

**MANAGING INVASIVE SPECIES: LEAFY SPURGE
CONTROL PROJECT REPORT**

March 31, 2006

Rural Development Institute, Brandon University

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The Institute has diverse research affiliations, and multiple community and government linkages related to its rural development mandate. RDI disseminates information to a variety of constituents and stakeholders and makes research information and results widely available to the public either in printed form or by means of public lectures, seminars, workshops and conferences.

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Submitted to:

Curtis Evenson
ARDI Administrator
Box 72
Morris, MB R0G 1K0
Ph (204) 204-746-8186
Fax (204) 746-8213
Email cevenson@mts.net

Prepared by:

Beth Peers, LSSG Coordinator
Pamela McTavish
April Peers
Ryan Gibson

Submitted by:

Rural Development Institute
Brandon University
Brandon, MB R7A 6A9
Ph (204) 571-8515
Fax (204) 725-0364
Email rdi@brandonu.ca

TABLE OF CONTENTS

Acknowledgements	1
Introduction	2
Project Team.....	3
Awareness and Prevention Strategies.....	3
Promotional Materials.....	3
July 26 th Awareness Tour	5
Ag Days	7
IPM Planning.....	8
Biocontrol.....	8
How to Collect Leafy Spurge Beetles.....	10
How to Release Leafy Spurge Beetles.....	10
Monitoring Leafy Spurge Beetles.....	11
Producer Assistance	12
Evaluation.....	12
Unanticipated Results.....	13
Lessons Learned	14
Appendix A: July 26 th Leafy Spurge Awareness Tour Invitation and Agenda	15
Appendix B: Land and Vegetation, Beetle Release and Monitoring Forms	18
Appendix C: Viable Control Options	23
Appendix D: GANTT Project Timeline	27

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Introduction

On behalf of the Leafy Spurge Stakeholders Group (LSSG), the Rural Development Institute (RDI) is coordinating the *Managing Invasive Species: Leafy Spurge Control* project. This project aims to enhance control of leafy spurge in Manitoba by increasing awareness, encouraging the adoption of integrated pest management (IPM) plans, prevention stewardship, and developing a biocontrol component.

The LSSG is comprised of more than 20 members from agricultural and conservation agencies plus all three levels of government. It was established to increase awareness of leafy spurge, examine its issues and impacts, provide related communication and outreach, and enhance coordination among stakeholder agencies. RDI coordinates the LSSG.

The major components of *Managing Invasive Species: Leafy Spurge Control* are:

- Awareness and Prevention Strategies: In areas of low to no infestation, the focus will be on creating a broad awareness of leafy spurge and prevention strategies to control the spread of the weed.
- IPM Planning: Landowners/producers in moderate and high infestation areas will be involved in assessing their leafy spurge infestation, and in developing and implementing specific site-based Integrated Pest Management (IPM) plans for control and containment.
- Biocontrol: The focus will be on the collection of beetles from North Dakota and distributing them in Manitoba, including the establishment of nurse/harvest sites for future use.
- Producer Assistance: Participating landowners/producers could receive financial assistance for control and management activities. Partnerships will be developed with other agencies, such as conservation districts and weed districts, for delivery of this assistance.
- Evaluation: Ongoing monitoring and evaluation will be undertaken to assess the impact and success of program activities. Feedback will be used to make ongoing improvements to project activities.

Brandon University students Laine Mosset and April Peers, have been hired to develop biocontrol field sites, assist with awareness activities and events and to work with landowners/producers to build their IPM plans.

Leafy spurge is a perennial weed species native to Europe that spreads rapidly in pastures and wildlife areas. Leafy spurge is highly competitive and considered impossible to eradicate. The highly invasive, adaptable and pernicious nature of leafy spurge allows the plant to grow in a variety of soil types and eco-zones including aspen forests, marshes, native grasslands and pastures. Infestation levels of leafy spurge are highest across the northern plains of the US and the three prairie provinces of Canada. Manitoba is the most severely affected province with more than 400,000 acres resulting in an annual economic loss estimated at \$20 million. The control and containment of leafy spurge affects a variety of individuals and agencies including landowners and managers, municipalities, land developers, government services, highways, railways and wildlife organizations.

Project Team

Beth Peers

Beth has served as the LSSG Coordinator since its inception in 1998. Beth is responsible for management of the project in conjunction with input from stakeholders such as Manitoba Agriculture, Food and Rural Initiatives as well as member agencies of the LSSG.

Laine Mosset and April Peers

Laine has completed her four-year Bachelor of Science (Honours) degree at Brandon University. She double majored in Mathematics and Geography and plans to enter the Master of Rural Development Program at BU in the fall of 2005. Laine grew up on her parents' grain farm near Waskada, Manitoba and has always enjoyed rural living.

Originally from Virden, Manitoba, April is in her final year of a four-year Bachelor of Science degree, majoring in Geography. A previous diploma in Rural Development from Assiniboine Community College generated an interest in environmental studies.

Ryan Gibson

Ryan's role within the project is to guide Laine and April with their activities. Originally from the rural community of Neepawa, Manitoba, Ryan has served as a research assistant at the Rural Development Institute since June 2002. He has a Bachelor of Arts (Honours) degree in Geography from Brandon University and has recently completed his Masters of Rural Development.

Pamela McTavish

Pamela's role within the project is to provide assistance to Beth as project manager. Her main activity is to ensure that an evaluation and ongoing monitoring of the project is undertaken to assist in assessing the impact and success of program activities.

Awareness and Prevention Strategies

Promotional Materials

One of the major components of the *Managing Invasive Species: Leafy Spurge Control* project focuses on creating a broad awareness campaign of leafy spurge and how to control the spread of this noxious weed. The leafy spurge awareness campaign was specifically targeted at areas of Manitoba that have infestation levels of low density or no density according to the 1999 infestation levels. In terms of awareness, it is the hope of this project to "stop leafy spurge before it starts" in areas of low to no infestation. To increase the awareness of leafy spurge, the project research team developed a variety of materials, including note pads, pens and magnets for distribution at fairs and other events. Each promotional item displays a picture of leafy spurge, the slogan "Control Your Spurge" and the LSSG website address (see Figure 1).



Figure 1:
2005 magnet design

The logos of Brandon University, the LSSG, RDI and the Government of Canada Government are included on the note pads to acknowledge the contributions each has made to this project. Promotional materials were handed out by project group members, weed supervisors and conservation district managers at Manitoba fairs and festivals that take place in areas of low to no infestation throughout the summer as well as at events such as Ag Days, which took place in January 2006.

Three different placemat designs focusing on identifying, preventing and managing spurge were developed. These three themes make readers aware of what the weed looks like, where it is found, why it is a threat, how they can prevent and how they can manage leafy spurge infestations. On each of the three placemats, it was advised that the reader contact their local weed supervisor or Manitoba Agriculture, Food and Rural Initiatives for more information concerning spurge. The fact that “leafy spurge costs Manitobans over \$20 million a year” was also written on the bottom of each placemat to inform readers of the negative economic consequences associated with this noxious weed. These placemats were distributed to various communities in low to no infestation areas. Sixty-four restaurants were given the laminated placemats for their use. The non-laminated placemats were used at the Manitoba Conservation District Association (MCDA) convention.

In addition to the placemats, a “Control Your Spurge” poster was developed. It outlines how to prevent, contain and control leafy spurge. One hundred and ninety-seven posters have been distributed to conservation district offices, rural municipal offices and other locations in low to no infestation areas of Manitoba.

April and Laine, along with help from two CDs attended 14 fairs over the summer. In addition conservation district managers from Pembina Valley and LaSalle Redboine were able to attend two fairs and distribute materials for the project. More were anticipated, but due to the decrease in the number of agricultural fairs in rural Manitoba, this was difficult. Many rural towns have combined their fairs to save money and in order to schedule fair activities. Many rural towns now have festivals versus agricultural fairs, which do not promote the same agricultural themes.

July 26th Awareness Tour

To promote the awareness of leafy spurge control mechanisms, Laine Mosset and April Peers organized a leafy spurge awareness tour that focused on biocontrol (see Appendix A). Eighteen people from across Manitoba participated in the tour, held on July 26th. The tour group visited sites within Spruce Woods Provincial Park as well as on Victoria Grazing Association pastureland north of Holland.



Weed supervisors, conservation district managers, landowners/producers, students and government workers participated in the tour (see Figure 2). Although the tour was presented to a diverse audience, everyone in attendance had one common interest, learning how to effectively manage leafy spurge. After handing out information packages on leafy spurge to everyone, Laine made introductions and then the group proceeded to Spruce Woods Provincial Park (SWPP).

At SWPP Gerry Rosset, Natural Resource Officer, showed the group three distinct sites and spoke about the park's biocontrol efforts.

It was evident that biocontrol is having a great impact on the leafy spurge in SWPP based on the photographs that were taken before and after beetles were released. The overall spurge density has been dramatically reduced over the past few years. One site was situated beside the SWPP office where Mr. Rosset had set up a beetle collection display. A collecting device, net and flea beetle separator made up this exhibit. It was explained how the collection devices worked and how the beetles were sorted, stored, transported and later released.



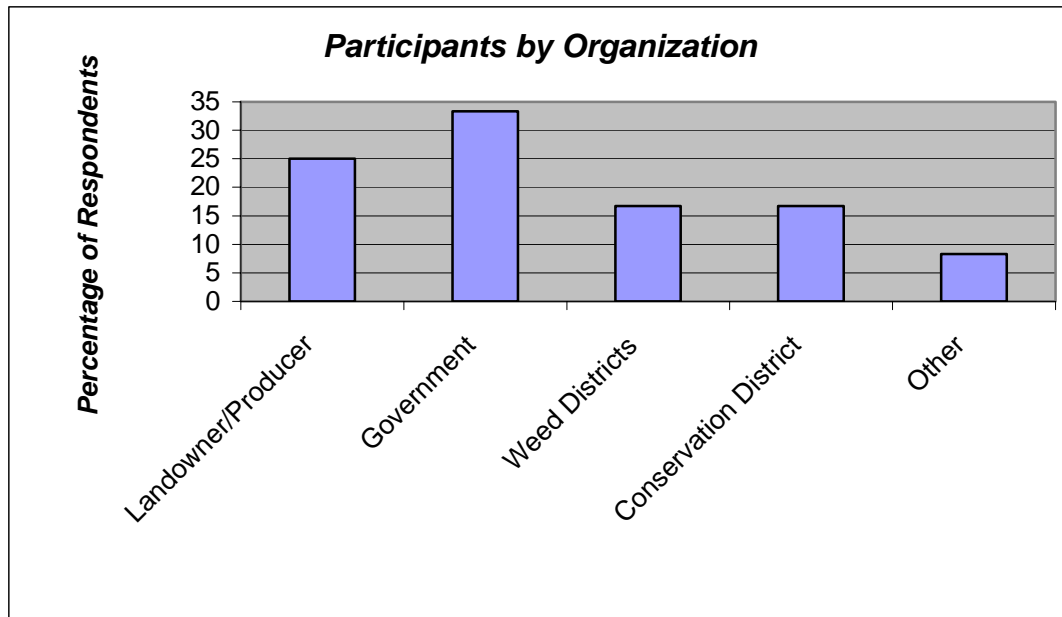


Figure 2: Tour participants

At noon the group left for Holland where they enjoyed a lunch consisting of soup, sandwiches and coffee cake at the Hollander Hotel. A few more individuals that could not attend the leafy spurge tour made it out for lunch. Leafy spurge identification, prevention and management placemats nicely complemented the conversations that took place over lunch.

After dinner the group visited the Victoria Grazing Association site located approximately 40 kilometres north of Holland. April explained how the Victoria Grazing Association had traveled to North Dakota to collect beetles for a number of years and deposited beetles in many places on the property. The group was shown the halo effect; evidence that suggests biocontrol is working in the pasture. Laine set up a transect display and discussed the measures that are to be taken when releasing and monitoring beetles. She described how to count and record heights of flowering and non-flowering leafy spurge stems, as well as to take note of area descriptions (eg. topography, shade, current land use). Aside from showing everyone the vegetation sample and flea beetle monitoring forms that RDI uses (see Appendix B), Laine also discussed the importance of taking photographs on an annual basis to track changes in the overall density of leafy spurge. A short lesson on how to use a GPS unit along with discussion on the importance of GPS readings concluded the talk.



Before heading back to Carberry, the tour group enjoyed refreshments and donuts in the middle of the Victoria Grazing pasture. Participants completed tour evaluation forms, and Pamela McTavish, April and Laine concluded the event. Comments about what was liked best about the tour included “the sharing of information between participants” and “seeing some of the success stories in insect controls” (see Figure 3).

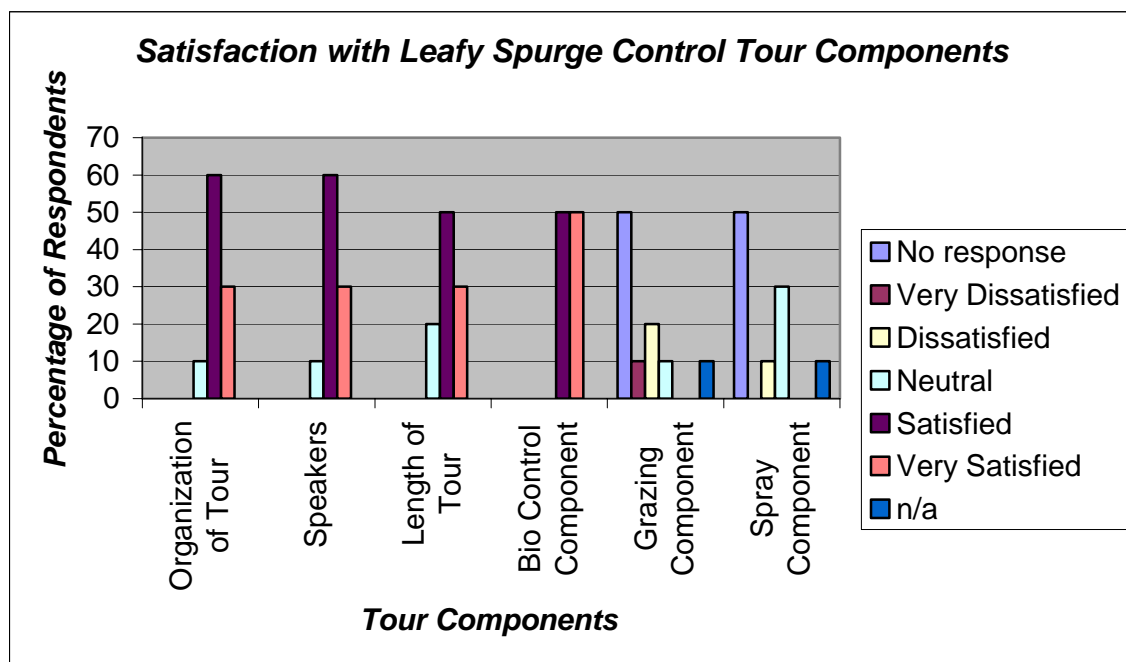


Figure 3: Satisfaction with Leafy Spurge Control Tour Components

Ag Days

Preparations for Ag Days began at the beginning of September. A list of potential speakers had been compiled during the summer (July) and it was dissected and speakers were chosen at a September 2nd meeting. The agenda was sketched out and a chairperson for the day was also chosen.

Afternoon:

"The Weeds of 2005"

Chairman – Bruce Murray, Manitoba Agriculture, Food and Rural Initiatives

- 1:30 pm "Weeds of the year for 2005" - Bruce Murray, - Provincial Weed Specialist, Manitoba Agriculture, Food and Rural Initiatives
- 2:30 pm "The Leafy Spurge Battle - RDI Project" Richard Warkentin, Stanley Soil Management Association Group, Winkler
- 3:00 pm "Seeds Can Fly - Scentless Chamomile" - Michele Ammeter, Weed Supervisor, RM of MacDonald
- 3:30 pm "Mapping Spurge" - Karen Rempel, Rural Development Institute.

April contacted Richard Warkentin about speaking at Ag Days in regards to their experiences with leafy spurge. Richard Warkentin had recently presented his information about leafy spurge flea beetles in rural Manitoba and was willing to present at Ag Days.

A biography of Richard was composed by April, Ryan and Beth for the committee. It was sent to Stephanie Cruickshanks for editing and entry. April had a number of phone conversations with Richard regarding his presentation. One call included what information would be needed and which pictures would best accentuate the information.

Richard sent a facsimile of the topics he planned on covering for the presentation with suggested pictures with each topic. April developed a PowerPoint presentation from this information and faxed it back to Richard for a final review.

Ag Days was a great success for ARDI/RDI. There were 72 in attendance for the 2:30 pm presentation by Richard Warkentin. Leafy spurge was the focus in two of the four presentations. Promotional materials were taken to the event and were placed on the side table near the coffee and doughnuts. Although the placemats were admired only 3 of the “Preventing” designs were taken. Also taken were 3 posters, 50 notepads, 65 pens, 37 magnets, 11 IPM templates, 5 newsletters, 15 Multi-species grazing/Bio-control fact sheets, 14 LSSG brochures, 7 RDI brochures and multiple copies of the 3 different children’s handouts.

IPM Planning

IPM is a process by which one selects and applies a combination of management techniques (biological, chemical, mechanical, and cultural) that, together, will control a particular weed species or infestation efficiently and effectively, with minimal adverse impacts to non-target organisms. IPM seeks to combine two or more control actions, which will interact to provide better control than any one of the actions might provide. IPM does not necessarily require the eradication of a weed species or a particular infestation of weeds, although these might be objectives in some cases. IPM is species-specific, tailored to exploit the weaknesses of a particular weed species, site-specific and designed to be practical and safe (see Appendix C for viable control methods).

Student researchers spent a large part of their 2005 summer assisting six individual landowners/producers develop IPM plans. Three from the Southwest region, two from the Central region and one from the Eastern-Interlake region were selected based on the following criteria: willingness to work with students, openness to new ideas, and level of leafy spurge infestation on their property. Members of the project team held initial meetings with each producer. Landowners/producers were given a package containing information to help them better understand the project and the options available to prevent, contain and control their leafy spurge infestations.

Throughout the summer, landowners/producers’ lands were assessed. GPS units and transect lines were used to collect baseline data and show the extent and density of the spurge infestations on each producer’s property. With the help of the landowners/producers and this gathered information, IPM plans were developed to help the landowners/producers manage their leafy spurge infestations.

At the end of the summer, April traveled to each producer’s home to review their IPM plan. All landowners/producers that were able to take time away from harvest were pleased with their plans and excited to see what next year would bring.

Biocontrol

On July 10, 2005, three members of the project, along with two members of the Green Cover project traveled to Minot, North Dakota in order to collect leafy spurge beetles (genus *Aphthona*). Having the two groups work together was more efficient both in

resources and cost (i.e. collection equipment sharing). Since the early 1990s, Ward County (which surrounds the city of Minot, ND) has developed intensive biocontrol programs for the control of leafy spurge.

Administered by the local weed board, Ward County has numerous beetle nurse sites that consist primarily of *Apthona lacertosa*. The biocontrol programs produced their intended results of reducing leafy spurge infestations. An example of the program's success is that during the late 1990s the annual number of beetles that were harvested from Ward County exceeded 20 million per year. In recent years, however, the beetle counts have decreased as a result of successful control of leafy spurge.



Due to wet weather conditions, the collection of leafy spurge beetles was delayed until mid-July. In usual weather conditions, leafy spurge beetles are collected in late June to early July.

Ward County Weed Supervisor, Derrill Fick, provided invaluable assistance by directing the team to several beetle harvest sites where *Apthona* beetles could be collected. After a day and half of successful collection, the team returned to Manitoba to disburse the beetles. More beetles were collected than anticipated and so the project team was able to provide beetles to landowners/producers. Due to weather conditions however, only five out of six landowners/producers received beetles. The release of beetles onto the landowners/producers' lands will further enhance the IPM plans.

April Peers left the group at Boissevain and headed east to release the beetles at various producer locations. Ryan Gibson and Pamela McTavish came back to Brandon to release beetles on the two harvest site locations and at various producer locations.



Beetles collected in Minot in July were used mainly for the purpose of establishing two harvest sites in southern Manitoba. Two sites were chosen based on the following criteria: one in the southwestern region and one in the central region, public ownership of the land (i.e. Crown Land) and ease of access to the site for future monitoring. CD manager Rick Baker signed a Memorandum of Understanding (MOU) as the Agriculture Crown Land's Branch was not willing to monitor the beetles that were released on the nurse site in that area. An MOU with the RM of Whitehead was signed for the second beetle harvest site. It is extremely important to monitor the beetles in future years to ensure their population is stable and that the biocontrol method is working.

Through the assistance of Jennifer Pachkowski, a former leafy spurge field technician, skills and capacities were built among student research assistants on how to collect, monitor, and move beetle populations. Lessons learned were gathered from Jennifer on

her previous beetle collection trips to North Dakota to ensure that beetle collection goals were achieved. Jennifer served as a resource contact throughout the duration of the project.

How to Collect Leafy Spurge Beetles

Collecting *Aphthona* beetles is by no means difficult. One of the hardest parts in collecting beetles is selecting a location from which to collect. Beetles are collected from late June to early July, dependent on various factors such as the weather. Beetles need to be collected and dispersed prior to the beetles laying eggs, which usually occurs in mid to late July.

Basic directions for beetle collection include: (*excerpted from the Leafy Spurge Field Manual, 2005*)

- Collect on a dry sunny day with calm winds.
- Use a strong stroke with the sweep net in a rhythmic fashion of step, sweep.
- Sweep through the tops of plants (beetles climb the plants when it is hot and sunny).
- Sweep to find where the concentrations of beetles are (sometimes on the edge of patches or in draws).
- Empty the net into a pillowcase. Keep the pillowcase closed. The beetles are very active and will not stay confined for long.
- Empty the pillowcase into a sorting device.
- Sort beetles using the sorting device listed above.
- Put pieces of leafy spurge into the paper storage containers.
- Measure the beetles using a small film canister. The canister contains about 4000 beetles.
- Empty the canister into the paper storage container.
- Mark the container with the number of beetles enclosed, duct tape the lids shut and store in coolers with ice.
- Do not set the containers directly on the ice. This is especially important if the beetles are transported a long distance. Placing newsprint on top of ice will prevent the containers from getting wet.

The equipment required to collect the beetles includes a sweep net, paper cups with lids to transport the beetles, cooler(s), ice, sorting device, and a film canister. Once the beetles are collected, it is recommended that the beetles be dispersed as soon as possible from the time of their collection. Beetles can survive for 48 hours when placed on ice in a cooler.

How to Release Leafy Spurge Beetles

Just as in collecting, releasing leafy spurge beetles is not difficult. The most critical part of releasing the beetles is in the release location. The beetles should be released on land which has similar environmental conditions as which they were collected on. This will help to ensure success of the transplanted population. For example, field studies show that successful populations of *A. lacertosa* were found on moist areas with clay loam soils covered by 2-5 cm of litter.

Beetles can be released using either a point or grid method. The point method refers to all of the beetles being released at one spot. The container is placed at the release point (a marked point) and beetles are left to climb out of the container. Alternatively, the beetles may be dumped out of the container all at once. Spurge flea beetles live in clusters, therefore they should never be sprinkled over the release area.

The grid method involves releasing the beetles at intervals of approximately 20 metres across a wide area. This may produce quicker results in larger areas heavily infested with leafy spurge. There should be a minimum of 1000 beetles released at each drop, whether it be grid or point release (*excerpted from the Leafy Spurge Field Manual, 2005*).

Monitoring Leafy Spurge Beetles

The importance of monitoring beetle biocontrol sites cannot be overstated. Little is known about the spurge beetle behaviour or the specific environmental factors that influence their survival. There are also very few harvestable sites located in Manitoba at this time. Record keeping and monitoring are the keys to improving this situation. Monitoring involves sweeping for beetles in the release area(s) and filling out an Annual Biocontrol Monitoring form.

The following table outlines the estimated peak population dates for *A.lacertosa* beetles in Manitoba. *A.nigriscutis* will peak approximately one week later. If possible, sweep two weeks prior to the peak population date, during and two weeks after. If not possible, monitoring should be as close as possible to the estimated peak population date.

Manitoba Peak Population Dates for Leafy Spurge Beetles

AREA	PEAK POPULATION DATES FOR <i>A.lacertosa</i>
Brandon	July 16-17
Cypress River	July 11-12
Deloraine	July 9-10
Emerson	July 5-6
Elm Creek	July 8-9
Gladstone	July 12-13
Glenboro	July 11-12
Harding	July 14-15
Killarney	July 11-12
MacGregor	July 12-13
Starbuck	July 14-15
Stonewall	July 11-12

Release sites should be photographed and marked before beetles are released. Each year as part of the monitoring, take photos at approximately the same date and from the same direction. This will help reveal the impact of the biocontrol over time. Evidence of beetle activity includes small holes punctured throughout the leaves of the plant. Heavy beetle activity will result in the shredding of leaves. Evidence of significant larval activity is a round circular area with stunted and less dense spurge. This effect is commonly called a halo (*excerpted from the Leafy Spurge Field Manual, 2005*).

Producer Assistance

One of the components of the project was helping landowners/producers obtain financial assistance where possible to help them with managing their leafy spurge. Discussions with landowners/producers allowed students to determine what current methods were already in place. For example, one landowner/producer was working in conjunction with the RM regarding chemical application. The landowner/producer pays for the chemical and the municipality sprays for him.

A list was compiled of Rural Municipalities, Conservation Districts and other associations in the landowners/producers' areas that would be of possible assistance for landowners/producers. Managers and weed supervisors were contacted and asked about any programs already in place that aid landowners/producers with their leafy spurge infestations. The main goal was to form partnerships with these associations and landowners/producers to manage the leafy spurge on the producer's land. Minimal success came out of this venture as many RMs and CDs do not offer specific programs for leafy spurge. Many districts do not have a weed program or a weed supervisor.

Getting landowners/producers familiar with the Canada-Manitoba Farm Stewardship Program's Environmental Farm Planning was also very beneficial. Once this farm plan is complete additional funding (up to \$30,000) may become available to landowners/producers to help manage leafy spurge.

Funding for the *Managing Invasive Species: Leafy Spurge Control* project allows \$5000 for producer assistance. The funding was split evenly among the six landowners/producers. This money will help the landowners/producers with such leafy spurge projects as purchase of herbicides, backpack sprayers, fencing for grazing sheep or goats and guardian animals for predation control. Hopefully this will benefit the landowners/producers in their battle with leafy spurge.

Evaluation

Monitoring and evaluation has been ongoing to assess the impact and success of program activities. Feedback from project team members has also been used to make ongoing improvements to project activities. A number of tools were developed and used throughout the summer. At the beginning of this project, a "GANTT Timeline" was created to ensure all the tasks necessary for completing this project were accounted for and deadlines for these initiatives were made (see appendix D). A complete list of all the fairs, festivals and events taking place in Manitoba throughout the summer of 2005 were recorded into a spreadsheet. The following information was collected: event name, event

date, contact information for event organizer, event location, leafy spurge infestation level, gate admission, booth fee, and method of awareness (i.e. stationary booth or walking around handing out materials).

Another reporting tool was developed to record the fairs and events that were attended by project team members. This tool listed the events, dates and locations in which the fairs took place. It also specified how many promotional materials (i.e. magnets, pens and notepads) were handed out at each event. Numbers of fact sheets (i.e. Leafy Spurge: The Silent Invader, Multi-Species Grazing, IPM Manuals, Leafy Spurge and Species Diversity), children's handouts (i.e. word search, illustration and board game) and project description sheets distributed at the fairs were recorded. The number of contacts made along with questions and comments made by fair visitors were tracked. The number of placemats and posters distributed to various rural municipal town offices, conservation districts and businesses across Manitoba were recorded.

To determine the success of the July 26th Leafy Spurge Awareness Tour, a questionnaire was developed and issued to each tour participant. Project team members analyzed these responses to determine how satisfied tour participants were with the various sites visited on the tour. Charts and graphs were constructed to determine what organizations were represented at the awareness tour.

In December, 2005 a project team member surveyed a random sample of the restaurants that had received leafy spurge placemats. Nineteen of the 64 restaurants were telephoned and asked questions regarding their placemat use. Eight of the restaurants responded to not using the placemats, mainly due to the placemats being too large for the tables or causing extra work for the servers. Six restaurants responded to still using the placemats and that they seemed to spark conversations among the local farmers. All six stated they would continue to use the placemats and three of those requested new placemats as theirs were worn and curling up at the ends.

A list of contributions made by individuals towards the *Managing Invasive Species: Leafy Spurge Control* project was compiled. Names of these contacts, the organizations whom they represent, as well as a brief description of their project contributions and the time spent on these efforts were recorded.

Lastly, student researchers both kept logbooks detailing the work they did for the project on a day-to-day basis. These journals were instrumental in writing up this project report as they detailed the events associated with the *Managing Invasive Species: Leafy Spurge Control* project. These personal logbooks were especially useful as they included names and numbers of contacts, meeting notes and project progressions.

Unanticipated Results

Three children's awareness activities were designed by the project team: a leafy spurge board game, word search and illustration of a leafy spurge weed for children to color. The purpose of these awareness materials is to educate youth on the severity of leafy spurge and to educate more adults through these children's voices. These children's awareness materials were delivered to fairs and events as well as to the Riverbank Discovery Centre in Brandon. Through the Riverbank Discovery Centre, leafy spurge children's awareness

activities have been introduced into the youth curriculum. Brad Wall, Interpretive Programmer, estimates that over the course of the summer 1100 children will be educated on how to identify and prevent leafy spurge from spreading. Through the Riverbank Discovery Centre, an interpretive sign detailing leafy spurge identification is also being constructed on behalf of this project.

The biocontrol component of the project called only for the collection of enough leafy spurge beetles to develop two harvest sites in Manitoba. However, enough beetles were collected (> 80,000) that we were able to provide beetles to five out of the six landowners/producers that we worked with over the summer. This was very beneficial to their IPM plans.

A great deal of the research being done by summer research students was aided by organizations outside of the university. Rural municipalities, weed districts and conservation districts were helpful. When having trouble getting the information we required, we asked conservation districts for their help and found that they were very interested in helping us. For instance, the conservation district manager in Manitou attended an agriculture fair and handed out leafy spurge material on behalf of the *Managing Invasive Species: Leafy Spurge Control* project.

Lessons Learned

One of the biggest limitations to the project was having to rely on the weather in order to complete the *Managing Invasive Species: Leafy Spurge Control* project components. Throughout the month of May we had extremely cool temperatures, temperatures much lower than what is expected for that time of year. The months of June and July brought large rains to Manitoba that caused flood damage to most all landowners/producers. A tornado also tore through the south central/southeastern Manitoba region causing devastation to one of the landowners/producers. These weather actions along with other farm crises such as BSE placed leafy spurge lower in terms of priority on landowners/producers' lists of issues needing to be dealt with on their farms.

Due to the cooler temperatures and "flash floods" that persisted well into the month of July, the leafy spurge flea beetles that were to be collected from Minot in late June / early July were not collected until July 12th. Due to late beetle collection, a large portion of the project activities such as developing nurse sites were not accomplished until later in the summer. Deadlines were pushed back to accommodate the weather. Also, beetle populations were down around Minot due to the extreme weather patterns as well as being victims of their own success. These decreasing beetle counts caused our project group to have to spend an extra night in Minot so that our beetle collection number goal could be reached.

Another limitation was the late start of the project. The *Managing Invasive Species: Leafy Spurge Control* project commenced in April 2005 making it "tight knit" to plan and organize all the activities. Placemats and the poster were not available early enough in the season to attend May and June fairs and events.

**Appendix A:
July 26th Leafy Spurge Awareness Tour Invitation and
Agenda**

June 10, 2005

Hi There

We just wanted to formally invite you to our Leafy Spurge Control Tour on July 26, 2005 that will focus on biocontrol. The itinerary has not been finalized but for the time being, this is what we have in mind. If you are able to come please call us by July 1st so we can make travel and dining arrangements. You can *R.S.V.P.* to 571-8523 or e-mail April at peersa@brandonu.ca or Laine at mossetl@brandonu.ca I hope you will be able to make it out for this tour.

Sincerely,

April Peers and Laine Mosset

Research Assistants

Rural Development Institute

Brandon University

Brandon, MB R7A 6A9

Managing Invasive Species:
Leafy Spurge Control
Rural Development (RDI), Brandon University
Tour Agenda July 26(Rain Date: July 27), 2005

9:45

Carberry Plains Community Centre

Meeting Place: 500 Stickle Av. – right off Hwy #5. Park on East side of parking lot along the tree line

10:00

Leave Carberry for 1st tour site

10:20

Spruce Woods Provincial Park tour site

Gerry Rosset will speak about the park's biocontrol efforts

10:45

Leave for 2nd tour site

11:30

Wawanesa tour site

Focus on Grazing Goats/Sheep as a method of Leafy Spurge Control

12:00

Leave for lunch

12:30

Lunch in Holland

1:30

Leave for 2nd tour site

2:00

Victoria Grazing Association tour site

Focus on Biocontrol

Example of Biocontrol working (halos)

Transect display

GPS

Importance of monitoring

Focus on Spraying as a method of Leafy Spurge Control

3:15

Wrap up – questions/answers

3:45

Leave for home

4:15

Estimated time of arrival in Carberry

**Appendix B:
Land and Vegetation,
Beetle Release and Monitoring Forms**

Vegetation Assessment Form								
Baseline Data Collection								
Name of surveyor								
Date surveyed								
Legal description								
GPS reading								
General topography								
Site topography								
Patch size								
Vegetation association								
Soil type								
Beetles present								
Species of beetles								
		Stems / 0,25m2		Euphorbia esula L.				
		#F	#NF	Avg. height F	Avg. height NF	Bare ground%	Litter%	
							Vegetation cover%	
North 1m								
North 3m								
North 5 m								
North 10m								
East 1m								
East 3m								
East 5m								
East 10m								
South 1m								
South 3m								
South 5m								
South 10m								
West 1m								
West 3m								
West 5m								
West 10m								
		Other plant species within the plot marker						
North 1m							F- flowering	
North 3m							NF- non-flowering	
North 5 m							Heights in inches	
North 10m								
East 1m								
East 3m								
East 5m								
East 10m								
South 1m								
South 3m								
South 5m								
South 10m								
West 1m								
West 3m								
West 5m								
West 10m								
		Other plants in the transect area (This list may not include all of the species found within the plot marker area)						

Part A: In-Depth Survey (to be used with all sites)

Insect: _____ Date Surveyed: _____

Surveyed by: _____ Telephone: _____

Wind speed: _____ Temperature: _____

Conditions (sunny, cloudy etc.) _____

Legal Location: _____

Nearest Town: _____ Municipality: _____

GPS Reading: _____

Beetles: present absent

General topography hilly valley level knoll

Site topography slight slope steep slope level

The site faces North South East West

Spurge infestation is continuous patchy

Size of infestation <1 acre 1-5 acres 6-10 acres >10 acres

Estimate of spurge density 0-25% 26-50% 51-75% 76-100%

Number of flowering stems / m² 0 0-20 21-35 36-49 50+

Average height of **flowering** stems _____

Average height of **non-flowering** stems _____

Vegetation cover (ground area shaded by all plants) 0-25% 26-75% 76-100% % of spurge cover _____

Tree & shrub shade at release site full partial none

Litter cover 0 1-5% 6-10% 11-25% 26-50% >50%

Bare ground 0 1-5% 6-10% 11-25% 26-50% >50%

Has release area been cleared of trees? yes no

Current land use pasture public land roadside idle other

Vegetation association short grass long grass mixed grass aspen other

Soil moisture regime well drained moderately well drained poorly drained

Altitude (if known) _____ metres

Annual precipitation (if known) <25cm 25-40cm 41-60cm >60cm

Resident insect (potential parasite/predator) type: _____

Have herbicides been applied within the last 2 years? no don't know yes, if yes please indicate type: _____

Other control methods used in past year:

mowing cultivation grazing (please indicate sheep goats horses)

Beetle Counts: N 5m 10m
 E 5m 10m
 S 5m 10m
 W 5m 10m

Part B: In-depth Beetle Release (to be used in conjunction with Part A)

Insect: _____ Date Surveyed: _____
 Surveyed by: _____ Telephone: _____
 Wind speed: _____ Temperature: _____
 Conditions (sunny, cloudy etc.) _____

General topography	<input type="checkbox"/> hilly	<input type="checkbox"/> valley	<input type="checkbox"/> level	<input type="checkbox"/> knoll	
Site topography	<input type="checkbox"/> slight slope	<input type="checkbox"/> steep slope	<input type="checkbox"/> level		
The site faces	<input type="checkbox"/> North	<input type="checkbox"/> South	<input type="checkbox"/> East	<input type="checkbox"/> West	
Spurge infestation is	<input type="checkbox"/> continuous	<input type="checkbox"/> patchy			
Size of infestation	<input type="checkbox"/> <1 acre	<input type="checkbox"/> 1-5 acres	<input type="checkbox"/> 6-10 acres	<input type="checkbox"/> >10 acres	
Estimate of spurge density	<input type="checkbox"/> 0-25%	<input type="checkbox"/> 26-50%	<input type="checkbox"/> 51-75%	<input type="checkbox"/> 76-100%	
Number of flowering stems / m ²	<input type="checkbox"/> 0	<input type="checkbox"/> 0-20	<input type="checkbox"/> 21-35	<input type="checkbox"/> 36-49	<input type="checkbox"/> 50+
Average height of flowering stems _____					
Average height of non-flowering stems _____					
Vegetation cover (ground area shaded by all plants)	<input type="checkbox"/> 0-25%	<input type="checkbox"/> 26-75%	<input type="checkbox"/> 76-100%	% of spurge cover _____	
Tree & shrub shade at release site	<input type="checkbox"/> full	<input type="checkbox"/> partial	<input type="checkbox"/> none		
Litter cover	<input type="checkbox"/> 0	<input type="checkbox"/> 1-5%	<input type="checkbox"/> 6-10%	<input type="checkbox"/> 11-25%	<input type="checkbox"/> 26-50% <input type="checkbox"/> >50%
Bare ground	<input type="checkbox"/> 0	<input type="checkbox"/> 1-5%	<input type="checkbox"/> 6-10%	<input type="checkbox"/> 11-25%	<input type="checkbox"/> 26-50% <input type="checkbox"/> >50%
Has release area been cleared of trees?	<input type="checkbox"/> yes	<input type="checkbox"/> no			
Current land use	<input type="checkbox"/> pasture	<input type="checkbox"/> public land	<input type="checkbox"/> roadside	<input type="checkbox"/> idle	<input type="checkbox"/> other
Vegetation association	<input type="checkbox"/> short grass	<input type="checkbox"/> long grass	<input type="checkbox"/> mixed grass	<input type="checkbox"/> aspen	<input type="checkbox"/> other
Soil moisture regime	<input type="checkbox"/> well drained	<input type="checkbox"/> moderately well drained	<input type="checkbox"/> poorly drained		
Altitude (if known)	_____ metres				
Annual precipitation (if known)	<input type="checkbox"/> <25cm	<input type="checkbox"/> 25-40cm	<input type="checkbox"/> 41-60cm	<input type="checkbox"/> >60cm	
Resident insect (potential parasite/predator)	type: _____				
Have herbicides been applied within the last 2 years?	<input type="checkbox"/> no	<input type="checkbox"/> don't know	<input type="checkbox"/> yes, if yes please indicate type: _____		

Beetles: present absent

Date beetles collected: _____ Where collected: _____

Date released: _____ Time released: _____

Number of beetles released: _____ Release type: point grid

Beetle Counts:

<input type="checkbox"/> N 5m	<input type="checkbox"/> 10m
<input type="checkbox"/> E 5m	<input type="checkbox"/> 10m
<input type="checkbox"/> S 5m	<input type="checkbox"/> 10m
<input type="checkbox"/> W 5m	<input type="checkbox"/> 10m

Biocontrol Annual Monitoring Data Form

Date Surveyed: _____
 Surveyed by: _____ Telephone: _____
 Wind speed: _____ Temperature: _____
 Conditions (sunny, cloudy etc.) _____
 Legal Location: _____
 GPS Reading: _____

Spurge infestation is	<input type="checkbox"/> continuous	<input type="checkbox"/> patchy			
Size of infestation	<input type="checkbox"/> <1 acre	<input type="checkbox"/> 1-5 acres	<input type="checkbox"/> 6-10 acres	<input type="checkbox"/> >10 acres	
Estimate of spurge density	<input type="checkbox"/> 0-25%	<input type="checkbox"/> 26-50%	<input type="checkbox"/> 51-75%	<input type="checkbox"/> 76-100%	
Number of flowering stems / m ²	<input type="checkbox"/> 0	<input type="checkbox"/> 0-20	<input type="checkbox"/> 21-35	<input type="checkbox"/> 36-49	<input type="checkbox"/> 50+
Average height of flowering stems	_____				
Average height of non-flowering stems	_____				
Vegetation cover (ground area shaded by all plants)	<input type="checkbox"/> 0-25%	<input type="checkbox"/> 26-75%	<input type="checkbox"/> 76-100%	% of spurge cover _____	
Litter cover <input type="checkbox"/> 0	<input type="checkbox"/> 1-5%	<input type="checkbox"/> 6-10%	<input type="checkbox"/> 11-25%	<input type="checkbox"/> 26-50%	<input type="checkbox"/> >50%
Bare ground <input type="checkbox"/> 0	<input type="checkbox"/> 1-5%	<input type="checkbox"/> 6-10%	<input type="checkbox"/> 11-25%	<input type="checkbox"/> 26-50%	<input type="checkbox"/> >50%
Current land use	<input type="checkbox"/> pasture	<input type="checkbox"/> public land	<input type="checkbox"/> roadside	<input type="checkbox"/> idle	<input type="checkbox"/> other
Vegetation association	<input type="checkbox"/> short grass	<input type="checkbox"/> long grass	<input type="checkbox"/> mixed grass	<input type="checkbox"/> aspen	<input type="checkbox"/> other
Annual precipitation (if known)	<input type="checkbox"/> <25cm	<input type="checkbox"/> 25-40cm	<input type="checkbox"/> 41-60cm	<input type="checkbox"/> >60cm	
Resident insect types: _____	Notes: _____ _____ _____				

Have herbicides been applied within the last year? no don't know yes, if yes please indicate type and rate of application: _____

Other control methods used in past year:

mowing cultivation grazing please indicate: sheep goats

Beetle Counts: N 5m 10m
 E 5m 10m
 S 5m 10m
 W 5m 10m

Appendix C: Viable Control Options

Viabile control options are:

(1) No treatment

(2) Chemical Control

For chemical control to be most effective, proper timing is essential. **No single treatment will work to eradicate leafy spurge.** Spraying with herbicides must be regular and well-timed or the leafy spurge will rapidly re-infest. It is likely not cost effective to spray after seed set because even if it limits seed growth, the seeds have been released and there will be little benefit for next year. It is generally advised to continue treatment until at least 90% of the leafy spurge is eradicated.

The optimal time to apply herbicide is during the growing season. It is optimal to spray in the spring between the second period of growth. Spraying at least 15 feet around the visible perimeter of a leafy spurge patch will also help to control any small leafy spurge plants. Caught quickly enough, herbicides can be used to eliminate or control small patches of leafy spurge. Herbicides are useful in containing or controlling existing patches when used in combination with other management controls.

Common herbicides utilized in the control of leafy spurge include Amitrol 240©, Dicamba (Banvel II®), 2,4-D amine, Picloram (Tordon 22K®), DyCleer, MCPA (amine or ester). **Before applying any herbicides, one should consult Manitoba Agriculture and Food's *Guide to Crop Protection for application rates.*** [taken from *Integrated Pest Manual, Rural Development Institute 2003*]

Approximate costs for roadside spraying of leafy spurge in 2001 were \$220 per pass mile. This spray was a mixture of 2,4-D, Dycleer and Garlon 4.

(3) Mowing

If timed properly, mowing can prevent leafy spurge from seeding. Repeat mowing should be done every 2 to 4 weeks. It is important to mow only during the early flowering stage, before the seeds turn brown. Late mowing may result in further seed spread. Optimal times for mowing are from mid to late May, mid June and early to mid July. [taken from *Integrated Pest Manual, Rural Development Institute 2003*]

(4) Biological Control

Biological control uses the natural enemies of leafy spurge to control and reduce the pest population. The use of beetles and multi-species grazing (using goats/sheep) places leafy spurge under stress resulting in weaker plants and ultimately in reduced stem density. It may take several years before you will see promising results. It is important that you do not stop using other control measures while waiting for the biological agents to work.

FLEA BEETLES: Thus far the most effective biocontrol agents for controlling leafy spurge include the flea beetles from the genus *Aphthona*. *Lacertosa* and *nigriscutis* work best in this area. The adult beetles feed on the leaves of leafy spurge, but it is the root-mining larvae that place the plant under the most stress. The damage caused by the flea beetles will also make the plants more susceptible to other control methods.

The use of biocontrol agents may not work for everyone. Often, areas containing leafy spurge simply do not meet site requirements needed by flea beetles, and a population will

not survive at the site. In any case, be patient and allow the biological control agents a chance to get established. Try releasing them in several different areas.

A successful release site will show a reduction in leafy spurge from 100% cover to 5% cover. As mentioned previously, this may take several years to accomplish and success will depend mainly on site suitability (soils, slope, aspect) as well as the number of flea beetles released.

All of the flea beetles require well-drained soils. Avoid areas susceptible to spring flooding or sites that collect moisture. Release the beetles in patches of leafy spurge that are at least a half acre or more in size and near the edge of the patch in the full sun. A minimum of 1,000 per release is recommended, more if available. Given the time, they will make their way into the denser or shadier parts of the infestation.

Do not use insecticides of any kind within a 100-foot (30 m) radius around the colony. If using herbicides, leave at least a 10-foot (3 m) buffer zone around the release site. Spray after August 15 to make sure you do not remove the top growth needed by adult beetles for food. Do not cultivate the insect area or you risk losing your beetle population.

MULTI-SPECIES GRAZING is the practice of using two or more livestock species in the same grazing system. Multi-species grazing works to reduce leafy spurge infestations because different animals use different forage resources in the pasture.

Cattle and horses will not consume leafy spurge and sometimes will avoid leafy spurge patches entirely. Sheep and goats, on the other hand, will eat leafy spurge. Sheep initially exhibit a relative avoidance to leafy spurge, but after they become accustomed to its taste, they will readily graze leafy spurge. Goats exhibit a relative preference for leafy spurge and will readily consume it. Sheep overlap the diet of cattle by 20-40% and goats overlap by 5-20%. This means that sheep or goats can be added to an existing system without large reduction in cattle or horse stocking rates.

Multi-species stocking rates depend on many factors:

- Length of grazing season
- How much you are willing to reduce your cattle or horse herd
- Amount of bush (sheep and particularly goats will make up a good portion of their diet in woody browse if it is available. This means less percent of the diet will be made up of leafy spurge)
- Amount of leafy spurge in the pasture (it will take a lot more animals to graze 400 stems/m² than 30 stems/m²)

Studies have shown that continuous grazing will give the quickest reduction in leafy spurge. However, rotational grazing is nearly as good. Use whatever system best suits your farm and management system. The most important thing is to get the control mechanism in your pastures.

It is the repetitive nature of the grazing that eventually kills leafy spurge. In 3 to 5 years, leafy spurge can be reduced by as much as 90% by using sheep or goats. Putting high numbers of sheep or goats in the pasture for a short period is not as effective as repeat grazing at lower stocking rates. A good place to start would be from 1 to 3 infested acres

per sheep or goat. As leafy spurge decreases, the number of sheep or goats will also need to be decreased as they will start to overlap the diet preferred by your cattle or horses.

Sheep can take up to 50% and goats up to 80% leafy spurge as a total of their diet before digestive upsets occur. After that point, symptoms can become performance inhibiting.

Managed grazing with species-specific grazing animals, such as sheep and goats, is also effective against leafy spurge. **Grazing is the only control method that is revenue-neutral or even revenue-generating.** Contact the Sheep and Goat Specialist with Manitoba Agriculture and Food, or your local sheep and goat associations for more details on fencing and predator control. [taken from *Integrated Pest Manual, Rural Development Institute 2003*]

(5) Integrated Approach

The most effective control is to combine a variety of techniques — in other words, take an integrated management approach. As a landowner or land manager, you can choose and combine control methods based on your own preferences, size of problem and accessibility of the leafy spurge. A combination of the above techniques would be considered an integrated approach to controlling leafy spurge. [taken from *Integrated Pest Manual, Rural Development Institute 2003*]

Monitoring

Monitoring is the repeated collection and analysis of information to evaluate progress in meeting resource management objectives. Periodic observation of the leafy spurge being managed is necessary to evaluate the effectiveness of a pest control program. If management objectives are not being met, pest control actions need to be modified. Without some type of monitoring, there is no way of knowing whether control actions are contributing to the fulfillment of management objectives.

Adapted from the IPM Manual

Appendix D: GANTT Project Timeline

Awareness and Prevention Strategies									
Activity		May	June	July	Aug.	Sept.	Oct.	Nov.	Resources
Identify low to no infested municipalities		May 6							Cloropleth, MAFRI maps
Research RMs for fair and festival planning		May 6							
• Populations									Internet Phone
• Main town/city/village(s)									
• Fair/festival/event dates									
Review/revise poster boards for fairs/festivals			June 17						Gerry Oliver
Design and arrange for fairs/events promo materials			May 27						
Increase awareness about leafy spurge at fairs/festivals			X	X	X				Truck/car
Gather information for leafy spurge place mats		May 6							
• Restaurants in RMs									Internet vehicle
• Poll restaurants to see if will use		May 27							
• Deliver place mats to communities						Sept. 2			Vehicle/ place mats
Put together packages containing information on leafy spurge for landowners/producers		May 20							Templates Fact sheets
Brainstorm awareness event ideas		May 27							
• Eg. Beetle collection workshop									
• Eg. Field tour with landowners/producers (contacts list, lunch, transportation)									
Plan and organize an awareness activity for approximately 20 people Ex. A tour with participating landowners/producers			June 3						Jen P.
Compile RSVP list for tour				July 1					
Book vans for tour				July 20					Bev Enterprise
Book restaurant for tour				July 20					Holland
Buy beverages for the tour(water, pop)				July 25					

Put together packages for those attending tour			July 22					Fact sheets Magnets...
Deliver awareness activity (tour)			July 27					Packages, water
Conduct post measure of activity			July 29					Eval. tool
Put together package for awareness events/conferences(Beef Days, Grazing School, Conservation Districts Convention, Pasture Tour)		June 3						
Attend selected Beef Days		X	X	X	X	X		
Plan Ag Days session		X	X	X	X	X	X	
Organize materials for Ag Days		X	X	X	X	X	Nov.25	
Present at Ag Days (January)								
Conduct post measure of event								
Away (out of office)		June 7-8						
Laine away			July 11-24					
April in morning classes				August2-22				

IPM Planning										
Activity			May	June	July	Aug.	Sept.	Oct.	Nov.	Resources
Identify landowners/landowners/producers			May 31							Weed supervisors
<ul style="list-style-type: none"> • 3 in moderately infestation areas • 3 in severely infested areas 										
Contact landowners by telephone and arrange for an initial meeting			June 3							
Initial meetings				June 24						
<ul style="list-style-type: none"> • Increase awareness of leafy spurge • Discuss project objectives 										Fact sheets
<ul style="list-style-type: none"> • Develop evaluation method to ensure objectives are met 										
<ul style="list-style-type: none"> • Inform landowners of their possible gain through this project 										pamphlets
<ul style="list-style-type: none"> • Explain what Invasive Pest Management 										template

(IPM) plan is								
• Discuss how to develop an IPM Plan								template
• Answer any questions								
• Conduct pre measures with landowners								
First meeting with landowner #1		June 10						
First meeting with landowner #2		June 10						
First meeting with landowner #3		June 17						
First meeting with landowner #4		June 17						
First meeting with landowner #5		June 24						
First meeting with landowner #6		June 24						
Collect baseline data for the 1st time Survey and assess spurge infestation		June 24						GPS
Complete Part A: in-depth survey								Field manual
Collect vegetative samples								Transects, bags
Take pictures of leafy spurge								Digital camera
Conduct post measures with landowner								
Landowner #1		June 10						
Landowner #2		June 10						
Landowner #3		June 17						
Landowner #4		June 17						
Landowner #5		June 24						
Landowner #6		June 24						
Collect baseline data for the 2nd time			July 8					
• Complete Part A: in-depth survey								Field manual
• Collect vegetative samples								Transects, bags
• Take pictures of leafy spurge								Digital camera
Review and revise IPM plans		X	X	X	X			Template
Landowner #1		X	X	X	X			
Landowner #2		X	X	X	X			
Landowner #3		X	X	X	X			
Landowner #4		X	X	X	X			
Landowner #5		X	X	X	X			

Landowner #6		X	X	X	X			
Collect baseline data for the 3rd time				Aug. 5				
<ul style="list-style-type: none"> Take pictures of leafy spurge 								Digital camera
<ul style="list-style-type: none"> Preparing beetle sites 								
Conduct post measure				Aug. 19				
Help develop an evaluation tool				Aug. 19				
Complete reporting for site monitoring Visits				Aug. 26				
Create final field report of summer findings/research					Sept. 2			Template
Away (out of office)		June 7-8						
Laine away			July 11- 24					
April in morning classes				August 2 -22				

Biocontrol										
Activity			May	June	July	Aug.	Sept.	Oct.	Nov.	Resources
Identify beetle release sites				June 24						Truck
<ul style="list-style-type: none"> Determine 5 or 6 sites 										
<ul style="list-style-type: none"> Determine part(s) of land that will be focused on 										GPS
<ul style="list-style-type: none"> Conduct pre measure with landowners 										
Landowner #1				June 10						
Landowner #2				June 10						
Landowner #3				June 17						
Landowner #4				June 17						
Landowner #5				June 24						
Landowner #6				June 24						
<ul style="list-style-type: none"> Get written consent from landowner in regards to using their land for releasing beetles. They must agree to allow people, 										Consent Form

every year, to gather and collect beetles.								
Identify nurse/harvest sites		June 24						Jen P./Pauline
<ul style="list-style-type: none"> Determine 2 sites which must be publicly owned land. Ex. Town park, Crown land, etc.								RM offices/maps Weed sups.
<ul style="list-style-type: none"> Determine part of land that will be used 								GPS
<ul style="list-style-type: none"> Collect baseline data 								
<ul style="list-style-type: none"> Complete Part A: in-depth survey 								
<ul style="list-style-type: none"> Collect vegetative samples 								Transects, bags
Create memorandums of understanding between RDI and landowner (crown)			July 10					
Determine the number of beetles required		June 24						
Beetle Collection			July 10-12					Green cover personnel, others
<ul style="list-style-type: none"> Travel as a group to Foxholm (Just outside of Minot, ND) 								Truck
<ul style="list-style-type: none"> Spend the night(possibly 2) 								Hotel rooms(2)
<ul style="list-style-type: none"> Early morning travel out to harvest/nurse site 								Truck
<ul style="list-style-type: none"> Sweep for beetles (5 hours) 								Field equip.
<ul style="list-style-type: none"> Collect beetles in appropriate containers 								Field equip.
<ul style="list-style-type: none"> Store beetles on ice for transport 								Field equip.
Beetle Release			July 12-13					Field equip.
<ul style="list-style-type: none"> Beetles must be released within 48 hours 								
<ul style="list-style-type: none"> Transport beetles back to Manitoba 								
<ul style="list-style-type: none"> Release beetles onto designated areas 								GPS
Help develop an evaluation tool		X	X					
Complete reporting for site monitoring visits				Aug. 26				
Away (out of office)		June 7-8						
Laine away			July 11-24					

April in morning classes						August2 -22				
Evaluation										
Activity			May	June	July	Aug.	Sept.	Oct.	Nov.	Resources
Construct GANTT Timeline			X							
Pre-evaluation										
Post-evaluation										
Develop evaluation tool for fair communities				June 17						
Develop evaluation tool for trial place mat communities			May 27							
Develop evaluation tool for place mat / poster delivery					July 5					
Develop evaluation tool for promotional material delivery					July 5					
Develop in-kind contribution tool						Aug. 30				
Write log books of project events							Sept. 2			
Write LSSG newsletter articles						Aug. 15-20				
Create final field report of summer findings/research							Sept 2			
Away (out of office)				June 7-8						
Laine away					July 11-24					
April in morning classes						August2-22				

RDI ADVISORY COMMITTEE

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Dean of Arts
Brandon University

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Acting Director
Rural Initiatives, Community Cooperatives
and Regional Development Initiatives
Manitoba Agriculture, Food and Rural Initiatives

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Health Canada

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MTS Communications Inc.

Jeff Williams
VP Academic & Research
Brandon University

Dion Wiseman
Associate Professor
Department of Geography
Brandon University

Robert Annis
Director
Rural Development Institute
Brandon University

The role of the RDI Advisory Committee is to provide general advice and direction to the Institute on matters of rural concern. On a semi-annual basis the Committee meets to share information about issues of mutual interest in rural Manitoba and foster linkages with the constituencies they represent.