



Leafy Spurge Impact Assessment

November 27, 1999

Analysis Prepared by:

**The Leafy Spurge Stakeholder Group's
Impact Assessment Working Group**

Acknowledgements

WESTARC Group Inc. would like to take this opportunity to thank the contributors to this project without whom it could not have been done. We wish to thank the Weed Control Supervisors, the Agricultural Representatives, North Dakota State University, and all of the people who helped to complete this work.

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Executive Summary

The **Leafy Spurge Stakeholders Group** (LSSG) was formed in the fall of 1998 to examine the issues and impacts of leafy spurge. This plant is an invasive noxious weed that infests thousands of acres in Agri-Manitoba. The LSSG is a broad coalition of agricultural and conservation groups and all three levels of government. This coalition is spearheaded by the Weed Supervisors Association of Manitoba and co-ordinated by WESTARC Group Inc. of Brandon University. The current objectives of the group are:

- to raise the awareness of the leafy spurge problem and the need for action by all levels of government, private landowners, producer groups and conservation organizations;
- to provide accurate and locally based information on the extent and economic impact of the leafy spurge problem in Manitoba;
- to provide information to landowners to enable them to effectively control and manage leafy spurge on their properties; and
- to co-ordinate leafy spurge efforts in Manitoba to ensure the best use of resources by all agencies.

In the summer of 1999, the Leafy Spurge Stakeholders Group embarked on a project to develop an estimate of the leafy spurge infestation in Manitoba and its potential impact. Data on infestation levels was obtained from three main sources. These sources included:

- 1) a survey of weed control districts conducted by Weed Supervisors;
- 2) reports from Manitoba Agriculture Representatives on estimates of infestations in 112 rural municipalities; and
- 3) a 1981 survey from which data was extrapolated to provide information for those rural municipalities for which there were no other sources of data.

Data from the study undertaken by the Leafy Spurge Stakeholders Group estimates that the net economic impacts associated with the leafy spurge infestation in Manitoba may be approaching **\$20 million** per year. It is estimated that at least **340,000 acres** are impacted. Without control actions being initiated to limit the growth rate of the infestation, it is possible that the impacted acres (and associated economic impacts) could increase rapidly.

The total annual economic impact on pastureland is estimated at \$16 million. An estimated 225,000 acres of grazing land is infested in Manitoba with a potential impact of a reduced herd size of 16,540 head. Leafy spurge costs Manitobans more than \$5 million per year in reduced producer income (\$2 million per year) and reduced production expenditures (\$3 million per year). Potential secondary economic impacts on other business sectors are estimated at \$11 million per year. Additionally, land values are potentially reduced by over \$30 million. This brings potential increased property tax implications for owners of croplands and residential holdings as land values are reassessed. If taxes on infested acres may be reduced due to lower assessment values, taxes on other lands may have to be raised to compensate for the lost revenue.

The potential direct and indirect economic impact on public lands is \$2.5 million. In terms of recreation, direct impacts could amount to \$674,000 per year, with secondary economic impacts of \$1.55 million per year. These estimates are related to reduced expenditures on consumptive and non-consumptive wildlife-associated recreation. Approximately 107,000 acres of public lands are infested. Most of these acres are primarily identified in the sandy-soil and sand-duned terrain associated with the Carberry Sandhills as well as the Assiniboine and Souris River basins. Riding Mountain, Duck Mountain and the sandy-soil areas east and southeast of Winnipeg may also be vulnerable to this noxious weed.

Potential watershed impacts were estimated at \$281,000 per year (direct impacts of \$157,000 and secondary impacts of \$124,000).

Estimated control costs for rights-of-way are \$400,000 per year. This figure includes:

- Weed Control Districts costs of \$300,000;
- Highways Department \$53,000;
- Railways \$12,000; and
- An undetermined cost for Pipelines and Hydro.

The LSSG recognizes there are gaps in the data that leads to potentially underestimating the total scale of the infestation and economic impacts. Infestation rates for many municipalities were not provided. Based on a 1981 survey, it is known that some municipalities not included in weed districts had moderate to heavy infestations of leafy spurge at that time and several other municipalities had light infestation. The amount of infested public land may be understated as some parks and provincial forests were not included in the sample.

A LSSG sub-committee analyzed the data and prepared this report on the potential impact of leafy spurge in Manitoba. This group relied on the analysis model developed at North Dakota State University (NDSU). There are four steps to the impact analysis methodology, which are as follows:

Step 1: Identify the potential impact of the infestation by land-use type. (e. g., reduced carrying capacity, increased soil erosion, reduction of species diversity).

Step 2: Determine the impact in quantitative terms. (e. g., calculate the reduced carrying capacity of the land in terms of Animal Unit Months).

Step 3: Calculate the direct economic impacts in financial terms.

Step 4: Estimate the secondary impacts.

The following chart on page 3 summarizes the estimated net economic impact of leafy spurge infestation in Manitoba today.

Total Direct and Indirect Economic Impacts

	Grazing Land	Public Land	Rights of Way
Direct Annual Impacts	> \$5 M	\$0.8 M	\$0.4 M
Secondary Annual Impacts	> \$11 M	\$1.7 M	N/A
Total Annual Impacts	> \$16 M	\$2.5 M	\$0.4 M

Over \$19 M
per year

1.0 Introduction

The **Leafy Spurge Stakeholders Group** (LSSG) was formed in the fall of 1998 to examine the issues and impacts of leafy spurge. This plant is an invasive noxious weed that infests thousands of acres in Agro-Manitoba. The LSSG is a broad coalition of agricultural and conservation groups and all three levels of government. This coalition is spearheaded by the Weed Supervisors Association of Manitoba and co-ordinated by WESTARC Group Inc. of Brandon University. The current objectives of the group are:

- to raise the awareness of the leafy spurge problem and the need for action by all levels of government, private landowners, producer groups and conservation organizations;
- to provide accurate and locally based information on the extent and economic impact of the leafy spurge problem in Manitoba;
- to provide information to landowners to enable them to effectively control and manage leafy spurge on their properties; and
- to co-ordinate leafy spurge efforts in Manitoba to ensure the best use of resources by all agencies.

1.1 Leafy Spurge Stakeholders

- Manitoba Agriculture and Food
- Ducks Unlimited
- Manitoba Equine Ranchers Association
- Manitoba Weed Supervisors Association
- Manitoba Cattle Producers Association
- Manitoba Habitat Heritage Corporation
- Agriculture and Agri-Food Canada
- Manitoba Conservation
- Manitoba Department of Highways
- Prairie Farm Rehabilitation Administration
- Canadian Forces Base Shilo
- Keystone Agricultural Producers
- Canadian Wildlife Service
- Sheep Association of Manitoba
- Assiniboine Community College
- Nature Conservancy of Canada
- Association of Manitoba Municipalities

In the summer of 1999, the Leafy Spurge Stakeholders Group embarked on a project to develop an estimate of the leafy spurge infestation in Manitoba and its potential impact. Data on infestation levels was obtained from three main sources. These sources included:

- a survey of weed control districts conducted by Weed Supervisors;
- reports from Manitoba Agriculture Representatives on estimates of infestations in 112 rural municipalities; and
- a 1981 survey from which data was extrapolated to provide information for those rural municipalities for which there were no other sources of data.

The following document was prepared after an ad hoc working group assembled on November 27, 1999 to examine the potential impacts of leafy spurge in Manitoba. The participants of the working group included:

Janet Moore — Manitoba Conservation

Kim Brown — Manitoba Agriculture & Food

Paul McCaughey — Agriculture & Agri-Food Canada

John Johnston — Manitoba Weed Supervisors Association

Les Routledge (facilitator) — WESTARC Group Inc.

2.0 Gauging the Extent of the Infestation

2.1 Data Collection Approach

Detailed information on leafy spurge infestation was collected through a survey of Rural Municipalities included in weed control districts. The survey was conducted on a quarter-section level of resolution. Responding weed control supervisors were asked to provide data for four categories, namely private land, crown grazing land, wildlife management, and right-of-ways. The results of this survey indicated that at least 174,940 acres of land have been impacted by leafy spurge infestation. This figure includes 166,920 acres of grazing land, 107,000 acres of public lands (DND, Spruce Woods, other), and 5,951 acres along roadways and other right-of-ways. The survey form is appended as Appendix 3 of this document.

Agriculture Representative Districts for areas not contained in weed control districts were also surveyed to collect additional information on leafy spurge infestation. Data was received for 112 Rural Municipalities. In the Brandon District, the methodology involved interviewing counselors from each ward. The information collected using this methodology identified the total number of acres containing leafy spurge. Seventy percent (79 Rural Municipalities) indicated a presence of leafy spurge. More detailed information on the number of acres impacted was collected on 14 Rural Municipalities which indicated that 61,207 acres of land in these 14 Rural Municipalities are infested. The results of this data collection process are contained in Appendix 4.

Combining the two approaches indicates that at least 340,000 acres of land are impacted by leafy spurge infestation. This figure includes 225,000 acres of grazing land, 107,000 acres of public lands (DND, Spruce Woods, etc.), and 8,200 acres along roadways and other right-of-ways.

Table 1 on below presents the current estimated level of leafy spurge infestation in Manitoba by responding Municipality. The first row tabulates the impacted acres that were identified in the weed control districts by weed control supervisors. The second row tabulates the estimated impacted acres in Canadian Forces Base Shilo and Spruce Woods Provincial Park. The third row contains an estimate of the impacted acres contained in the survey of the Rural Municipalities described previously.

For the purposes of this preliminary analysis, it was assumed that 100% of crown lands were used for grazing purposes and 100% of public lands and wild lands were not used for grazing purposes. It was also assumed that Canadian Forces Base Shilo and Spruce Woods Provincial Park were not used for grazing purposes.

Table 1

RM	Land Type	Grazing Land Acres	Public Lands and Wildlife Habitat Acres	Right-of-ways Acres	Total Acres
	RMs in Weed Control Districts	166,922	2,066.5	5951.5	174,940
	Other (Parks and Base)	0	103,940	0	103,940
	Survey of RMs	58,083	810	2313	61,207
	Total Acres	225,005	106,817	8265	340,087

A more detailed table appears as Appendix 2 to this document.

2.2 Density of Leafy Spurge Infestation

Highly detailed information was received for approximately 175,000 acres of the impacted land. This amount represents about 50% of the total impacted acres. The sample included all land types.

Approximately 85% of these acres were in quarter sections that were characterized as being severely impacted, with 70% of the acreage in these sections being infested by leafy spurge. At these rates of infestation, previous research from a similar study conducted in North Dakota¹ indicates that the carrying capacity of the land is reduced to near zero. North Dakota State University (NDSU) states that when patch density reaches 30% canopy cover (about 80-120 stems per square metre), grazing use by cattle approaches zero.²

An additional 10% of these acres were in quarter sections that were characterized as being moderately infested with percentage infestation levels ranging from 30% to 70%. Based on this previous research, the carrying capacity of the land with this level of infestation is reduced by between 37.5% and 100%. The remaining 5% of these acres were in quarter sections that were characterized as being lightly infested with percentage infestation levels of less than 30%.

It is not possible at this time to extrapolate these observations to the rest of the infested land area (i.e. the remaining 168,000 acres). However, it is possible to conclude that at least 48% of the land infested by leafy spurge in Manitoba is experiencing a moderate to severe (48% to 100%) reduction in the carrying capacity of the land. Map 1 on the following page plots the acres of infested land for the province of Manitoba in 1999.

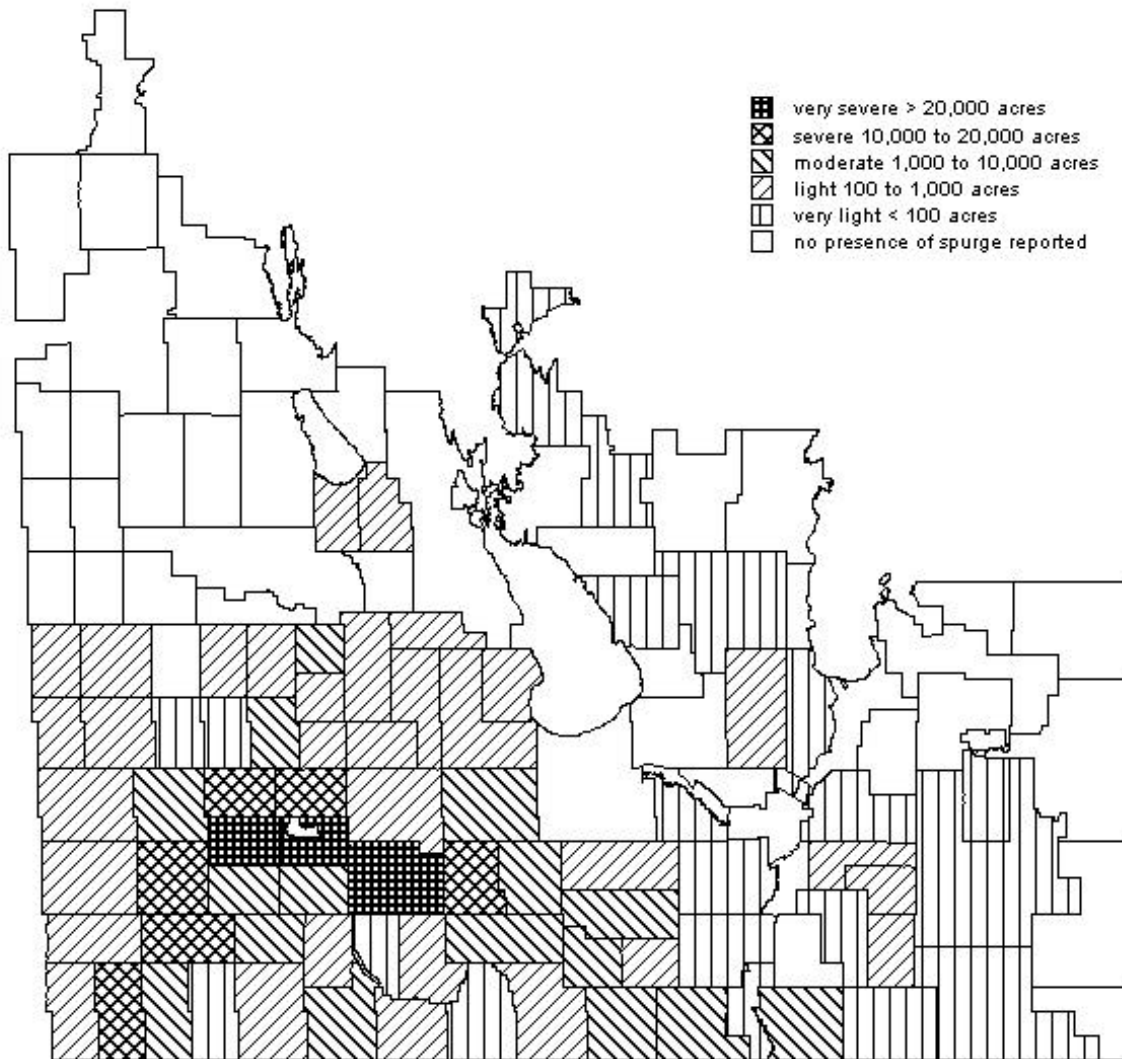
¹ Thompson, Flint, Leistriz, F. Larry, and Leitch, Jay A., Economic Impact of Leafy Spurge in North Dakota. Agricultural Economics Report No. 257, NDSU, Fargo, North Dakota, February 1990.

² Correspondence from Dean Bangsund, NDSU to Les Routledge, WESTARC Group Inc. August 10, 2000.

Map 1

Acres of Leafy Spurge Infestation

Province of Manitoba 1999
Includes Data from Weed
Supervisors and Ag Reps



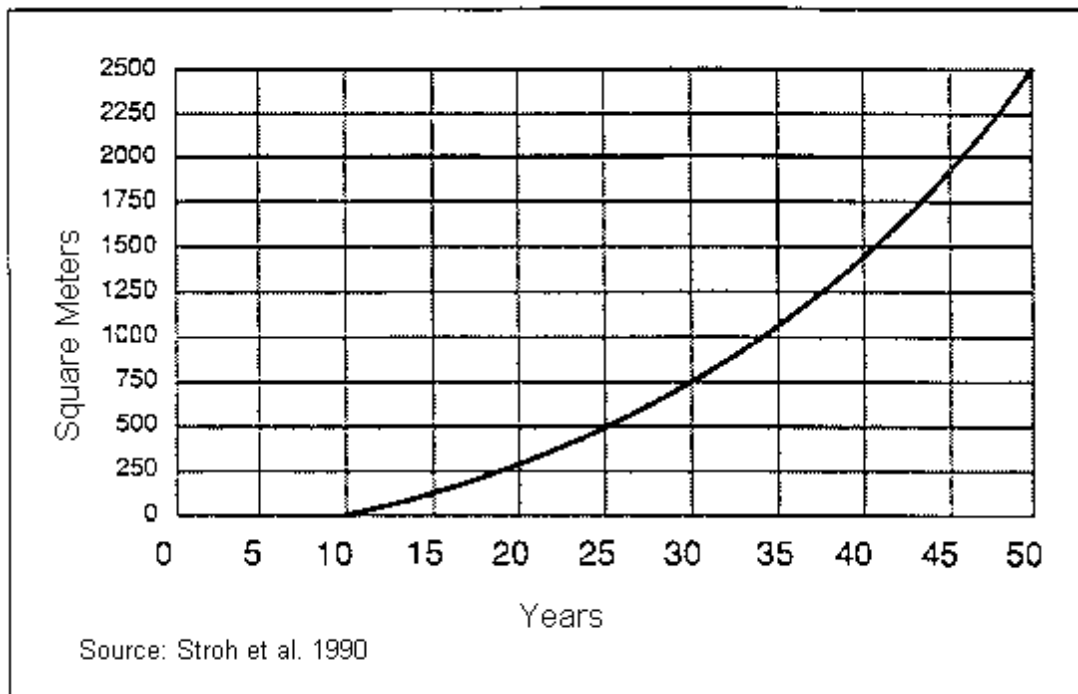
2.3 Potential Data Gaps

Due to limited resources, there may be additional areas of infestation that were not captured in this survey. For example, as illustrated by Map 2 on page 10, the range of the infestation extends across most of southern Manitoba. From a survey conducted in 1981, we also know that areas of light infestation extend into the areas surrounding Riding Mountain and Duck Mountain. The map presents an overlay of the 1981 data with the data collected in 1999. Overall, the map illustrates that the estimated number of impacted acres is likely to be low, because the 1999 study does not include data from several of the rural municipalities that were known to have been impacted in 1981.

In the 1981 surveys, these areas were characterized as being lightly infested. Over a 20-year period, previous research from North Dakota has reported that an area covered by a leafy spurge patch can expand sixteen-fold. Chart 1 below shows a graph of how a leafy spurge patch can expand. Accordingly, the amount of infestation reported in this survey may be underestimating the total extent of the problem across the province.

An additional potential data gap in the 1999 profile occurs with nature lands. Additional research is required to estimate the potential number of acres impacted in parks and provincial forests that were not included in the 1999 profile.

Chart 1: Leafy Spurge Patch Expansion³

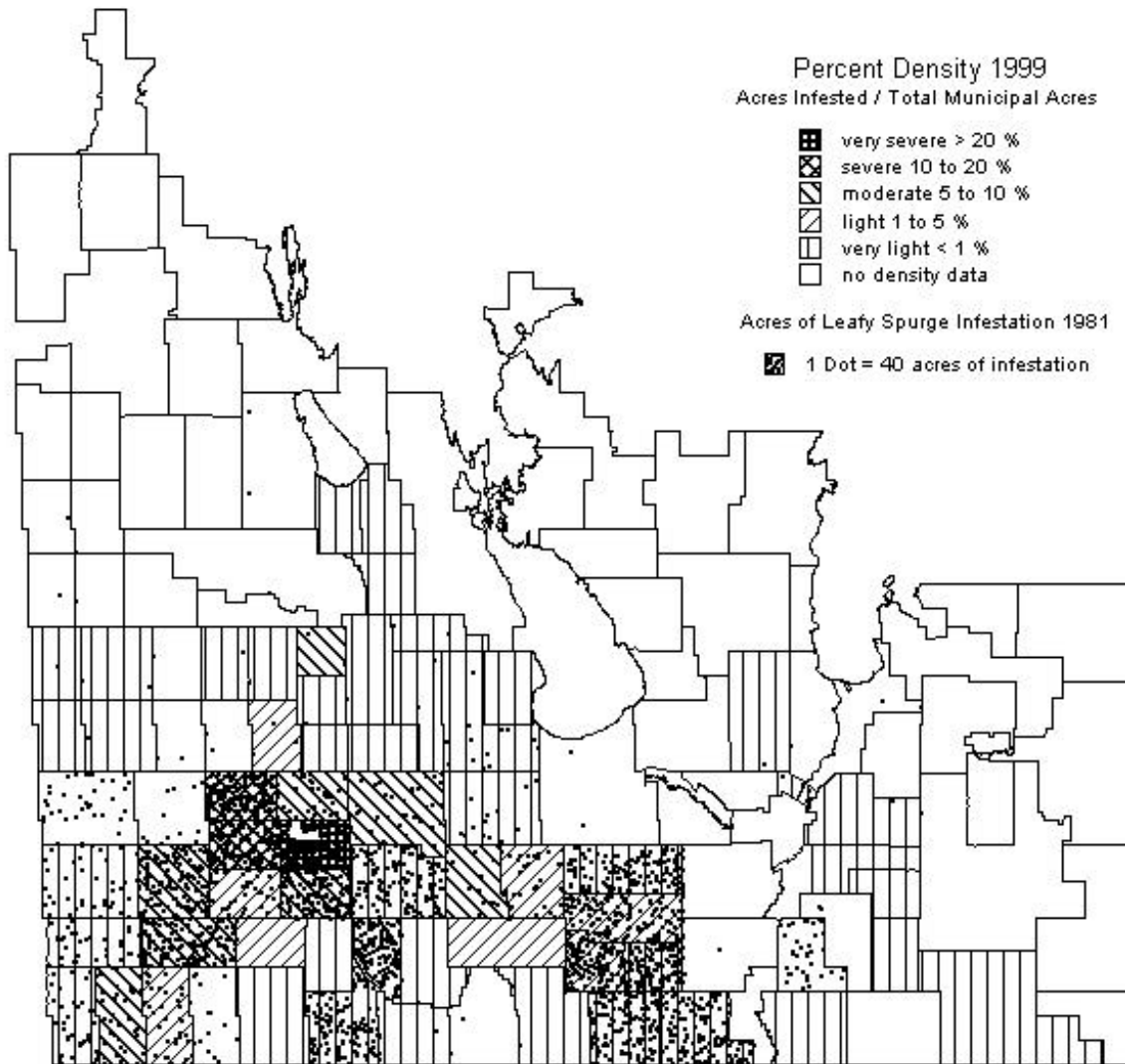


³ Stroh, Rodney K., Bandsund, Dean, and Leitch, Jay A., Leafy Spurge Patch Expansion, Staff Paper No. AE90001, Department of Agricultural Economics NDSU, Fargo, North Dakota, 1990.

Map 2

Density of Leafy Spurge Infestation

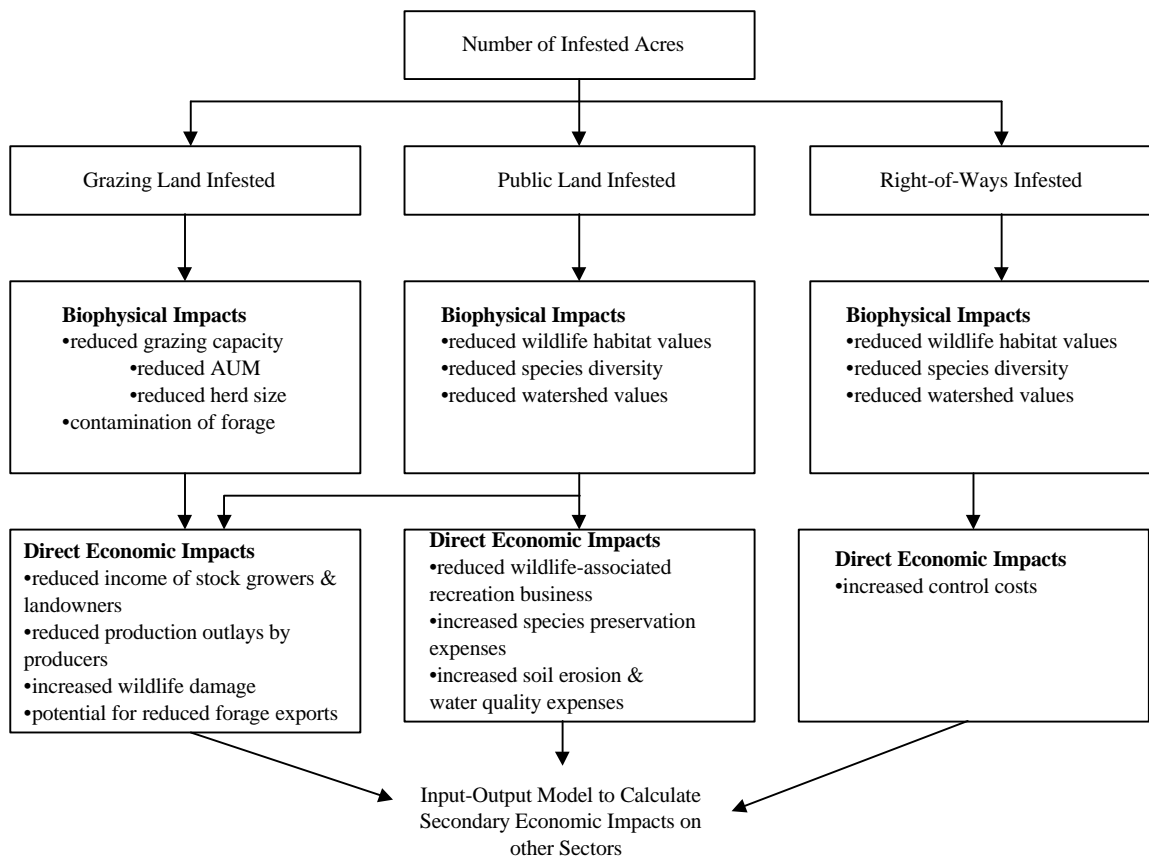
Province of Manitoba 1999
Includes Indication of
Presence Representing
1981 / 1999



3.0 Assessing the Impacts

The impact assessment methodology presented in the following sections is modeled on the impact assessment techniques developed by North Dakota State University (NDSU). A bibliography of the referenced studies appears at the end of this report. NDSU has completed grazing land impact assessments for North Dakota, South Dakota, Montana, and Wyoming. The overview of their grazing lands impact assessment approach is presented in the left-hand column of boxes in Chart 2.

Chart 2: Impact Assessment Approach



NDSU has also completed an economic impact assessment for North Dakota’s wildlands⁴. The NDSU analysis was considered as preliminary in nature, with a requirement of additional research to substantiate the impacts in both biophysical and economic terms. The principle types of impacts considered by NDSU were reduced wildlife carrying capacity, reduced hunting & recreation activity, and increased soil erosion and flood damage. The overview of their public land impact assessment approach is presented in the centre column of boxes in Chart 2.

⁴ Wallace, Nancy M., Leitch, Jay A., Leistriz, F. Larry, and Economic Impact of Leafy Spurge on North Dakota Wildland. Agricultural Economics Report No. 281, NDSU, Fargo, North Dakota, March 1992.

A third type of impact associated with infestation of right-of-ways is included in our analysis framework for Manitoba. This element has been included to lay a foundation for identifying potential costs, such as control costs incurred by owners of roads, railways, pipelines, hydro-electric lines and other right-of-ways. The overview of their right-of-ways impact assessment approach is presented in the right hand column of boxes in Chart 2.

3.1 Impact Analysis Methodology

For each stream of focus in Chart 2, the impact assessment methodology is modeled after federal benefit-cost analysis guidelines⁵ and the NDSU impact assessment methodology.

The three streams in Chart 2 demonstrate the four-step process of our methodology that follows:

- Step 1: Identify the potential impact of the infestation by land use type (e.g. reduced carrying capacity, increased soil erosion, reduction of species diversity).
- Step 2: Determine the impact in quantitative terms, if possible (e.g. calculate the reduced carrying capacity of the land in terms of Animal Unit Months (AUM)⁶).
- Step 3: Calculate the direct economic impacts in financial terms.
- Step 4: Estimate the secondary impacts

The following analysis should be considered as preliminary in nature. Funding and resource constraints have restricted the study by limiting the resolution of the impact assessment calculations; and by requiring the analysis to be based on North Dakota input-output multipliers.

3.2 Grazing Land Impacts

3.2.1 Biophysical Impacts

The NDSU research has identified that a leafy spurge infestation can reduce the carrying capacity in two ways. First, it inhibits normal herbage production from direct competition of the spurge plant. Second, it reduces available herbage since cattle totally or partially avoid grazing on infested range sites⁷.

The NDSU research has not considered potential impacts on forage production or on minimum tillage croplands. It is possible that the economic value of these impacts (per acre) may be higher than for grazing land.

⁵ Benefit-Cost Analysis Guide. Planning Branch, Treasury Board Secretariat, March 1976.

⁶ “The amount of forage required by one animal unit (AU) for one month is called an animal unit month (AUM). One animal unit is defined as a 1,000 lb. (450 kg.) beef cow with or without a nursing calf with a daily requirement of 26 lbs. (11.8 kg) of dry matter forage. Therefore, one AUM is equal to 780 lbs. (380 kg) of dry matter forage (30 days x daily forage requirement).” This description of AUM was found at the Manitoba Agriculture and Food Website. <http://www.gov.mb.ca/agriculture/crops/forages/bjb00s17.html#Animal Unit Month>

⁷ Thompson, Flint, Leistriz, F. Larry, and Leitch, Jay A., Economic Impact of Leafy Spurge in North Dakota. Agricultural Economics Report No. 257, NDSU, Fargo, North Dakota, February 1990.

It should also be noted that the NDSU analysis assumes that the grazing land is used for cattle production. In the opinion of the working group participants, this assumption was considered reasonable for Manitoba. It is acknowledged, however, that grazing land is also used for other livestock such as horses, bison, elk, etc.

Previous NDSU research has found that the number of lost AUM varies significantly depending on underlying productive capacity of the land in question. If possible, in future analyses in Manitoba, it could be recommended to segment the analysis by soil type and vegetation cover (available through GIS mapping) to more accurately calculate the value of lost AUM on a municipality-by-municipality or township-by-township basis. Previous analysis conducted by NDSU in the Northern Great Plains⁸ calculated lost Animal Unit Months (AUM) on a county by county basis in four states. They are as follows:

- South Dakota – 1.2 AUM lost per infested acre
- North Dakota – 0.61 AUM lost per infested acre
- Wyoming – 0.4 AUM lost per infested acre
- Montana – 0.34 AUM lost per infested acre

For the purposes of this analysis, it was observed that about 80% of Manitoba's beef herd are grazed on native grasslands. It was assumed that 0.6 AUM is lost on native pasture and 1 AUM is lost on tame pasture. On a weighted basis, these assumptions result in an average of 0.68 AUM lost AUM per infested acre. It should be noted, however, that the current data for Manitoba does not separate tame versus native grasslands in the inventory of infested acres. It is recommended that future inventories should include this segmentation. The Manitoba working group was of the opinion that 0.68 lost AUM per infested acre was a reasonable working assumption for Manitoba. Using the above AUM impact assumptions, it is possible that the current leafy spurge infestation on 225,000 of grazing land is reducing carrying capacity by 153,000 AUM per year.

Lost AUM reduces the maximum herd size in the province. For North Dakota, NDSU assumed that a loss of 9.25 AUM⁹ reduced the beef herd by one head. For this preliminary analysis using this ratio, this lost carrying capacity may be reducing the potential size of the Manitoba beef herd by 16,540 head. This amount represents between 3% and 4% of the current beef herd in the province.

3.2.2 Direct Economic Impacts

Previous NDSU analyses have quantified the value of a lost AUM at between \$10 and \$12. The Manitoba working group considered current market rental rates for grazing land and concluded that a weighted average of \$12.68 per AUM was a reasonable estimate for Manitoba. This calculation was based on the assumption that 80% of lost AUM were on native grasslands that rent for \$0.32 per head per month (current community pasture rates),

⁸ Bangsund, Dean A. and Leistriz, F. Larry, Economic Impacts of leafy Spurge on Grazing Lands in the Northern Great Plains. Agricultural Economics Report No. 275-S, NDSU, Fargo, North Dakota, November 1991.

⁹ There may be subtle adjustments to this figure (9.25 AUMs per lost cow) dependent upon current grazing practices in Manitoba, which could have substantial effects on the level of lost economic activity.

and that 20% of lost AUM were on improved or tame pasture that could be rented for higher rates.

In 1991, another NDSU study¹⁰ developed a methodology to determine the impact of reduced herd size on production outlays such as forage, grain, and livestock services. On average across the four states considered in this study, the size of this impact was about 1.6 times the impact of lost production on producers and landowners. For this preliminary analysis, it was decided to use this ratio to estimate the size of the impact in Manitoba.

From an economic perspective, it appears that leafy spurge may be costing Manitoba over \$5 million in lost income per year. About \$2 million of this lost income may be incurred by livestock producers and over \$3 million will be lost by providers of inputs such as forage, grain, and livestock services.

From a gross revenue perspective, assuming that the market value per head for the beef herd is \$500, and assuming a loss of 16,540 head of cattle, leafy spurge may be reducing total gross receipts in the livestock sector by over \$8 million per year.¹¹ Since producers are unable to maintain a larger herd size due to the presence of leafy spurge, these revenues are simply unattainable. From a policy perspective, this implication could impede efforts to adapt and diversify the agricultural economy of rural Manitoba.

3.2.3 Secondary Economic Impacts

Calculating secondary economic impact assessments typically requires the use of input-output tables. While these tables are available from Statistics Canada for Manitoba, funding limitations precluded their use at this time.

As an alternative, it was decided to employ the North Dakota ratios to estimate secondary economic impacts in Manitoba. Based on the North Dakota input-output model, the total effect on other business sectors is calculated at approximately 2.2 times the direct impact. Using that ratio for Manitoba would imply potential secondary economic impacts on other business sectors of \$11 million per year. It is thought that using this model may be understating the level of secondary impacts in Manitoba.

The 1991 NDSU study¹² also estimated the impact of infestation in terms of its reduction on land values. Based on that study, the reduced value of infested land is approximately 15.9 times the value of lost AUM. With an infestation affecting approximately 153,000 acres, it is possible that there could be a province-wide reduction in land values of over \$30 million per year.

¹⁰ Bangsund, Dean A. and Leistritz, F. Larry, Economic Impacts of leafy Spurge in Montana, South Dakota, and Wyoming. Agricultural Economics Report No. 275, NDSU, Fargo, North Dakota, October 1991.

¹¹ The Manitoba Working Group defined \$500 per head and a loss of 16,540 head of cattle to be appropriate working estimates.

¹² Bangsund, Dean A. and Leistritz, F. Larry, ib.id., Fargo, North Dakota, October 1991.

It was noted by the participants in the Manitoba working group that these reduced land values could/will impact on land taxes. The owner of the infested land may be able to argue for a reduction in tax rates due to the lower market value of the land. When faced with this situation, municipalities may need to increase tax rates on other types of land to make up for the shortfall in revenue.

In summary, the presence of leafy spurge infestation on grazing land may be reducing income in Manitoba by over \$16 million per year. This figure accounts for the \$5 million in direct economic impact and the \$11 million in indirect economic impact as mentioned previously. In this impact assessment summary we have not attempted to quantify the economic impacts associated with the following:

- foregone income taxes for governments;
- increased wildlife damage on farms due to displaced wildlife from nature lands;
- potential lost forage and crop land production (e.g. zero/minimum tillage);
- potential risk of loss of forage export markets due to contaminated forage product;
- reduced land values and property tax impacts; and
- reduced size of the provincial beef herd.

3.3 Public Lands Impacts

Public lands are owned and administered by the Government of Canada and the Province of Manitoba and have various designations. These land designations cover a range of uses and activities including:

- Provincial Parks and Provincial Forests
- Wildlife Management Areas
- Department of National Defense Training Area located at CFB Shilo
- Provincial Wildlife Refuges
- Crown Lands coded for nature and other values

For the purposes of this analysis, the Manitoba working group assumed that public lands were used for non-agricultural purposes unless specific data indicated otherwise (i.e. Crown Lands under agricultural use permits for grazing, and Prairie Farm Rehabilitation Administration (PFRA) Community Pasture used for grazing).

The 1999 survey found that about 107,000 acres are infested and most of those acres are severely or very severely infested (greater than 70% infestation). However, the inventory on impacted public lands may be incomplete. While the survey did include Spruce Woods and the Lauder Sandhills/Assiniboine Wildlife Management Areas, nature lands in other national/provincial parks and forests were not included. There exists the potential for future expansion in Riding Mountain, Duck Mountain, and Whiteshell and Bird's Hill areas as well as smaller wildlife management areas.

Two types of potential impacts on public lands were considered, namely reduced habitat value and increased soil erosion/flood damage. The following sections explore these impacts in more detail.

3.3.1 Reduced Habitat Value

The impact of leafy spurge on habitat values can include a reduced carrying capacity on nature lands for a variety of species as leafy spurge plants are able to “choke out” other existing vegetation. Although some species such as certain bird species can potentially use leafy spurge as a food source, there are several other species that may not be able to include leafy spurge in their respective diets. Major changes in plant diversity caused by leafy spurge infestation may lead to a lack of cover or forage needed to sustain indigenous wildlife populations.

Additionally, leafy spurge infestations may lead to a reduction in species diversity. There is the potential to further pressure vulnerable species, due to loss of natural habitat. The working group participants identified several vulnerable species that are protected under the Manitoba Protected Species Act as being potentially impacted including the Western Spiderwort, the Baird’s Sparrow, and the Small White Lady Slipper.

Placing an economic value on reduced habitat values is a difficult process. The underlying field science to determine the harm caused by leafy spurge and the impact on carrying capacity or species diversity is not well developed.

One NDSU study¹³ conducted in 1992 attempted to quantify the economic value of reduced habitat values by measuring the potential losses in consumptive and non-consumptive recreation spending. That study concluded that potential direct economic impact was \$2,952,795 per year for the 468,000 acres of infested public lands or approximately \$6.30 per acre. If this type of relationship applies in Manitoba, the direct economic impact value could amount to \$674,000. Further, if the North Dakota input-output ratios are used, the secondary economic impacts in Manitoba could amount to \$1,550,000.

Further work is required to determine that these impacts apply to Manitoba. For example, the extent of the infestation is mostly south of the 53rd parallel. As such, it most likely will not impact tourism and recreation spending linked to the northern part of the province.

¹³ Wallace, Nancy M., Leistriz, F. Larry and Leitch, Jay A., Economic Impact of Leafy Spurge on North Dakota Wildland. Agricultural Economics Report No. 281, NDSU, Fargo, North Dakota, March 1992.

3.3.2 Increased Soil Erosion/Flood Damage

The NDSU study conducted in March of 1992¹⁴ has identified potential losses of watershed value from leafy spurge infestation. Overall, it is believed that leafy spurge reduces the ability of infested land to hold rainfall and spring run-off. This in turn can lead to an increase in downstream land erosion and reduced water quality. Soil-erosion damages can include:

- on site loss of soil structure and plant nutrients;
- off site damage experienced through degradation of surface water by run-off carrying sediment; and
- off-site impaired ground cover which may lead to more rapid run-off contributing to increased soil erosion and flood damage.

In economic terms the impacts can include:

- increased water treatment costs paid by government; and
- increased costs to mitigate or repair rapid water run-off (e.g., soil erosion, flood control, etc.)

The NDSU analysis determined that reduced watershed value was \$1.47 per infested acre of nature land. If this ratio applies in Manitoba, the reduced watershed value may equate to direct economic impacts of \$157,000 per year, and secondary economic impacts of \$124,000 per year or a total impact of \$281,000.

3.3.3 Summary of Public Lands Impacts

Chart 3 on the following page, while preliminary in nature, presents potentially reasonable estimates of the total annual economic impacts on recreation and water conservation from leafy spurge infestation. Direct and secondary economic impacts on recreation account for \$2,224,000. Direct and secondary economic impacts on water conservation account for \$281,000. Together these economic impacts account for \$2,505,000.

¹⁴ Wallace, Nancy M., Leistriz, F. Larry and Leitch, Jay A., *ib.id.*, Fargo, North Dakota, March 1992.

Chart 3: Public Lands Impacts

	Recreation	Water Conservation	Total
Direct Annual Impacts	\$674,000	\$157,000	\$831,000
Secondary Annual Impacts	\$1,550,000	\$124,000	\$1,674,000
Total Annual Impacts	\$2,224,000	\$281,000	\$2,505,000

3.4 Impact of Infestation on Right-of-Ways

The primary current economic impact of infestation on right-of-ways is increased control costs. These appear to be close to \$400,000 per year. This figure breaks down as follows:

- Weed Control Districts - \$300,000
- Department of Highways - \$53,000
- Railways - \$12,000
- Pipelines/Hydro – undetermined

In the future, the costs of infested right-of-ways could include costs to compensate landowners for land infested from right-of-ways. Working Group members noted that this potential liability might exist under the Noxious Weeds Act.

4.0 Total Direct and Indirect Economic Impacts

This preliminary study is based on the data that was available to be collected at the time. In fact, the total direct and indirect economic impacts are probably even greater than has been stated in this report. Given that these are conservative estimates, leafy spurge infestations may be even more costly to the province of Manitoba.

Based on the data collected for this study, the net economic impacts associated with the leafy spurge infestation may be approaching \$20 million per year, as summarized in Chart 4 on the following page.

If no control actions are taken to limit the growth rate of the infestation, it is possible that the impacted acres (and by extension economic impacts) could increase rapidly over time. Chad Prosser, a research scientist for the United States Department of Agriculture (USDA), recently participated in a municipal weed meeting sponsored by the Manitoba Weed Supervisors Association in Holland, Manitoba. Experts previously believed that “a leafy spurge patch could double in size in 10 years. Now they think it can double in five.”¹⁵ This represents the biological potential to spread, but not necessarily the actual spread.

Individual small patches have the potential to double every five years, but this does not include seed dispersal in new patches. Overall, NDSU research indicates that patches can double every ten years. Established leafy spurge infestations are more likely to spread by rhizomes, while seed dispersal might not contribute as much to that potential spread.

Other indicators of impact include:

- a potential reduction in the Manitoba beef herd of over 17,000 head causing a potential decrease of gross receipts of over \$8.5 million per year,
- potential reduction of land values by nearly \$40 million,
- potential for increased wildlife damage to agricultural producers and the general public, and
- potential for reduced species diversity.

¹⁵ Dawson, Allan, “*Leafy spurge costs Manitoba \$19 million a year*”, The Manitoba Co-operator, Vol. 57, No. 33 March 23, 2000.

Chart 4

Total Direct and Indirect Economic Impacts

	Grazing Land	Public Land	Rights of Way
Direct Annual Impacts	> \$5 M	\$0.8 M	\$0.4 M
Secondary Annual Impacts	> \$11 M	\$1.7 M	N/A
Total Annual Impacts	> \$16 M	\$2.5 M	\$0.4 M

Over \$19 M per year

5.0 Conclusions

With this type of analysis, there are limitations. The field data was not complete and this study had to rely upon studies completed by North Dakota State University using data from North Dakota. The impact estimate would benefit from closing the current data gaps. Although data gaps exist, leafy spurge remains a serious economic problem as evidenced by the level of economic loss estimated in this study.¹⁶

Because of these limitations, there are certain implications regarding reliability. This analysis is probably understating the number of acres affected, lost production values, and other economic damage. However, it is acceptable as an order of magnitude estimate, which can be used for policy development purposes.

As a result of this limited approach and the implications in terms of reliability, there is a definite need for further research. There needs to be more field research to fill in the data gaps. Additional field research should cover any missed areas and go into more detail with regard to soil type, density, and land use.

There also needs to be more research into the impacts of leafy spurge infestation on habitat and watershed areas. This research would have to address such issues as lost carrying capacity, threatened species/sensitive wildlife habitat, and soil erosion/flooding.

¹⁶ Correspondence from Dean Bangsund of NDSU to Les Routledge of WESTARC Group Inc.

Appendix 1: References

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Appendix 2: Table of Infestation

Rural Municipality	Acres	Wildlife Gr: Rights of Way			Grazing	Crown	Wildlife	Right-of-Wa
RM'S IN WEED CONTROL DISTRICTS								
Brokenhead	1	-	-	1	0%	0%	0%	100%
Argyle	300	240	-	60	80%	0%	0%	20%
Lorne	2,700	2,160	-	540	80%	0%	0%	20%
Arthur	11,294	11,181	-	113	99%	0%	0%	1%
Edward	931	888	11	32	95.4%		1.2%	3.4%
Blanshard	10	10	0	0	95.4%		1.2%	3.4%
Hamiota	0	-	-	-	95.4%		1.2%	3.4%
Woodworth	1,990	1,898	24	68	95.4%		1.2%	3.4%
Brenda	7,400	7,030	-	370	95%	0%	0%	5%
Winchester	100	95	-	5	95%	0%	0%	5%
Cameron	18,000	17,172	216	612	95.4%		1.2%	3.4%
Glenwood	2,000	1,908	24	68	95.4%		1.2%	3.4%
Sifton	12,000	11,448	144	408	95.4%		1.2%	3.4%
Cornwallis	50,544	48,219	607	1,718	95.4%		1.2%	3.4%
Dufferin	8,233	7,410	-	823	90%	0%	0%	10%
Franklin	2,000	1,800	-	200	90%	0%	0%	10%
South Cypress	28,938	28,938	-	-	100%	0%	0%	0%
Armstrong	1	1	0	0	95.4%		1.2%	3.4%
Louise	20	16	-	4	80%	0%	0%	20%
Robin	270	216	-	54	80%	0%	0%	20%
MacDonald	20	19	0	1	95.4%		1.2%	3.4%
Morris	3	2	0	0	95.4%		1.2%	3.4%
Montcalm	3	2	0	0	95.4%		1.2%	3.4%
North Cypress	700	665	-	35	55%	40%	0%	5%
North Norfolk	1,885	1,508	94	283	65%	15%	5%	15%
Pembina	450	248	68	135	40%	15%	15%	30%
Portage la Prairie	350	334	4	12	95.4%		1.2%	3.4%
Piney	65	59	-	7	85%	5%	0%	10%
Stuartburn	95	86	-	10	85%	5%	0%	10%
Rockwood	437	371	-	66	80%	5%	0%	15%
Rosser	0	-	-	-	95.4%		1.2%	3.4%
St. Andrews	1	1	0	0	95.4%		1.2%	3.4%
South Norfolk	5,250	5,040	158	53	66%	30%	3%	1%
Victoria	15,750	15,120	473	158	66%	30%	3%	1%
Wallace	142	85	-	57	50%	10%	0%	40%
Turtle Mountain	2,140	1,926	171	43	90%	0%	8%	2%
Riverside	917	825	73	18	90%	0%	8%	2%
Whitemouth	1	1	0	0	95.4%		1.2%	3.4%
Reynolds	0	-	-	-	95.4%		1.2%	3.4%
SUB - TOTAL	174,940	166,922.0	2,066.5	5,951.5				
OTHER - Parks & Base								
DND	45,000	-	45,000	-				100%
	58,940	-	58,940	-				100%
SUB-TOTAL	103,940	0	103,940	0				
SURVEY OF RM'S								
R.M. of Grey	250	239	3	9	95.4%		1.2%	3.4%
R.M. of Roland	130	124	2	4	95.4%		1.2%	3.4%
R.M. of Cartier	5	5	0	0	95.4%		1.2%	3.4%
R.M. of Headingly	10	10	0	0	95.4%		1.2%	3.4%
R.M. of Daly	17,510	16,705	210	595	95.4%		1.2%	3.4%
R.M. of Whitehead	23,040	21,980	276	783	95.4%		1.2%	3.4%
R.M. of Oakland	10,000	9,540	120	340	95.4%		1.2%	3.4%
R.M. of Saskatchewan	2,000	1,908	24	68	95.4%		1.2%	3.4%
R.M. of Stanley	2,000	1,600	100	300	80%		5%	15%
R.M. of Odanah	500	477	6	17	95.4%		1.2%	3.4%
R.M. of Langford	500	477	6	17	95.4%		1.2%	3.4%
R.M. of Lansdowne	500	477	6	17	95.4%		1.2%	3.4%
R.M. of Rhineland	2,000	1,908	24	68	95.4%		1.2%	3.4%
	2,762	2,635	33	94	95.4%		1.2%	3.4%
	61,207	58,083	810	2,313				
TOTAL	340,087	225,005	106,817	8,265				

Appendix 3: Survey Form

Manitoba Weed Supervisors Association

August 31, 1999

All MWSA Members

As part of an in kind contribution to the Leafy Spurge Stakeholders Group (LSSG), the MWSA has committed to gather data on the number of acres of land infested with leafy spurge. This information will be used to determine the approximate number of acres of land infested with leafy spurge in the province today. We will use these figures to come up with an economic impact leafy spurge is having on various sectors of the Manitoba economy.

If you are in an area where there is a lot of leafy spurge, please do your survey by township. Estimate the number of acres on each quarter section using the following formula.

5% - 10% = 12 acres	31% - 35% = 52 acres	56% - 60% = 92 acres
11% - 15% = 20 acres	36% - 40% = 60 acres	61% - 65% = 100 acres
16% - 20% = 28 acres	41% - 45% = 68 acres	66% - 70% = 108 acres
21% - 25% = 36 acres	46% - 50% = 76 acres	71% - 75% = 116 acres
26% - 30% = 44 acres	51% - 55% = 84 acres	76% ===== 160 acres

There are 144 quarters in a township. Estimate the number of acres infested with leafy spurge on each quarter. 0% = 20 quarters, 10% = 25 quarters, 20% = 30 quarters, 50% = 35 quarters, 76% = 34 quarters.

Township 8, Range 24

20 quarters x 0 acres =	0 acres
25 quarters x 12 acres =	300 acres
30 quarters x 28 acres =	840 acres
35 quarters x 76 acres =	2660 acres
34 quarters x 160 acres =	<u>5440 acres</u>
	9240 acres

If your district has less than 100 acres of leafy spurge, please fill in survey as number of patches. Example: 20 patches x 20 meters x 20 meters = 8000 square meters or 2 acres.

Could you please include a map of each municipality in your district and shade in different colours the areas where leafy spurge is found. Very light infestation would be areas where only a small patch would be found, light infestation would be sections with 2 to 3 patches, moderate would be sections with more than a couple of acres, and severe would be sections that have 100 acres or more on them.

As you can tell, I am late getting this information out. We are having our next LSSG meeting on September 14, 1999 and would like to take this information to that meeting. It would be greatly appreciated if you could **fax** me the survey back **by the middle of next week (September 8, 1999)**.

In advance, I thank you for your cooperation in conducting this survey. If you have any questions, please give me a call.

John Johnston, Cameron Glenwood Sifton Weed District

Please Fax survey to (204) 855-2836

Appendix 4: Agricultural Representative Survey Results

Leafy Spurge by Agricultural Representative District

SOUTHWEST

Melita

RM of Edward	presence
RM of Arthur	presence
RM of Brenda	presence
RM of Albert	presence
RM of Cameron	heavy infestation

Neepawa

RM of Langford	Presence
RM of Lansdown	Presence
RM of Rosedale	Presence

Viriden

RM of Sifton	presence
RM of Pipestone	presence
RM of Archie	presence (light)
RM of Wallace	presence
RM of Woodworth	presence

Minnedosa

RM of Saskatchewan	Presence
RM of Odanah	None he is aware of
RM of Minto	Presence (light)
RM of Harrison	Presence (light)
RM of Clanwilliam	Presence (medium)
RM of Park	Presence (within last 24 months)

Boissevain

RM of Winchester	presence (very light)
RM of Morton	presence (light)

Hamiota

RM of Hamiota	Presence (light)
RM of Miniota	Presence (light)
RM of Blanchard	Presence (light)

Killarney

RM of Turtle Mountain	Presence
RM of Riverside	Presence
RM of Strathcona	Presence (very light)

Shoal Lake

RM of Birtle	Presence
RM of Strathclair	Presence
RM of Shoal Lake	No

Souris

RM of Whitewater	Presence
RM of Glenwood	Presence
RM of Oakland	Presence (heaviest in area)

Brandon

RM of Whitehead	Presence (heavy)
RM of Cornwallis	Presence (extremely heavy)
RM of Daly	Presence
RM of Elton	Presence (lighter)

Carberry

RM of North Cypress	Presence (heavy)
RM of South Cypress	Presence (medium)

CENTRAL

Pilot Mound

RM of Roblin	Presence (light)
RM of Louise	Presence (light)

Morden

RM of Pembina	Presence (light)
RM of Stanley	Presence (medium)

Altona

RM of Rhineland	Presence
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Morris

RM of Montcalm	Presence (light)
RM of Morris	Presence (light)
RM of MacDonald	Presence

Starbuck

RM of Grey	Presence
RM of Starbuck	Presence (light)
RM of Cartier	Presence (light)

Carman

RM of Roland	No
RM of Thompson	Presence (medium)
RM of Duffrin	Presence (heavy)

Treherne

RM of Victoria	Presence (heavy)
RM of South Norfolk	Presence (medium)
RM of Grey	Presence

Gladstone

RM of North Norfolk	Presence
RM of Westbourne	Presence
RM of Lakeview	Presence
RM of Glenella	Presence

Portage La Prairie

RM of Portage La Prairie	Presence
RM of Cartier	Presence

NORTHWEST

Ste. Rose

RM of McCreary	Presence (light)
RM of Ste. Rose	Presence (light)
RM of Alonsa	No
RM of Lawrence	No

Dauphin

RM of Ochre River	Presence (light)
RM of Dauphin	No
RM of Gilbert Plains	No
RM of Grandview	No

Roblin

RM of Boulton	No
RM of Shellmouth	No
RM of Hillsburg	No
RM of Shell River	No

Russell

RM of Ellice	Presence
RM of Russell	No
RM of Silver Creek	No
RM of Rossburn	No

Ethelbert

RM of Ethelbert	No
RM of Mossey River	No
RM of Mountain	No

Swan River

RM of Swan River	No
RM of Minitonas	No

The Pas

RM of The Pas	No
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EASTERN – INTERLAKE

Dominion City

RM of Franklin Presence (medium)

Vita

RM of Stuartburn Presence (light)
RM of Piney No

St. Pierre

RM of De Salaberry Presence (medium)
RM of Richot Presence
RM of Hanover Presence (very light)

Steinbach

RM of La Broquerie Presence (light)
RM of Ste. Anne Presence (light)
RM of Tache Presence (light)

Dugald

RM of Springfield Presence (very light)
RM of Whitemouth No
RM of Reynolds No

Beausejour

RM of Broken head No
RM of Lac du Bonnet No
RM of St. Clements No

Selkirk

RM of St. Andrews No
RM of West St Paul Presence (very light)
RM of East St. Paul Presence (very light)

Tuelon

RM of Armstrong
RM of Gimli

Stonewall

RM of Rockwood Presence (very light)
RM of Woodlands No
RM of Rosser No

Lundar

RM of Eriksdale No
RM of Coldwell Presence (very light)
RM of St Laurent Presence (very light)

Ashern

RM of Grahamdale Presence (very light)
RM of Sigunes Presence (very light)

Fisher Branch

RM of Fisher No

Arborg

RM of Bifrost No

SPURGE ACRES IN BRANDON DISTRICT

RM of Whitehead

TWP 9 Rng 22	10%	2304 acres
TWP 9 Rng 21	10%	2304 acres
TWP 9 Rng 20	5%	1152 acres
TWP 10 Rng 20	15%	3456 acres
TWP 10 Rng 21	55%	12672 acres
TWP 10 Rng 22	5%	1152 acres

Total 23040 acres

RM of Daly

TWP 11 Rng 20	5%	1152 acres
TWP 11 Rng 21	10%	2304 acres
TWP 11 Rng 22	50%	11520 acres
TWP 12 Rng 22	25%	5760 acres
TWP 12 Rng 21	10%	2304 acres
TWP 12 Rng 20	1%	230 acres
Total		17510 acres

RM of Elton

TWP 11 Rng 19	5%	1152 acres
TWP 11 Rng 18	2%	460 acres
TWP 11 Rng 17	2%	460 acres
TWP 12 Rng 17	1%	230 acres
TWP 12 Rng 18	1%	230 acres
TWP 12 Rng 19	1%	230 acres
Total		2762 acres

RM of Cornwallis

TWP 10 Rng 19	15%	1776 acres
TWP 10 Rng 18	60%	13056 acres
TWP 10 Rng 17	60%	13824 acres
TWP 9 Rng 17	35%	8064 acres
TWP 9 Rng 18	30%	6912 acres
TWP 9 Rng 19	30%	6912 acres
Total		50544 acres