successful *Aphthona* establishment.

- **Limitations caused by sex ratios:** Some flea beetle populations have female-biased sex ratios, and some species show this bias more frequently than others. This study is directed at examining the causes for and the ramifications of a female-biased sex ratio.

Project Status: Research studies and analyses associated with the described projects are ongoing.

Team Members: David Kazmer, assistant professor, University of Wyoming Department of Biology; Richard



Jack Butler (foreground) takes a Daubenmire sample at a TLS assessment site in Ekalaka, Mont., while Matt Parker uses the COAST Digital Imaging System to take pictures of ground cover. Butler is a professor of biology at Central Missouri State University, and Parker is his graduate student assistant.

Hansen, entomologist, USDA-Animal & Plant Health Inspection Service; David Horvath, plant physiologist, USDA-ARS Red River Valley Agriculture Research Center; Rod Lym, professor, North Dakota State University Department of Plant Sciences; Bob Carlson, professor, North Dakota State University Department of Entomology; Tony Caesar, research plant pathologist, USDA-ARS Northern Plains Agricultural Laboratory; and Gerry Anderson, TEAM Leafy Spurge co-principal investigator, USDA-ARS Northern Plains Agriculture Research Laboratory.

Contact: Bob Nowierski, Montana State University Department of Entomology, Leon Johnson Hall, Bozeman, MT 59717-3020. Phone: 406/994-5080. Fax: 406/994-6029. E-mail: nowiersk@montana.edu

TRNP Control Efforts

Principal Investigator: Russ Runge, resource management specialist, Theodore Roosevelt National Park.

Project Description: The primary emphasis of TRNP's TEAM Leafy Spurge project is directed at using Geographic Information System (GIS) and Global Positioning System (GPS) technologies to collect data for the entire Little Missouri River drainage region. Runge, for one, is extremely excited about the project and its potential ramifications. "We're trying to collect data on anything and everything that can be measured – soil types, vegetation, roads, water systems, you name it," he said. "Our goal is to develop a comprehensive GIS database with a variety of applications, including the control of leafy spurge and other invasive weeds." The effort is a first for the region, he added.

Another aspect of the project, and one that involves a strong partnership between the National Park Service and the USDA-ARS, is continued monitoring of biocontrol release sites. TRNP has been a leader in the use and monitoring of biocontrol agents and Integrated Pest Management, and is serving as a model for other national parks with invasive weed problems.

The park's efforts to control leafy spurge and build a comprehensive database are an outstanding example of cooperation between government and other agencies. Cooperators include the National Park Service, the USDA-ARS and -APHIS, the U.S. Geological Survey, NASA, the National Biocontrol Institute, the state of North Dakota, county Extension agents and weed control coordinators, numerous universities and the Rocky Mountain Elk Foundation.

Team Members: Gerry Anderson, TLS co-principal investigator and ad hoc committee member; Noel Poe, superintendent, Theodore Roosevelt National Park; Steve Hagar, GIS specialist, TRNP; Paula Anderson, biocontrol/herbicide technician, TRNP; Bonnie Foster, GIS technician, TRNP; Kristina Stine, biocontrol technician, TRNP; Aaron Nellen, biocontrol technician, TRNP; and student conservation assessment volunteers Matt Ianuzzi and Catherine Corsier.

Contact: Russ Runge, Theodore Roosevelt National Park, PO Box 7, Medora, ND 58645. Phone: 701-623-4466, ext. 3407. Fax: 701/623-4840. E-mail: russell_runge@nps.gov

Decision-Making Tool Development

Principal Investigator: Roger Sheley, Montana State University Extension Service/Noxious Weed Specialist, and professor, MSU Department of Plant, Soil & Environmental Sciences.

Project Description: Sheley's team is working on the development of a decision-making tool for landowners, land managers and other people who are actively involved with leafy spurge management efforts.

The model will allow landowners/managers to input criteria from a specific situation, select a management strategy (or strategies), and see the predicted outcome. Data collected by other TEAM Leafy Spurge members will be used extensively to develop the decision-making tool, which will also enable landowners/managers to evaluate the economics,

or cost, of leafy spurge management.

Despite the complexities involved with developing the interactive, computer-based tool, Sheley says the end product will be user-friendly. "It's a complicated process, but the end product won't be – in fact, it will be very easy to use," he said.

The decision-making tool, when completed, will be distributed on CD-ROM.

Team Members: Jim Jacobs, post-doctoral research technician; and Matt Rinella, graduate student, Montana State University.

Contact: Roger Sheley, Montana State University Department of Plant, Soil & Environmental Science, Leon Johnson Hall, Bozeman, MT 59717-3020.

Phone: 406/994-5686. Fax: 406/994-3933.

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Foreign Exploration

Principal Investigator: Neal Spencer, research leader, USDA-ARS Northern Plains Agricultural Research Laboratory.

Project Description: As the name implies, TEAM Leafy Spurge's foreign exploration project is an overseas effort to identify and study new biocontrol agents. By going back to the homeland of leafy spurge – where the weed is kept in check by a variety of natural enemies – researchers hope to discover new biocontrol agents that are pre-adapted to various climactic zones and habitats in North America. "New biocontrol agents are needed to fill niches not covered by the 12 agents that have already been approved and released," Spencer said. "We need agents that will work in shady areas, riparian areas, areas with very sandy soil and rocky, dry areas."

Most of the search effort, Spencer said, is being directed at root feeders since they have shown the most promise as effective biocontrol agents and as "teammates" to capitalize on potentially beneficial synergistic relationships with pathogens.

The project also provides funding for conducting and evaluating host specificity tests on new biocontrol agents that are found; for personnel and improvements at the USDA-ARS Office of International Research Programs greenhouse in Frascati, France, where the quarantine work will be conducted; and for additional research of *Thamnurgus spp.*, a beetle that appears to work very well when used synergistically with soil-borne pathogens.

Project Status: Several species of new biocontrol agent candidates have been collected, including numerous members of the *Aphthona* family. The search-and-discovery portion of this program has been hampered at times by political and social strife in regions where natural enemies of leafy spurge need to be sought.

Team Members: Massimo Cristofaro, research insect ecologist/entomologist; and Alex Konstantinov, contract insect taxonomist.

Contact: Neal Spencer, research leader, USDA-ARS Northern Plains Agricultural Research Laboratory, 1500 N. Central Ave., Sidney MT 59270. Phone: 406/482-9407. Fax: 406/482-5038. E-mail: nspencer@sidney.ars.usda.gov

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Herbicide Study

Principal Investigator: Leon Wrage, Noxious Weed Specialist, South Dakota State University Extension Service.

Project Description: Wrage's project involves three specific demonstrations: 1) A comparative evaluation of long-term herbicide applications; 2) A study of new and developing herbicide technologies; and 3) A study of leafy spurge control alternatives for environmentally sensitive areas. Also included as a coordinated aspect of the project is an evaluation of reduced-rate herbicide applications in areas where *Aphthona spp.* have established.

- **Evaluation of Long-Term Herbicide Application:** This evaluation involves demonstrations of 15 different fall/spring combinations applied on an annual basis for the duration of the program. Data collection will include visual analysis of control and grass response on a yearly basis, with biomass measurements to be taken during the final year of the project.

- **New/Developing Herbicide Technologies:** Similar to the evaluation of long-term herbicide application, this demonstration will focus on annual fall/spring applications of imazameth and diflufenzopyr anti-auxin. Data collection will include visual analysis of control and grass response on a yearly basis, and a dry matter evaluation of biomass components planned for the future.

- **Alternatives for Environmentally Sensitive Sites:** This demonstration will evaluate the integration of a mechanical control, mowing, with reduced-rate applications of 2,4-D and picloram. Data collection will include visual analysis of control and grass response, and measurements of weed densities, grass weights and weed weights. Future opportunities for data collection include carbohydrate analysis to evaluate treatment impacts on leafy spurge roots.

The demonstrations, when combined, will help provide the data necessary for developing sound IPM approaches to leafy spurge control. Wrage pointed out that much of the leafy spurge research conducted in South Dakota is based in the eastern part of the state, which features environmental factors that are far different than those in western South Dakota. "We're excited because this project will help us collect much-needed data from the western part of the state," he said. The project, which compliments similar work by Rod Lym in North Dakota, will also provide additional opportunities for TLS assessment teams.

Project site: Harding County, S.D.

Project Status: The project was hampered by its late inclusion in TEAM Leafy Spurge, Wrage said, and by difficulties in finding suitable demonstration sites. "We made four trips to Buffalo before we found a site," he said. The delays forced postponement of some demonstrations until next season, but no significant impacts on data collection are expected.

Team Members: Sharon Clay, associate professor of Weed Science, South Dakota State University; Darrell Deneke, IPM Coordinator, South Dakota State University Extension Service; and Ken Nelson, Harding County Extension agent, South Dakota State University Extension Service.

Contact: Leon Wrage, South Dakota State University Extension Service, Ag Hall/Box 2207A, Brookings, SD 57007. Phone: 605/688-4591. Fax: 605/688-4602. E-mail: wragel@ur.sdstate.edu

WELCOME, from page 1

cooperation in the northern Great Plains with respect to integrated pest management (IPM). Absolutely no funds were diverted from ongoing national, state or local leafy spurge management programs.

“**T**eamwork” is the operative word behind TEAM Leafy Spurge. An ad hoc committee composed of federal, state and private managers and researchers who are intimately familiar with the challenges facing those who deal with this pervasive noxious weed directs the program. The committee reviews all potential research and demonstration projects to determine whether they should be part of the program. The vision provided by these far-sighted individuals helps ensure that the program stays on track and in-tune with the needs of land managers in the four-state region.

As you will see by reading this issue of *Leafy Spurge News*, TEAM participants include a wide range of federal, state and private organizations and individuals. All of the participants are top-notch researchers and managers with a firm IPM foundation upon which we hope to build, and it is exciting to see so many experts focused on a single problem and all in one area. We hope this effort and the new management technologies it spawns will help significantly reduce leafy spurge infestations both here in the Great Plains and throughout other parts of the country where it is rapidly becoming a problem.

Sincerely,

Lloyd Wendel
USDA-APHIS
Mission, TX

Gerry Anderson
USDA-ARS
Sidney, MT

EDITOR, from page 1

with national implications and applicability;

- To form long-term partnerships among federal, state and private entities and land managers;
- To transfer economically and ecologically proven management and control technologies to landowners and land managers.

All of us who are involved with leafy spurge management and control look forward to keeping up to date on the benefits TEAM Leafy Spurge provides to landowners and land managers in, and beyond, the study area.

Just a reminder: Please send me your articles and news items for the October issue of *Leafy Spurge News*. Without your help, it will be a mighty slim production.

C.H. Schmidt

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TEAM Leafy Spurge 2nd Annual Meeting

Oct. 7-8, 1998 at Rapid City, S.D.

Interested in the latest research of leafy spurge management technologies? Then plan on attending the TEAM Leafy Spurge Second Annual Meeting, Oct. 7-8 in Rapid City, S.D., to find out what the USDA-ARS and its TEAM partners are doing to help stop the spread of this invasive range weed and make ranching more profitable.

Included on the agenda is an open forum where you can learn about TLS research and demonstration projects and talk with researchers, an afternoon session with several informative speakers, a banquet with keynote speaker Judith St. John, assistant Deputy Director of the USDA-Agricultural Research Service, and a trip to Mt. Rushmore.

Attending the meeting is a great way to meet with other leafy spurge colleagues and exchange ideas and information, and it's a great way to keep up with the latest in leafy spurge management technologies. We'll see you in Rapid City!

Wednesday, Oct. 7

Rapid City Civic Center, Rushmore H Room

- 9 a.m.-noon – Open Forum for all TEAM participants
- Noon - 1 p.m. - Lunch (on your own)
- 1:00-1:20 p.m. – “**Leafy Spurge Control with Herbicides**,” Rod Lym, North Dakota State University.
- 1:25-1:45 p.m. - “**Multi-Species Grazing**,” Tim Fallor, director, North Dakota State University Extension Service/Hettinger Extension Research Center.
- 1:50-2:10 p.m. - “**Biocontrol with Insects**,” Bob Richard, director, USDA-APHIS PPQ/Bozeman.
- 2:15-2:35 p.m. - “**Leafy Spurge in Wyoming**,” Lars Baker, Fremont County (Wyo.) Weed & Pest Coordinator.
- 3 p.m. - Departure for Mt. Rushmore tour.
- 7:30 p.m. - Banquet at the Radisson Motel.

Thursday, Oct. 8

Rapid City Civic Center, Rushmore H Room

- 8 a.m. - noon - Pre-proposals for existing projects.
- Noon - 1 p.m. - Lunch (on your own)
- 1 - 5 p.m. - Pre-proposals for new projects.

Friday, Oct. 9

- 8 a.m.-noon - Ad hoc committee meeting (closed session).

Registration Form

Name: _____
Affiliation: _____
Address: _____

Phone: _____
Fax: _____
E-mail: _____

Cost per person (choose one):

- Registration (includes banquet), \$20
- Registration (includes banquet) & Mt. Rushmore tour (includes transportation), \$30

Please register **PRIOR TO SEPT. 11** by remitting this form, along with a check made payable to TEAM Leafy Spurge, to:

Chad Prosser, TLS Coordinator
USDA-ARS NPARL
1500 N. Central Ave.
Sidney MT 59270

Registrations can also be made by calling or e-mailing Prosser (**406/482-9403**; **chad@mail.sidney.ars.usda.gov**) or Wendy Sundheim (**406/482-2020**; **sundheim@sidney.ars.usda.gov**) OR register on-line at **<http://www.team.ars.usda.gov/meeting.html>**

A block of rooms has been reserved for TLS meeting attendees at the Radisson Motel in downtown Rapid City, S.D. Rooms are \$50 and will be held until Sept. 22.

Several other hotels/motels are available close to the Radisson and Civic Center, including: Rushmore Plaza Holiday Inn (605/348-4000) - Less than one block; Alex Johnson Motel (605/342-1210) - Four blocks; Town House Motel (605/342-8143) - Six blocks; and the Super 8 (605/348-8070) - Two miles.

Please make your own reservations!

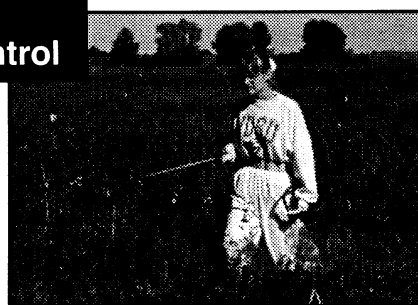
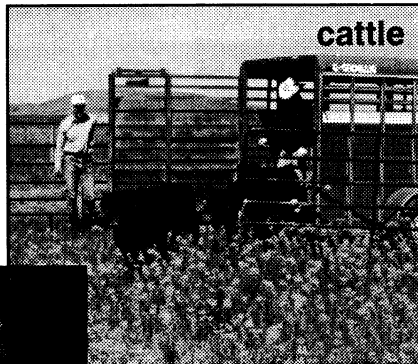
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