

INVASIVE PLANT INVENTORY OF LNIB RESERVE LANDS

January 28, 2006

DRAFT



Funded by: Public Conservation Assistance Fund

Prepared for: Chief and Council & LNIB Membership

**Prepared by: LNIB Natural Resource Department
Dave Caswell RPBio**

Executive Summary

Invasive plants may be considered the second greatest threat to the environment, next to habitat loss. As many of these plants are non-native, they have no natural predators to keep them in check. As a result, these plants have considerable impacts in lowering agricultural productivity, poisoning livestock, wildlife, as well as disturbing ecological processes. Invasive plants often spread to the exclusion of many plants traditionally used for sustenance and medicinal purposes. Similarly, the use of herbicides to treat invasive plants may also impact traditional practices. Managing invasive plants is critical to protecting First Nations traditional values.

The Lower Nicola Indian Band (LNIB) is committed to protecting the values of its membership and the environment. In terms of managing invasive plants, the first step for the band was to determine the extent of infestation on its reserve lands. The Band's natural resource department was successful in requesting grant funding from the Public Conservation Assistance Fund to complete an invasive plant inventory on its reserve lands.

An inventory of LNIB reserves was completed where invasive plants were expected to have the greatest impact and where subsequent treatment is expected to have the greatest benefit. Following methodology outlined in: *Seven Steps to Managing Your Weeds – A Manual for Integrated Weed Management in British Columbia 2002* a roadside survey used a 4x4 truck and Global Positioning System (GPS) was completed in the Hamilton, Joeyaska, Shulus-Mameet, Speous, and Zoht reservations.

The inventory identified 20 different invasive plant species growing on LNIB reserve lands. The Zoht reservation had the highest number of species identified at 18, followed by the Shulus-Mameet reserve at 13, Speous at 8, Hamilton with 4 and Joeyaska at 3. Based on the inventory Spotted Knapweed is having the largest impact both in terms of frequency of occurrence and area of infestation. In total, Spotted Knapweed infested more than 280 acres of the reserve land sampled. Other invasive species that appear to spreading include Blueweed, Dalmation Toadflax, and Hound's Tongue.

The completed inventory is the first step towards invasive plant management on LNIB's reserve lands. Moving forward a workplan is proposed to develop a comprehensive management strategy. The natural resource department proposes to continue pursuing funding opportunities to develop treatment strategies where prevention and public awareness are the main priorities. To be effective the strategies should also incorporate the membership's traditional values. In addition, the natural resource department also proposes to work with housing, public works and construction departments to coordinate activities wherever possible.

Invasive Plant Inventory of Reserve Lands

Acknowledgements

Funding for the invasive plant inventory was provided by the Public Conservation Assistance Fund (PCAF). A support letter for the grant application to PCAF was provided by Phil Beliveau on behalf of John Metcalf at the Ministry of Environment, Southern Interior Region. Field work was completed by Dave Caswell and Rhoda Dick. JS Thrower & Associates completed the mapping.

Table of Contents

Executive Summary ii

1.0 INTRODUCTION 5

 1.1 Background..... 5

2.0 LNIB RESERVE LANDS 6

 2.1 Habitat Classification and Land Uses 6

 2.1.1 Hamilton 6

 2.1.2 Joeyaska 6

 2.1.3 Shulus-Mameet 6

 2.1.4 Speous 7

 2.1.5 Zoht 7

3.0 METHODS 7

4.0 RESULTS 8

 4.1 Weed Frequency 8

 4.1.1 Hamilton 8

 4.1.2 Joeyaska 9

 4.1.3 Shulus-Mameet 9

 4.1.4 Speous 10

 4.1.5 Zoht 11

 4.2 Area of Infestation 12

 4.2.1 Hamilton 12

 4.2.2 Joeyaska 13

 4.2.3 Shulus-Mameet 13

 4.2.4 Speous 13

 4.2.5 Zoht 13

5.0 Discussion 13

 5.1 Species Impacts..... 13

 5.2 Reserve Comparison 14

6.0 Workplan..... 16

Literature Cited 17

Appendix A: Biogeoclimatic Classifications of LNIB Reserve land (Lloyd *et al.* 1990).
..... 18

Appendix B. Example Data Sheet and Sample Codes..... 19

Appendix C. Invasive Plant Species Accounts 20

1.0 INTRODUCTION

In British Columbia invasive plants are often considered the second biggest threat to the environment, second only to habitat loss. Most invasive plants are considered “alien” to North America. Through abundant seed production and rooting these plants aggressively establish and spread into new areas. Invasive plants lower agricultural productivity, poison livestock, and disturb valuable ecological processes. In addition to agriculture and cattle ranching, First Nations continue to utilize a variety of plants and animals medicinal and sustenance purposes. Invasive plants can invade an area to the exclusion of many traditional use plants and animals. Furthermore, treatment methods of invasive plants such as the spraying of herbicides may also prevent traditional practices. As a result there is a high economic, social and cultural cost associated to the impacts and management of invasive plants.

The Lower Nicola Indian Band (LNIB) is dedicated to enhancing economic opportunity for its membership in a manner that supports First Nations culture and the environment. LNIB is also aware of the considerable threat invasive plants pose to the socio-economic and cultural values of its membership. To protect the values of its membership and the environment, LNIB is committed to managing invasive plants its reserve lands. One of the first steps towards managing invasive plants involves identifying and determining the extent of infestation. To begin managing invasive plants LNIB completed an invasive plant inventory for 7 of its reserve lands in the summer of 2005. A public awareness campaign was also started to support the project and educate the local community regarding the impacts of invasive plants. This initiative is expected to be the first step towards developing and implementing an invasive plant strategy for the LNIB reserve lands.

1.1 Background

Previous the summer of 2005, no formal invasive plant inventory has been completed on LNIB reserve lands. Provincial ministries directed towards managing invasive plant inventories did not include federal or reserve lands in their inventory. Regional overview maps showing invasive plant locations provide some indication of infestations surrounding the reserves, however there is not enough detail to develop a management strategy.

A number of stakeholders regularly undertake weed treatment activities on LNIB reserve lands. Government ministries such as Transportation and Highways as well as other private and crown companies such Teresan and BC Transmission Corporation treat for invasive plants on right of ways that cross reserve lands. Activities on right of ways for the most part are aimed at limiting in-growth of vegetation for maintenance and access. Invasive plant treatments are predominantly mechanical (mowing) or spraying of herbicide. LNIB has been cooperative with stakeholders; however no formal review of their maintenance activities has been completed.

2.0 LNIB RESERVE LANDS

LNIB have 10 reserves located surrounding the town of Merritt BC, totaling approximately 17,600 acres of land. Due to limited resources the inventory focused on reserve lands where invasive plants are expected to have the largest negative impact and where treatment activities are expected to have the greatest benefit. Of the 10 reserves, the inventory focused on: Hamilton, Joeyaska, Nicola-Mameet, Speous and Zoht.

2.1 Habitat Classification and Land Uses

2.1.1 Hamilton

The Hamilton reserve #7 is the second largest reserve in terms of area at 4,398 acres. It is located about 10 km south of Nicola Lake from the junction of Quilchena and old Hwy 5. The Hamilton reserve ranges in elevation from approximately 600 to 1000 m. A majority of the reserve is considered *?es/q^wəl'·/k^wál' tək s/yíq-m* classified as BGxw1 at the lower elevations followed by */c'íl'*, classified as IDFxh2a with small areas of */q^w?ít* classified as IDFdK2a (Lloyd *et al.* 1990) (**See Appendix A for descriptions of the biogeoclimatic subzones). It is predominantly grassland characterized by bluebunch wheatgrass and arrow-leaved balsamroot with small copse of trembling aspen and paper birch in creek drainages. Cattle and horse grazing is the primary activity on the reserve. A few residences are also located on the reserve. The reserve is also a prime hunting area for deer. A small amount of off-road ATV or 4x4 use occurs on the Hamilton reserve.

2.1.2 Joeyaska

Joeyaska reserve #2 is a small reserve at an area of 247 acres and is located approximately 1km SE of Merritt. The reserve ranges in elevation from 600-700 m, a majority of which is *?es/q^wəl'·/k^wál' tək s/yíq-m*, classified as BGxw1 with a small portion of */c'íl'* classified as IDFxh2a (Lloyd *et al.* 1990). A majority of the reserve is agricultural/range with small areas of residential and natural grassland. Riding horseback or ATV's are the primary recreational activities on the reserve.

2.1.3 Shulus-Mameet

The Nicola-Mameet reserve #1 is the largest in area at 12100 acres and is located approximately 5km west of Merritt. The elevation ranges from 600 to 1250 m. A majority of the reserve is *s/?étq^w =ǰp* classified as PPxh2 followed by */c'íl'* classified as IDFxh2 and a small portion of */q^w?ít* classified as IDFdK2 (Lloyd *et al.* 1990). The reserve also contains large residential and agricultural/range areas. Considerable cattle grazing activity occurs on reserve as well as on adjacent range tenures. Horseback riding, hiking and hunting also occur on reserve. In addition to these activities there is

significant amount of off-road 4x4 or ATV use. The large residential areas contain the band office, an elementary school, health services building and ice skating arena. In addition, the reserve is also home to a number of businesses including a gas station, office buildings and sand and gravel. Forest harvesting has recently occurred to help manage the impacts of Mountain Pine Beetle

2.1.4 Speous

Speous reserve #8 is a small reserve at 247 acres located approximately 20 km W of Merritt. The elevation of the reserve is 600m and is composed primarily of /c'íl' classified as IDFxh2 (Lloyd *et al.* 1990). The reserve also contains small portions of residential and agricultural/range lands. Horseback riding and hiking are the primary recreational activities.

2.1.5 Zoht

Reserves #4, #5 and #14 at approximately 370 acres each make up Zoht reserve, which is located approximately 20 km north of Merritt. Reserve #4 sits at approximately 600m in elevation and is composed of ?es/q'wál'· /k'ál' tak s/yíq-m and s/?étq'w =ǰp classified as BGxw1 and PPxh2 respectively (Lloyd *et al.* 1990). The reserve is composed primarily of residential area with small portions of grassland and open Ponderosa Pine forest. The elevation of reserves #5 and #14 range from 900m to 1200m and are composed primarily of /q'w'ít classified as IDFdk1 (Lloyd *et al.* 1990). Horseback riding, hiking and hunting also occur on reserve. In addition to these activities there is significant amount of off-road 4x4 or ATV use. Forest harvesting has occurred to help manage impacts of the Mountain Pine Beetle.

3.0 METHODS

The invasive plant inventory followed the methodology outlined in: *Seven Steps to Managing Your Weeds – A Manual for Integrated Weed Management in British Columbia 2002*.

Local knowledge combined with overview maps showing infestations were used to determine priority areas for inventory. Roadside surveys using a 4x4 were considered the most efficient method to cover the large areas of the reserve. Initially roads were slowly driven to determine large areas of infestation. From the point of commencement, (POC) sample points were taken a maximum of every 200 m. At each sample point, invasive plants species as well as an estimate of their cover and density of infestation were documented. In addition the area of infestation was also estimated. Each sample point was recorded digitally by GPS and mapped. Appendix B. shows an example data sheet and codes.

4.0 RESULTS

In total, twenty different species of invasive plants were recorded during the inventory of LNIB reserve lands. The Zoht reserve had the highest number of species identified at 18. The Shulus-Mameet reserve had 13 different species identified, followed by: Spius with 9, Hamilton with 4 and Joyaska at 3. Spotted Knapweed was the only species that was common to all reserves sampled.

Invasive plant species that were exclusive to the Zoht reserve include Common Tansy, Nightflowering Catchfly, and Pineapple Weed. Russian Knapweed and Redroot Pigweed were only recorded at the Spius reserve. All other invasive plant species were common to two or more of the reserve lands

4.1 Weed Frequency

Figure 1 shows the frequency of invasive plants recorded in surveys of the Hamilton Reservation.

4.1.1 Hamilton

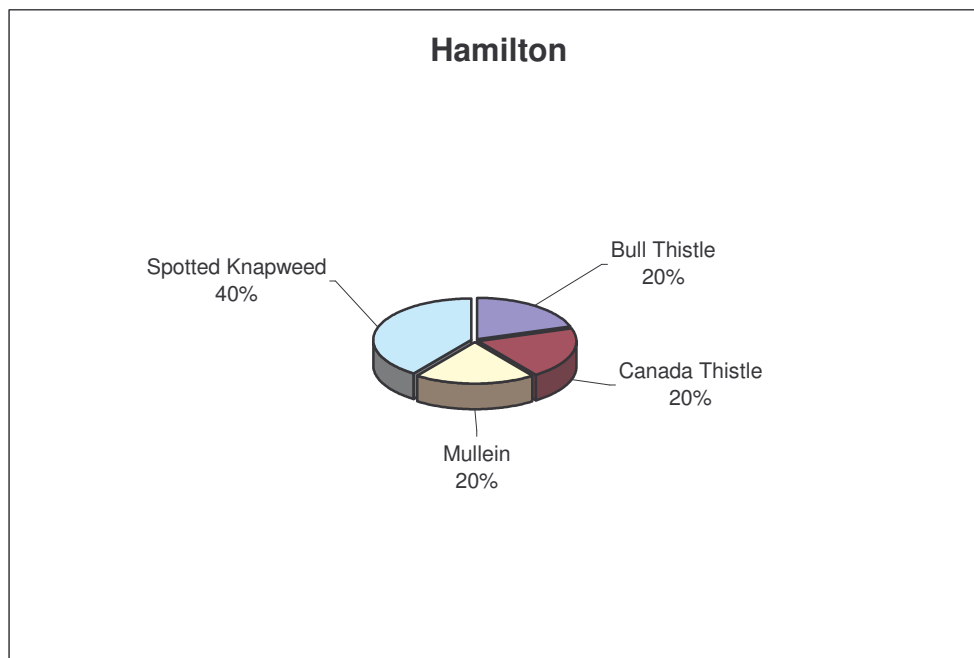


Figure 1. Frequency of Invasive Plants in the Hamilton Reserve.

In the Hamilton reserve Spotted knapweed was recorded most frequently at 40%, with Mullein, Canada Thistle, and Bull Thistle also common at 20% each.

4.1.2 Joeyaska

The frequency of invasive plant species recorded in surveys of the Joeyaska reserve is shown in figure 2.

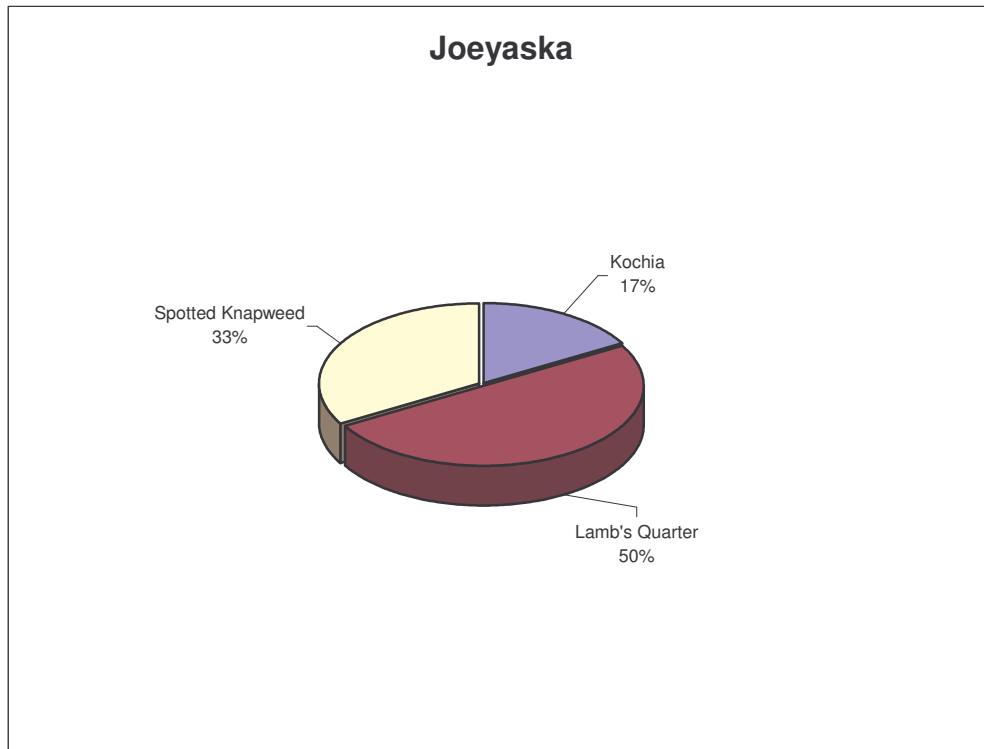


Figure 2. Frequency of Invasive Plants recorded in the Joeyaska Reserve.

In the Joeyaska reserve Lamb's Quarter was recorded most frequently at 50% followed by Spotted Knapweed at 33% and Kochia at 17%.

4.1.3 Shulus-Mameet

Figure 3 illustrates the frequency of invasive plants recorded in surveys of the Shulus-Mameet Reserve.

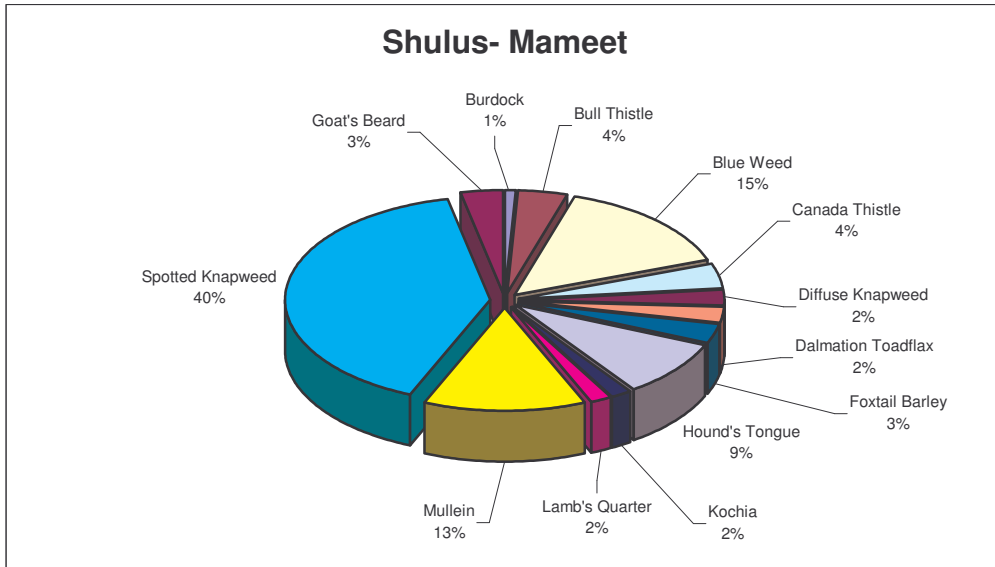


Figure 3. Frequency of Invasive Plants recorded in Shulus-Mameet Reserve.

Spotted Knapweed was recorded most often at 40% followed by Blueweed at 15% and Mullein at 13%. Other species of note included Hound’s Tongue at 9%, with Dalmatian Toadflax and Diffuse Knapweed at 2% and Burdock at 1%.

4.1.4 Speous

The frequency of invasive plants recorded in surveys of Speous Reservation is shown in figure 4.

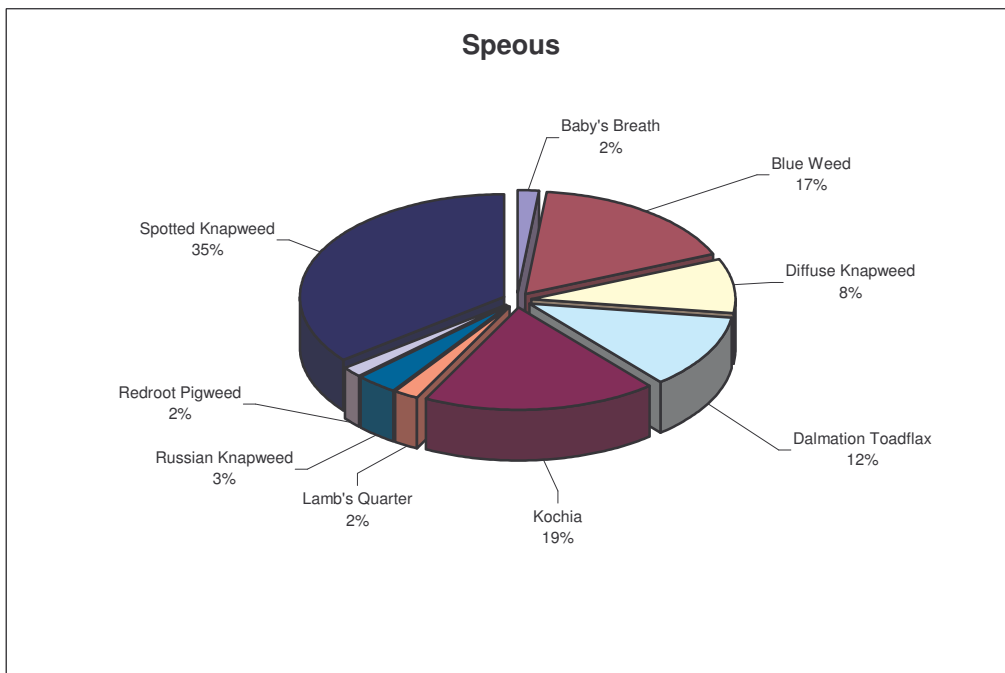


Figure 4 Frequency of Invasive Plants recorded in Speous.

Invasive Plant Inventory of Reserve Lands

In the Speous reserve Spotted knapweed was recorded most often at 35% followed by Kochia at 19%. Blueweed and Dalmation Toadflax followed at 17% and 12% respectively.

4.1.5 Zoht

The frequency of invasive plants recorded in surveys of Zoht Reservation is shown in figure 5.

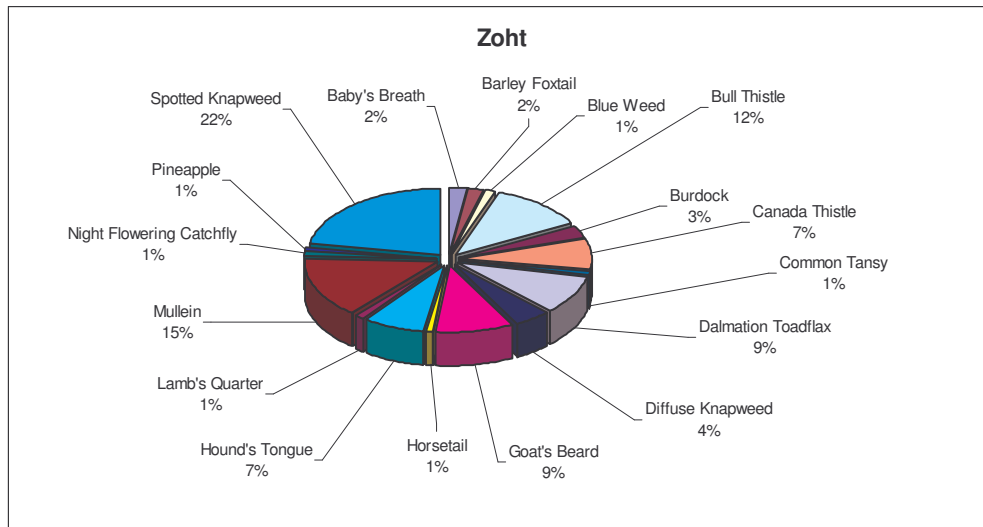


Figure 5. Frequency of Invasive Plants recorded in Zoht.

Spotted Knapweed was recorded most often at 22% followed by Mullein at 15% and Bull Thistle at 12%. Other species of note included Dalmation Toadflax at 9%, Hound's Tongue at 7% and Diffuse Knapweed at 4%.

4.2 Area of Infestation

Table 1. shows the infestation area of invasive plants for the Shulus-Mameet, Speous, Zoht, Joeyaska and Hamilton Reserves.

Table 1. Infestation area of Invasive plant species. m² (acres)

	Hamilton	Joyaska	Shulus-Mameet	Speous	Zoht
Baby's Breath	Not recorded	Not recorded	Not recorded	2550 (0.63)	12500 (3.09)
Blueweed	Not recorded	Not recorded	39375 (9.73)	75625 (18.69)	40000 (9.88)
Bull Thistle	625 (0.15)	Not recorded	23750 (5.86)	Not recorded	21875 (5.41)
Burdock	Not recorded	Not recorded	2500 (0.62)	Not recorded	7500 (1.85)
Canada Thistle	625 (0.15)	Not recorded	6875 (1.70)	Not recorded	55000 (13.59)
Common Tansy	Not recorded	Not recorded	Not recorded	Not recorded	40000 (9.88)
Dalmatian Toadflax	Not recorded	Not recorded	15000 (3.71)	35000 (8.64)	53625 (13.25)
Diffuse Knapweed	Not recorded	Not recorded	3750 (0.93)	15625 (3.86)	160000 (40.0)
Foxtail Barley	Not recorded	Not recorded	6250 (1.54)	Not recorded	2900 (0.72)
Goat's Beard	Not recorded	Not recorded	17500 (4.32)	Not recorded	207900 (51.0)
Horsetail	Not recorded	Not recorded	Not recorded	Not recorded	2500 (0.62)
Hound's Tongue	Not recorded	Not recorded	23750 (5.8)	Not recorded	67600 (16.7)
Kochia	Not recorded	100 (.02)	5000 (1.24)	57500 (14.2)	2500 (0.62)
Lamb's Quarter	Not recorded	2700 (0.67)	5000 (1.24)	10000 (2.47)	2500 (0.62)
Mullien	625 (0.15)	Not recorded	34375 (8.49)	Not recorded	65000 (16.06)
Nightflowering Catchfly	Not recorded	Not recorded	Not recorded	Not recorded	2500 (0.62)
Pineapple weed	Not recorded	Not recorded	Not recorded	Not recorded	625 (0.15)
Redroot Pigweed	Not recorded	Not recorded	Not recorded	2500 (0.62)	Not recorded
Russian Knapweed	Not recorded	Not recorded	Not recorded	20000 (4.92)	Not recorded
Spotted Knapweed	1250 (0.3)	20000 (4.94)	423925 (104.75)	101025 (24.96)	618225 (152.77)

4.2.1 Hamilton

Spotted Knapweed had the largest area of infestation sampled in the Hamilton reserve at 1,250 m², followed by Mullein, Bull and Canada Thistle each at 625 m².

4.2.2 Joeyaska

In the Joeyaska reserve, Spotted knapweed had the largest area of infestation at 20,000 m² followed by Lamb's Quarter at 2700 m² and Kochia at 100 m².

4.2.3 Shulus-Mameet

In the Shulus-Mameet reserve Spotted Knapweed infested the largest area sampled at 42,3925m², followed by Blueweed at 39,375 m² and Mullein at 34,375 m². Other species of note include Hound's Tongue at 23,750 m², Bull Thistle at 23,750 m² and Dalmatian Toadflax at 15,000 m².

4.2.4 Speous

Spotted Knapweed had the largest area of infestation sampled on the Speous reserve at 101,025 m². Blueweed and Kochia had the next largest areas of infestation at 75,625 m² and Kochia at 57,500 m². Other species of note included Dalmatian Toadflax at 35,000 m² and Russian Knapweed at 20000 m².

4.2.5 Zoht

On the Zoht reserve, Spotted Knapweed had the largest area of infestation sampled at 618,225 m². The species with the next largest areas of infestation included Goat's Beard at 207900 m² and Diffuse Knapweed at 160,000 m². Other species of note included Hound's Tongue at 67,600 m², Dalmatian Toadflax at 53,625 m² and Blueweed at 40,000 m².

5.0 Discussion

Invasive plants appear to be having a considerable impact on LNIB reserve lands. A number of species such as Knapweed, Blueweed, Dalmatian Toadflax, Hound's-Tongue, Lamb's Quarter and Kochia are combining to infest large areas and will continue to spread if left unchecked. In Appendix C species descriptions from *Guide to Weeds in BC* (www.weedsbc.ca) are shown for all species recorded during the inventory.

5.1 Species Impacts

In terms of area, Spotted Knapweed is having the largest impact. More than 280 acres of land is infested with Spotted Knapweed. As many areas were not sampled due to access, the actual area is likely much greater. Furthermore, a majority of the infestation was considered to be densely covered to the exclusion of most other species. Though Spotted Knapweed was recorded on all reserves, a majority of the infestation was split between

the Zoht and Shulus-Mameet reserves. Infestations of this size have considerable agricultural and ecological impacts. Much of the infestation occurs in cattle grazing areas. The infestation may limit grazing opportunity resulting in over-use of adjacent areas. The over-grazing of adjacent areas often provides disturbed soil for invasive species such as Spotted Knapweed to spread. The large infestation to the exclusion of other natural plants species impacts wildlife such as small mammals and grassland birds (Rutledge and Mclendon 2005).

Similar to Spotted Knapweed; Diffuse and Russian Knapweed aggressively spread over large areas to the exclusion of other species. Diffuse Knapweed was recorded on the Shulus-Mameet, Spius, and Zoht reservations. However, Russian Knapweed was only recorded on the Spius reserve. There are a number of records of hybridization between Spotted and Diffuse Knapweed (Zouhar 2001).

Based on overview maps, Blueweed appears to be on the rise in the Nicola Valley. This is supported by the considerable frequency it was recorded on the Shulus-Mameet, Spius and Zoht reserves. While Blueweed is less associated with agricultural crops it can contaminate clover and be pathway for viral disease amongst livestock (Frankton and Mulligan 1970).

Dalmatian Toadflax is another species known to spread aggressively. It is also beginning to show considerable impact on the Shulus-Mameet, Spius and Zoht reserves. Dalmatian Toadflax is toxic to livestock but is generally considered unpalatable (Rees *et al.* 1996). Low-till agricultural practices may contribute to the spread of this species into farming crops (McClay 1992).

Based on the results Hound's Tongue is beginning to establish in the Shulus-Mammet and Zoht reserves. In addition to out competing native species and reducing forage species, Hound's Tongue burs stick to wildlife and livestock. The burs can irritate the eyes of animals and in the case of livestock, may result in additional veterinary costs and reduces sales value. Hound's Tongue may be lethal to wildlife and livestock if it is consumed in large enough quantities (Upadhaya *et al.* 1988).

Common Burdock is another species beginning to establish in the Shulus-Mammet and Zoht reserves. Burdock is not considered as much of a threat to agricultural crops as it is generally intolerable of cultivation. Similar to Hound's Tongue the primary impact are the burs which entangle in the fur of livestock and may result in lower sales costs (Gross *et al.* 1980).

5.2 Reserve Comparison

Comparing reserves, the Zoht and Shulus-Mameet reserves have the largest infestation levels in terms of species numbers, frequency and area. There are a number of pathways leading to the introduction and spread of invasive plants in these areas. While all the reserves have a number of roads running through, the Zoht and Shulus-Mameet reserves are located near major highways. The Mameet Lake Rd and Hwy5 run through the

Shulus-Mameet reserves providing major pathways for the spread of invasive plants. Gravel pits often act as seed banks of invasive plants that are spread by vehicle traffic or through sanding roads in winter. One gravel pit is located at the south end of the Mameet Lake Rd inside the reserve, while a second pit is located 5 minutes west of the reserve on Hwy 5. These gravel pits likely contribute to the spread of invasive plants through the Shulus-Mameet reserve. At Zoht, the Coquihalla Hwy runs near the reserve. The cutbank from the Coquihalla provided a large area of exposed soil for the expansion of invasive plants including: Spotted Knapweed. It is also possible that the building of the cutbank exposed and spread additional seed source. While cattle grazing is common to all of the reserves, the grazing activity combined with the additional seed sources at these reserves may increase their impacts (Weeds BC 2002). Similarly, ATV and motorcycle activity contribute to the introduction and spread of invasive plants (Weeds BC 2002). Though all of the reserves experience some recreational ATV impacts, the activity is highest on the Shulus-Mameet reserve east of Rocky Pines subdivision.

As discussed many of these activities occur throughout all the reserves. In Spius, the spread of invasive plants is likely hindered by surrounding Douglas-fir forest. The surrounding mature forest is north facing with a well developed ground layer providing limited opportunity for the spread of invasive plants. However, development, overgrazing or heavy recreational use in the adjacent forest will allow for the spread of invasive plants.

More sampling effort is needed at Joeyaska and Hamilton to better determine the impacts of invasive plants on these reserves. The agricultural activities at Joeyaska have likely limited the spread of invasive plants. As a majority of incidents were recorded near the outside of the reserve, it is likely that the Coquihally Hwy junction is serving as a major pathway. Though the Hamilton reserve still needs additional sampling effort, considerable area was covered in the inventory. A majority of the reserve is dry grassland which likely slows the spread of invasive plants. However, creeks and draws running through the reserve will provide better growing opportunities. As water source for cattle is limited, grazing activity in these areas may be heavy, resulting in exposed soil and opportunity for the introduction and spread. The Hamilton reserve contains some of the most productive natural grasslands in the Nlaka'pamux territory. Special attention should be paid to protect the integrity of this area.

6.0 Workplan

Based on the results of the inventory, LNIB clearly needs to develop a strategy to effectively manage invasive plants on the reserve lands. Reserves present a unique challenge to managing invasive plants in that agriculture, forestry and community infrastructure occur in close proximity. Management strategies must integrate First Nations traditional values with effective weed control strategies. Funding levels to develop management strategies and implement treatment must be consistent and sustained. Short term initiatives will result in wasted resources as any forward progress is quickly lost when funding is withdrawn. A letter illustrating these points and a copy of this report will be sent to INAC to direct funds towards invasive plant management. In addition a proposal was submitted to Environment Canada in December 2005 to develop a comprehensive management strategy. Results will be known in March 2006. In addition the natural resource department should continue to pursue funding opportunities to manage invasive plants.

Prevention is the most cost effective strategy. In lieu of a management strategy and treatment dollars, there are a number of initiatives that could be implemented:

- The Natural Resource Department should continue to raise community awareness in the Band newsletter and through informative workshops. The community awareness should include information on: identification, impacts, as well as strategies for removing and reporting new infestations to the Natural Resource Department.
- Residential areas, community infrastructure and developments are major pathways for the introduction and spread of invasive plants on the reserve. As a result, a coordinated effort is needed from the Departments. To manage residential impacts, the Housing Department may need to develop/enforce by-laws for renters to clean up invasive plants on their properties. Construction and Public works need to develop and implement reclamation plans in terms of seeding exposed soil.
- The Title and Rights and Natural Resource Department should work together to raise awareness and promote invasive plant strategies throughout the Nlaka'pamux Traditional Territory. Interest needs to be paid to developments surrounding the reserves that are potential pathways for invasive plants to enter the reserve. In addition, the Natural Resource Department should remain active at the Southern Interior Weed Management Committee planning table to ensure LNIB's interests are protected. In doing so a relationship can be built with local stakeholders to work together on the invasive plant management.

Literature Cited

- Frankton, C. and G.A. Mulligan. 1970. Weeds of Canada. Publication 948. Ottawa: Canada Department of Agriculture.
- Gross, R.S., P.A. Werner, and W. Hawthorn. 1980. The biology of Canadian Weeds. 38. *Arctium minus Bernh. And A. lappa L.* Canadian Journal of Plant Science 60: 621-634.
- McClay, A.S. 1992. Effects of *Brachypterolus pulicarius* (L.) (Coleoptera: Nitidulidae) on flowering and seed production of common toadflax. The Canadian Entomologist 124: 631-636.
- Rees, N.E., P.C. Quimby, Jr., G.L. Piper, E.M. Coombs, C.E. Turner, N.R. Spencer, and L.V. Knutson. 1996. Biological Control of Weeds in the West. Western Society of Weed Science in cooperation with the USDA Agricultural Research Service, Montana Department of Agriculture, and Montana State University.
- Rutledge, C.R. and T. McLendon. Undated. An Assessment of Exotic Plant Species of Rocky Mountain National Park. Department of Rangeland Ecosystem Science, Colorado State University. Northern Prairie Wildlife Research Center home page.
Available: <http://www.npwrc.usgs.gov/resource/othrdata/Explant/explant.htm>
Accessed: Dec 15, 2005.
- Upadhaya, M.K., H.R. Tilsner, and M.D. Pitt. 1988. The biology of Canadian weeds. 87. *Cynoglossum officinale*. Canadian Journal of Plant Science 68:763-774.
- Zouhar, Kris. 2001. *Centaurea maculosa*. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: <http://www.fs.fed.us/database/feis/> [2006, January 22].
- Weeds BC. 2002. Seven Steps to Managing Your Weeds- A Manual for Integrated Weed Management in British Columbia. Open Learning Agency. Burnaby, BC.

Appendix A: Biogeoclimatic Classifications of LNIB Reserve land (Lloyd *et al.* 1990).

?es/q^wál'· /k^wál' tək s/yíq-m – Valley Grasslands – Bunchgrass Zone (BG)

In British Columbia the Bunchgrass zone occurs throughout the lower elevations of the Okanagan, Similkameen, Thompson, middle Fraser, lower Chilcotin and Nicola Valleys. The elevation of the bunchgrass ecosystem ranges from 200 – 1000m. It is warm to hot, with dry summers and moderately cold winters with little snowfall. These areas are characterized by bluebunch wheatgrass, and crust lichens. Ponderosa pine and sagebrush may establish in the mid and upper slopes of this zone. Riparian areas are characterized by Trembling Aspen, Black Cottonwood or Birch species, with an understory of Dogwood, Common snowberry and Nootka Rose.

s/?étq^w =łp – Ponderosa pine zone – (PP)

In British Columbia the Ponderosa pine zone occurs at the lower elevations in dry valleys of the Southern Interior Plateau and Southern Rocky Mtn. Trench. The elevation of the Ponderosa pine zone ranges from 335 to 900m. The Ponderosa Pine zone is the warmest, driest forested zone with moderately cold, dry winters. These areas are characterized by open, parkland stands of Ponderosa Pine with an understory of bluebunch wheatgrass. Douglas fir is common as a minor component as well as in wetter sites combined with Trembling Aspen, Black Cottonwood and Birch.

/c'íl' – Douglas-fir zone – (IDF_{xh})

/q^w?ít– Lodgepole Pine zone – (IDF_{dk})

The Interior Douglas-fir (IDF) zone composes a majority of the low to mid elevation landscape of the Southern Interior Plateau and Southern Rocky Mtn. Trench. The IDF zone ranges in elevation from 350 – 1450m. It is characterized by dry warm summers, long growing season and moderately cold winters with low to moderate amounts of snowfall. The overstory is composed primarily of Douglas-fir with minor amounts of Ponderosa Pine (IDF_{xh}) at lower elevations and Lodgepole Pine (IDF_{dk}) at higher elevations. The IDF_{dk} could be considered the lower elevation range of the **ne qwli7t** zone. The understory is characterized by pinegrass, birch-leaved spirea and soopolallie. Drier sites are characterized by bluebunch wheatgrass and Saskatoon. Wetter sites are characterized by Spruce with an understory of Birch, Dogwood and Black gooseberry.

Appendix C. Invasive Plant Species Accounts

Descriptions from *Guide to Weeds in BC* at <http://weedsbc.ca>