Baby's Breath and Invasive Weeds Removal 2015

Ranchlands Phase 2F&G Environmental Reserve

Project Report

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Contents:

Executive Summary……page 3

Background of the Ranchlands Baby's Breath Removal Project……..page 4

Project 2015……page 4

Endangered Species in Ranchlands Environmental Reserve:

- Tiny Cryptantha……..page 5
- Other Plants……page 6
- Birds……page 6
- Wildlife……..page 6
- Reptiles……page 6

Noxious Invasive Weeds in Ranchlands Environmental Reserve:

- Baby's Breath……page 7
- Leafy Spurge……..page 8
- Downy Brome……page 8

Project Preliminary Observations: May/June 2015

- Baby's Breath……page 9
- Leafy Spurge……..page 10
- Downy Brome……..page 10
- Tiny Cryptantha……..page 10
- Fencing and Gate on the Environmental Reserve……..page 10
- Weed Control outside the Environmental Reserve……..page 10

Summary of Project Data:

- Baby's Breath Removal……page 10
- Leafy Spurge Removal……..page 11
- Baby's Breath Germination Tests……page 11

Conclusions……...page 11

Acknowledgements……page 13

Sources……...page 13

Appendix A: Ranchlands Noxious Weeds Removal Project 2015 Proposal……..page 15

Appendix B: Baby's Breath Germination Tests……..page 19

Executive Summary:

Baby's Breath, a noxious/invasive weed, is threatening the habitat of Tiny Cryptantha on Ranchlands Phase 2F&G Environmental Reserve. A collaborated effort of the City of Medicine Hat, Industry, Medicine Hat College and Grasslands Naturalists Society is intended to remove this noxious weed from the Environmental Reserve. Besides Baby's Breath, another noxious weed known as Leafy Spurge has been found in Ranchlands. The goal is to preserve the habitat of Tiny Cryptantha as well as other endangered plants so they may survive for years to come.

In the previous two years, Calfrac Well Services provided manpower to successfully dig the Baby's Breath by severing the plant crown from the long tap root. Up to 52,000 plants were removed. Also, the Leafy Spurge plant tops were picked by hand and bagged and disposed in the City Landfill. However in 2015, due to the downturn of the Oil & Gas economy, Calfrac personnel were not available. Also, due to lack of moisture in the spring, the ground was very dry and too hard to dig the Baby's Breath roots. Therefore, to remove the seed load, the Grasslands Naturalists undertook to pick and bag the Baby's Breath as well as the Leafy Spurge plant tops during the summer on seven events from June to September. During the last picking in September, it was decided to save some of the Baby's Breath plants tops to determine whether the seeds were mature and could germinate to produce plants the following year. Thus, germination tests were conducted at the Medicine Hat College.

During more than 80 hours of hand picking the Baby's Breath to remove the seed load, nearly 15,000 plants (770kg) were bagged and disposed in the City Landfill. Also, additional 45kg (425 plants) of Leafy Spurge were picked and disposed. The germination tests revealed that over 80% of the Baby's Breath seeds were indeed mature and could produce plants for the following season. Hence, picking the plant tops and removing the seed load was well worth the effort.

It is recommended that this project to remove the invasive Baby's Breath from the Ranchlands 2F&2G Environmental Reserve be continued in 2016 to protect the endangered plant Tiny Cryptantha. Also, further work will be undertaken to develop methods to reduce and effectively eliminate the noxious weed Leafy Spurge.

Background of the Ranchlands Baby's Breath Removal Project:

In the fall of 2012, Jenna Macdonald, formerly with the City of Medicine Hat Parks & Recreation Department, gave a presentation on invasive weeds to the Medicine Hat College Rare Plant study group. In attendance was Medicine Hat College Environmental Reclamation Program student Sean Allen. Sean was inspired to take a novel approach to eradicate the invasive plant Baby's Breath from the Ranchlands 2F&G Environmental Reserve in collaboration with volunteers from Calfrac Wells Services Ltd. Over the next 2 years (2013 and 2014), Calfrac Well Services, Hyperion Research, City of Medicine Hat Parks and Recreation, City of Medicine Hat Land and Properties Management, and Grasslands Naturalists Society plus staff and students from Medicine Hat College volunteered many hours towards the eradication of Baby's Breath within the Ranchlands Environmental Reserve.

Ranchlands Environmental Reserve, located in the North East part of the City of Medicine Hat, Alberta is roughly 80 acres in size. The Ranchlands Environmental Reserve was established to protect the federally ranked rare plant Tiny Cryptantha (*Cryptantha minima*). Tiny Cryptantha was designated as endangered by the Committee on the Status of Endangered Wildlife in Canada in the years 1997 and 2000. The Ranchlands 2F&G area of Medicine Hat is designated as protected and critical habitat for the Tiny Cryptantha. Also on the reserve are several other rare plants, animals and archaeological features.

During May 2013, nearly 30,000 Baby's Breath roots were dug by Calfrac, and in May 2014 about 22,000 more plants were dug and disposed in the City landfill. Also, during both those years, the noxious weed, Leafy Spurge, was removed by picking and disposing of their plant tops from the site.

Project 2015:

Early in 2015, a proposal to continue removal of the Baby's Breath and other noxious invasive weeds from Ranchlands Environmental Reserve was submitted and approved by the City Land and Properties Department (Appendix A). However, due to the downturn in the Oil & Gas Industry, the Calfrac personal were not available to dig the Baby's Breath plants. Furthermore, due to the extremely dry spring and summer, the ground was too dry and hard to dig. Therefore, a Plan B was devised whereby the plants tops were to be picked by hand and bagged to remove the seeds, and disposed in the City Landfill.

The project activity was conducted from early June to mid September, on seven events involving 80 person-hours of Grasslands Naturalists volunteers led by project coordinator, Lisa James. A total of nearly 15,000 Baby's Breath plants weighing 770kg were picked and disposed. Also, Leafy Spurge was found in six areas within the reserve, which was picked and bagged.

With rain in late August, it was observed that some Baby's Breath plants were growing again, while other plants had matured and dried. On the basis of this observation, a question arose as to whether or not the seeds on the dried plants were sufficiently mature to germinate and produce new

plants next year. As a result, some plants with seeds were collected in September to conduct germination tests at the Medicine Hat College. Results are presented in Appendix B.

Endangered Species in Ranchlands Environmental Reserve:

Tiny Cryptantha

The Tiny Cryptantha is an annual species in the Boraginaceae family. The plant can grow 10 to 20 cm tall in flower, however in the Medicine Hat area the plant is usually a lot smaller. The stems are branched, erect and bristly-haired. Tiny Cryptantha flowers from late May to early July. They have very small white tube shaped flowers with a yellow center. The fruit produced is small cluster of four heteromorphic nutlets.

Plant numbers appear to fluctuate significantly from year to year depending on many conditions such as rainfall, seed production and germination conditions. Plant population size may range from single plants to several.

Optimal habitat for this plant is land that has undergone slight disturbed by grazing animals, animal burrows, erosion or human activity on trails or fence lines. Additional habitat requirements include south to southwest facing slopes in sandy loams soils such as the eroded bluffs above the South Saskatchewan River. Monitoring of other Tiny Cryptantha populations at DRD Suffield by Environment Canada indicate a strong correlation between spring moisture and temperature to Tiny Cryptantha growth. Tiny Cryptantha is also a poor competitor and is easily crowded out by grasses or other forbs including invasive species such as Baby's breath (*Gypsophila paniculata*).

Throughout Alberta, potential habitat for Tiny Cryptantha has been altered by human activity such as oil and gas development, cultivation of native prairie, construction of access roads, and rural and urban residential development. With the impact of all of these human activities as well as competition by other non-native species in prime habitat areas only a small amount of area has been left for the colonization of the Tiny Cryptantha. (See Sources for links to Federal and Provincial Species at Risk Recovery plans).

Tiny Cryptantha plant (on right) in comparison to another related plant – *Cryptantha fendleri*

Photo Credit: Cathy Linowski

Monitoring for the Tiny Cryptantha is carried out annually by Environment Canada in DRD Suffield NWA as part of the species at risk management plan. The previously documented populations found in the

Ranchlands 2F&G Reserve are also revisited on a regular basis. Notably there has been a significant decrease in all the populations since 2004. Potential explanations for the reduction in size of previously recorded population could be related to changes in weather patterns (moisture and temperature), ground disturbance during germination season or competition from invasive weeds such as Baby's Breath, Leafy Spurge, and Downy Brome in the area.

Prior, during and at the conclusion of each of the previous Baby's breath removal projects, Cathy Linowski, Coordinator of the MHC Environmental Reclamation Program who is a Field Botanist with expertise in survey for Tiny Cryptantha, monitored the previously documented locations for Tiny Cryptantha populations in the Ranchlands 2F&G Environmental Reserve. During the 2015 project, Lisa James participated in surveys for Tiny Cryptantha and also assisted during transacts to establish baseline numbers of Baby's Breath plants in the Ranchlands 2F&G Environmental Reserve as well as noting and documenting populations of other invasive weed species or other tracked/rare species.

Other Plants

Other rare plants that have been found in the Ranchlands Environmental Reserve include: Easter daisy (*Townsendia exscapa*) pictured on page 6, Nodding Buckwheat (*Erigonium cernum*), Lotus Milkvetch (*Astragalus lotiflorus*), Woolypod Milkvetch (*Astragalus purshii*), Purple Three-Awn (*Aristida purpruea*), Narrowleaf Four O'clock (*Mirabilis linearis*), and Broom Rape (*Orobanche ludoviciana*).

Birds

Sprague's Pipit – listed as Threatened, was heard overhead on most occasions.

Red Winged blackbird – spotted in the marshy margin of the wetland on the property.

Meadow Lark – occurred in the area and evidence of nesting was found.

Turkey Vultures – overhead particularly along the South Saskatchewan River.

Mallard ducks – spotted in the wetland while open water present.

Wildlife

White tail deer

Coyote

Jack Rabbits

Pronghorn antelope

Reptiles

Bull Snake

Rattle snake (pictured on page 7)

Rattlesnake (*Crotalus viridus viridus*) and Easter daisy (*Townsendia exscapa*) photographed in the Ranchlands 2F and 2G Environmental Reserve. Photo credit: Sean Allen

Noxious Invasive Weeds in Ranchlands Environmental Reserve:

Baby's Breath

Baby's Breath (*Gypsophila paniculata*) is listed as a noxious weed on the 2010 Alberta Invasive Species Act. The noxious weed classification means that the plant must be controlled by the property owner. In the case of Ranchlands 2F&G Environmental Reserve the owner responsible for control is the City of Medicine Hat.

In the early 1900's Baby's Breath was introduced in the Medicine Hat area as a garden ornamental and as a flower arrangement filler for the floral industry. It is Native to Eastern Europe and central Asia. As early as the mid 1800's Baby's Breath started appearing as an invader on the Canadian Prairies.

Mature baby's breath plants in flower Photo Credit: Jenna Macdonald

Baby's breath is a large perennial that thrives in areas that are dry and sandy plus is well adapted to disturbed areas. Highly competitive for moisture and light, Baby's Breath poses a risk to any kind of rare plants that may normally be found in this habitat as well as other native prairie plants. The main reason for the success of the Baby's Breath plant is a deep penetrating root system extending some 3m into the ground with a tap root with circumferences of more than 30 cm. Each plant grows erect to a height of upwards of 1.5 m with freely-branching stems. Early in its life cycle, Baby's breath may only produce stems and leaves. Later when mature, it has many small flowers which give it a powder puff appearance. The main stem breaks off at maturity and tumbles along the ground with the wind which enables it to disperse its thousands of seeds. As previously mentioned, germination studies of the seeds collected from the Ranchlands Environmental Reserve were conducted to determine the viability and overwinter rates without any winter scarification, and the possibility of regrowth next spring (see Appendix B for more details).

Leafy Spurge

Leafy spurge (*Euphorbia esula*) is a member of the Euphobiaceae family and is native to central and southern Europe and Asia. The plant was first reported in the United States in 1827 in the state of Massachusetts. The first reporting in North Dakota was in 1907; only eighty years after the plant first reached this country. The plant is roughly 2.5 to 3ft tall with stems that are erect. Leaves are directly attached to the stem are narrow, waxy and have a smooth edge and usually arranged alternately. There is skin irritating milky white sap inside the plant. The yellow flower parts are in sets of threes. Leafy spurge thrives best in dry conditions but tolerates some moisture such as ditches or where water accumulates in the spring. The seeds have high germination rates and can spread as far as 15 feet when seed capsules explode. Seeds in the soil can remain alive for over seven years, which means that leafy spurge will easily come back in areas that it was once destroyed.

Leafy spurge displaces native vegetation in prairie habitats and fields through shading and by usurping available water and nutrients and through plant toxins that prevent the growth of other plants underneath it. Leafy spurge is aggressive and once present, can completely overtake large areas of land.

Leafy Spurge plants in flower
Photo Credit: Lisa James

Downy Brome

Downy Brome also known as Cheat grass (*Bromus tectorum L*.) is an annual grass in the Poacea family that came from Europe in about 1861. It is believed downy brome did not reach the Prairie region of Western Canada until the 1930s. Tolerant of all soil types except for heavy clays once established this grass develops extensive lateral roots that can reduce available surface moisture from any other plant species. Distinctive in appearance, it is a slender grass with an inflorescence that droops so that the spikelet's point is toward the ground. The seed producing spikelets are 2- 3cm long and hairy. The

panicle is a pale green but as the plants mature they start to get a purplish tinge. Downy Brome is a nuisance because it reduces the diversity found on native rangeland, it can displace native grasses that are much more nutritious for cattle and once established is very difficult to get rid of because of the large number of seeds produced and prolonged (over ten year) potential viability of seeds!

Downy brome patch near access road showing extensive cover.
Photo Credit: Lisa James

Project Preliminary Observations: May/June 2015

Ranchlands Environmental Reserve was initially surveyed by Lisa James, Cathy Linowski and John Slater at different times during the months of May and June. All noxious weeds found other than Baby's Breath have been marked with a GPS location, as well as key features on the reserve such as Archaeological sites.

Baby's Breath

Baseline transacts for Baby's breath were documented for comparison to previous years findings. Generally the overall number of mature Baby's breath plants has been significantly reduced from the number of plants recorded in 2013. Particular attention was paid to areas of the reserve where previously large numbers of mature Baby's breath plants were removed to determine if regrowth was occurring from plants that had been dug the previous season. No regrowth of plants was located.

While the size of the Baby's Breath population has declined there is still an unacceptable amount of this noxious weed on the property. The heaviest populations of Baby's Breath were found on the existing pipeline and the access roadway, as well as on the eastern slope towards and south of the

gas well. Also, significant populations of Baby's breath were observed over the crest of the river bluffs outside of the fenced area of the Environmental Reserve.

Leafy Spurge- located in 6 areas. Total size of population in range of 120 plants, the largest grouping of which are around the Environmental Reserve Wetland.

Downy Brome- located on the gravel piles located near the front gate and along the main access road to the gas well.

Tiny Cryptantha

Locations of previously documented populations of Tiny Cryptantha (TC) were resurveyed with data provided to the Environment Canada species at risk coordinator Candice Neufeld by Cathy Linowski. No TC plants were observed this year likely due to the unusually dry conditions.

Fencing and Gate to the Environmental Reserve

During 2013, a fence with a locked gate at the access road from 11 Ave NE was installed around the Ranchlands 2F&G reserve with the intent that, if possible, a rancher would be invited in collaboration with the City of Medicine Hat to have cattle graze the reserve area. The intent was also to limit trespassing by individuals seeking to gain access to the South Saskatchewan River below the Ranchlands Environmental Reserve for paint ball and camping/partying. As of 2015, the fence is in overall good condition; however there are two sections of the fence wires partially down on the north side of the reserve. To date it has not been possible to arrange to have grazing carried out on the reserve; although cattle has been noted in the gas lease property across from the Environmental Reserve on the west side of 11 Ave NE.

Weed Control outside of the Environmental Reserve

The City of Medicine Hat has undertaken to manage Baby's Breath (and other noxious weeds such as Leafy Spurge) outside of the Ranchlands Environmental Reserve by a combination of mowing and targeted herbicide application. This has reduced the number of Baby's Breath plants that "tumble" onto the environmental reserve. Large numbers of tumbleweeds made up of Russian thistle, Kochia and Baby's Breath however still end up in the South Saskatchewan River bluffs just outside of the Environmental Reserve.

Summary of Project Data:

Baby's Breath Removal

Removal of the Baby's Breath plants consisted of breaking the plant stems as close to the ground as possible, and bagging and disposing of the material in the City Landfill. The project activity was conducted from early June to mid September on seven event days. The data of the plants picked are summarized in the following table with nearly 15,000 plants picked to remove the seed load.

Baby's Breath Plant Tops Removed	14,720
Net weight at City Landfill	770 kg (1698lbs)
Man Hours	81 hours

Leafy Spurge Removal

Similarly, the tops of the Leafy Spurge plants were picked close to the ground and bagged. From the six areas within the Reserve where Leafy Spurge was found, over 400 plants weighing about 45kg were picked and disposed in the City Landfill (see table below).

Leafy Spurge- Plant Top Removed	425
Net weight at City Landfill	45 kg (100lbs)
Man Hours	15 hours

Baby's Breath Germination Tests

Germination tests of the seeds collected from the Ranchlands Environmental Reserve indicate that seeds produced in the initial season have viability rates of between 76-98% without any winter scarification (see Appendix B for more details). This suggests that Baby's breath seed may germinate in the fall and new annual plants overwinter and begin early regrowth as soon as adequate spring moisture is available. Therefore, it was concluded that the picking of the plant tops reduced significantly the seed load and possible regrowth the following year.

Conclusions:

Digging the Baby's Breath plant roots as performed in previous years, by severing the root a minimum 15cm below the crown at the soil surface with a shovel, appears to be the most effective technique of eradication, because there does not appear to be regrowth from mature plants removed the previous season. And overall, there is a significant decrease in the number of viable plants; therefore this removal method should continue on a regular basis in the spring when manpower is available and moist soil conditions exist.

Currently, periodic mowing is carried out along the main access road and around the head of the gas well that is located on the property. This continued practice will not kill the Baby's Breath but will eliminate the seed load from producing new plants provided the mowing is performed a few times in late spring, mid summer and early fall before the plants go to seed. However, mowing and especially any grading of the access road needs to be timed so as to not disrupt the germination of Tiny Cryptantha.

There is a possibility that if a herbicide such as glyphosate is applied directly to the Baby's Breath plants at the proper times, it could be used in a target way in some areas of the Environmental Reserve such as the gravel piles, but this option would have to be approved by land managers and the species at risk coordinator so that no endangered plant species are put at risk.

Based on research, at this time, there are not effective biological controls for Baby's Breath. Heavy grazing early in a season by cattle would be a good option to prevent seed production and the subsequent seeding establishment of Baby's Breath. Grazing would also serve to support the population of Tiny Cryptantha as this would lower litter loads and create additional open spots for germination, reduce plant competition, provide areas of disturbance as well as fertilization. If cattle were introduced, water would have to be hauled in as well as the repairs to the fence be carried out.

Leafy Spurge has been found in 6 areas within the fenced area of the Environmental Reserve with the largest area being located near the wetland. The removal of the plant tops and flowers definitely helps control the spreading of seeds but does not kill the plant. Leafy Spurge is a hardy invader and develops an extensive root system from which it can regrow. One biological control that can be effective is the use of goats and sheep to graze this plant. If goats or sheep were used to control Leafy Spurge they would have to be contained in the areas that are infested and monitored. This would include having portable corrals and a water source. The other option for a biological control that could be used is a natural insect enemy such as the beetle *Aphthona lacertosa.* Land managers should look into this biological control to see if it would be a feasible option for the Ranchlands reserve. Spraying this weed is also an option, but again avoiding harm to any species at risk would have to be ensured. A strict regime would then need to be put into place to eradicate this invasion. Dense Leafy Spurge populations are also found along the river bluff outside the fenced area, which should also be taken into consideration and controlled.

For more information about biological control of Leafy Spurge, please contact
Dr. Rob Bourchier
Agriculture and Agri-Food Canada
Lethbridge, Alberta
rob.bourchier@agr.gc.ca
519-738-1235

Downy Brome unfortunately has no biological control at this time; however scientists are working on bacterial techniques which are still in the testing phase. There is a large amount of Downy Brome on and around the gravel piles near 11 Ave NE; in addition to along the main access road to the gas-well site in Environmental Reserve. Hand pulling is effective for small infestations as long as it is done before seed set and is continued for at least two to three years, however these patches are fairly well established. It may be possible to use a proper herbicide if it does not affect any of the species at risk. Consultation with land managers and herbicide applicators would need to take place to arrive at a suitable management program. Nonetheless, portions of the infestation by downy brome also occur within the Tiny Cryptantha population boundaries and this would prevent use of herbicide in this area.

In conclusion, if it is not possible to spray herbicide on the top or root of the Baby's Breath plant to kill it, because of the risk of harming rare species of plants such as Tiny Cryptantha, then severing the plant root at least 15cm below the crown using a shovel is the next effective technique of eradication. This technique was used in 2013 and 2014 to remove a significant amount of the Baby's Breath in the Ranchlands 2F&G Environmental Reserve. However in the spring of 2015, due to lack of moisture, the ground was extremely dry and hard to dig, and combined with Calfrac personnel not being available, the only other way to remove the Baby's Breath plants was to pick and bag the tops and dispose in the landfill. Similarly, the Leafy Spurge plant tops were picked to remove the flowers and seeds. Selective mowing along the access road and around the gas-well site was done to control vegetation growth and spread of weeds. Picking or mowing effectively removed the flowers and seed load which prevented germination and production of new plants the following year but, of course, these techniques do not kill the plants.

To keep moving forward with eradication of the invasive weeds from the Ranchlands 2F&G Environmental Reserve, techniques of spraying, grazing, mowing and/or biological control could be tested along with the current activities of digging and/or picking the plants by volunteers. If Calfrac personnel are not available to do the digging, then perhaps as volunteers, Scouts, Pathfinders, Cadets, CFB Suffield Troops or the Environmental Reclamation students at the Medicine Hat College could be asked do the picking and bagging. Letters outlining the scope of the project and request for volunteers should be mailed out as soon as possible to secure a work group.

Acknowledgements:

The 2015 Ranchlands 2F&G Baby's Breath and Noxious Weeds Removal project could not have taken place without the dedication, energy and hard work of volunteers such as the Grasslands Naturalists and especially Mr. John Slater who acted as the liaison between the City of Medicine Hat Land and Properties Department and Ms. Corlaine Gardner, supervisor for Lisa James at Police Point Park. Special thanks as well to Cathy Linowski, Coordinator of the Medicine Hat College Environmental Reclamation program for providing training, expertise about Tiny Cryptantha and input into the final report. Finally, thank you to the City of Medicine Hat for providing funding to support the Ranchlands 2F&G Baby's Breath and Noxious Weeds Removal project.

Sources:

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- "Baby's Breath Eradication Project Ranchlands Environmental Reserve 2F & 2G", report to City Medicine Hat by Sean Allen, 2014.

Appendix A:

Ranchlands Noxious Weeds Removal Project 2015 Proposal

Executive Summary:

Baby's Breath, a noxious weed, is threatening the habitat of Tiny Cryptantha on Ranchlands Phase 2F & G. A collaborated effort of Calfrac and The City of Medicine Hat intend to remove this noxious weed by digging it up. The goal is to preserve the habitat of Tiny Cryptantha so that the rare plant may grow for years to come.

Besides Baby's Breath, another noxious weed known as Leafy Spurge has been found in Ranchlands. Hand picking the plants has been done in the past two summers to remove and prevent spreading of the seeds. Further work will be undertaken this year to develop methods to reduce and effectively eliminate Leafy Spurge.

Purpose:

With continuation of the successful Baby's Removal Project; in the past 2 years, there has been a dramatic reduction in the population of Baby Breath on the Ranchlands 2F & G property. Over 50,000 noxious weeds have been removed from this valuable property. Also during the past two summers, four areas of Leafy Spurge were also removed by hand picking and bagging the plant and flowers.

Ranchland is the habitat of several rare and tracked species including the Prairie Rattlesnake, Easter Daisy, and Broom Rape which were spotted in 2014. But, most importantly is the Tiny Cryptantha an endangered plant that only grows in 4 locations in Canada along the South Saskatchewan River.

Baby's Breath and Leafy Spurge Invasion

Ranchlands 2F & G, a 75 acre lot, is a habitat for Tiny Cryptantha, (*Cryptantha minima)* a plant on the endangered species list. However, Ranchlands is being invaded by a weed, Baby's Breath, *Gypsophila paniculata L.*, designated as Noxious. According to the Alberta Weed Control Act (2012), Noxious weeds must be controlled. Baby's Breath is a prolific weed with many special adaptations allowing it to out compete many native plants. It grows a deep taproot up to four meters which allows it to survive in times of drought and live undisturbed for many seasons. As well, it produces 10,000's of seeds per year and at the end of the growing season the top growth of the plant turns into a tumble weed dispersing seeds everywhere it rolls. Baby's Breath's ability to reproduce at such an extreme rate is causing a threat to native plants and some may be lost forever.

Leafy Spurge is also invading the Ranchlands area. Methods to control the weed will be developed and tested. Further survey of the noxious weeds and inventory of the rare plants and other significant features on the property will be undertaken during the summer project.

Solution:

During spring break-up the oilfield slows down due to road bans and rainy weather. During this time many companies bring their employees home and annual maintenance is started and courses renewed.

However, break-up usually lasts longer than the annual maintenance, so companies need to find make work projects.

Calfrac has expressed an interest in continuing to help with the Baby's Breath project. Sometime in May or early June, a 2-day event to remove the Baby's Breath will be undertaken. Calfrac will donate about 30 people for about 6hrs/day to hand shovel, removing Baby's Breath. The employees will dig down a foot to expose the root where it will be severed and removed from the ground. It is important to sever the weed a foot below ground to ensure that the regenerative crown of the weed has been removed. The weeds will be stacked in piles on tarps to prevent the further spread of seeds. A dump trailer will be rented to haul the weeds to the locale landfill where the plants will be immediately buried to prevent the spread of the weed. Dave Curtis of the City of Medicine Hat, will be responsible for making disposal arrangements. It is important that any vehicles coming onto the property be washed to ensure that no other foreign species are introduced to this native prairie.

The City of Medicine Hat will be providing the tools, water, lunches. At the end of the project a city representative will present Calfrac with a plaque thanking them for their efforts.

The designated project supervisor will give an orientation and safety speech prior to the start of each day, and with the arrival of any new people on location.

During this orientation session, Calfrac's Safety officer will explain any safety concerns and procedures that are required of this project. For example, safety clothes, footwear, equipment and pre work warm up.

The project supervisor will be responsible for organizing this project and the associated partners and the materials necessary to carry out the project. As well, a record will be kept of the numbers of plants, manpower, and hours spent on the project. During the project, Cathy Linowski will be asked to identify Baby's Breath, Tiny Cryptantha and other rare plants.

On the property, Medicine Hat City has gas lines which will be identified. Crossing agreements with Medicine Hat Gas will be obtained prior to work commencing.

This year's event for removal of Baby's Breath will be only 2 days. The city should still have the shovels required to carry out the project. Following this event, the Supervisor will continue to work to develop and test methods for control and eventual elimination of the noxious weed Leafy Spurge that is invading the property. During the remaining time, this person will also do further surveys of the extent of the noxious weeds and conduct inventory of the rare plants and other significant features on the property.

The expenses of this year's project are summarized in the following tables. The total cost is estimated to be **$4,851.00.** The partners make in-kind-donations of an estimated $7,150. In addition, it is suggested the City provide recognition to them amounting to $700.

Costs:

Equipment	Price	How Many Needed	Cost for 50 people
Shovels (extra)	$10.00	10	$100.00
Start up supplies garbage bags, hand wipes, condiments, plates. Paper towel. Etc.			$300.00
Total			$400.00
			For 2 days
Food			
Refreshments Flat of Gatorade	$20.00	5	$100
Water 1 flat (24)	$5.00	5	$25
Ice	$5.00	8	$40
Lunch	$10 / person	80	$800
Total			$965

Portapoty		1	$90
Dump trailer	$129.00	2	$258
Consult Fee	Supervisor $13.50/hr	225hr	$3,037.50
Mileage	0.505/km	100km	$50.50
Plaque	50		$50.00
		Total	$3,486.00
Grand Total			$4,851.00

In kind donations			
	$/day	people	Total
Calfrac wages	$107.14	30x2days	$6,430
Grassland Naturalists	$12/hr 12hr/ person	5	$720
Total			$7,150

Recognition:

Several partners are committed to ensuring this project continues. They will be donated again many hours of their time to ensuring the success of the project. It is suggested that the City makes a donation to show the gratitude of the city. The Grassland Naturalists is an organization that runs on limited funding. A suggested $200 donation to the Grasslands Naturalist would be appreciated. The Calfrac

employees are the backbone of this project performing the hard work of removing the plants. The Calfrac social club host annual events for the staff such as a golf tournament. A suggested donation of $500 would keep the guys inspired to keep coming back year after year. Finally, Cathy Linowski at the Medicine Hat College is very supportive of this project and spent many hours surveying the Ranchlands to identify Tiny Cryptantha and other rare species of plants, so it is suggested that some form of recognition should be given to her.

Conclusion:

This project has had a positive benefit for all parties involved. The City of Medicine Hat is provided an inexpensive solution to a very difficult problem. The City has benefited from the awareness that this project has created. The public has joined the City in battling Baby's Breath in all areas of the city. The City has also increased their reputation through this project, organizations like the Alberta Emerald Foundation and Communities in Bloom have been impressed with the City's commitment to riding noxious weeds.

Calfrac has been providing a tremendous service to this community and protection of the environment. Calfrac will reap the benefits from being a leader and setting an example by protecting our native grasslands.

Tiny Cryptantha's habitat will have the threat of Baby's Breath greatly reduced, giving Tiny Cryptantha a chance to flourish.

Appendix B:

Baby's Breath Germination Tests

An ongoing question raised during the Ranchlands 2F&G Baby's Breath project was to do with the potential viability and germination rate of seeds from the Baby's Breath plants. As part of the 2015 project samples were collected and a germination trial based on the Darwin and Coupland research carried out in Saskatchewan in 1966.

Gypsophila paniculata (Baby's Breath) Germination Test: Medicine Hat College – November 12-20, 2015.

Purpose:

To investigate the rate of germination of seeds from inflorescences collected on the Ranchlands Environmental Reserve produced during the growing season of 2015. Two samples collected including a plant still attached to the crown of the plant and a second "tumbleweed" plant. Both samples were dry and beginning to shell out seeds.

Procedure:

Dry plants from both samples were crushed to release seeds. Once crushed the seeds were separated from the other plant material and a sample of greater than 100 seeds was added to a 5% bleach bath for one minute of surface sterilization. After the surface sterilization with bleach the seeds were rinsed with sterile distilled water three times. Petri dishes with filter paper were prepared by addition of sufficient distilled water to just moisten the filter paper. Four replicate petri dishes per sample were then prepared by adding 15 of the seeds per dish along with a second piece of filter paper to cover the seeds. Petri dishes were packaged in foil to prevent light and stored at room temperature. Eight days later the petri dishes were examined using a dissecting microscope to determine in germination had taken place. Data was collected and tabulated.

Results:

Sample 1 – "Tumbled" plants

Plate #	Number seeds germinated	Radicle length if germinated	Number of seeds not germinated	Number of seeds with bacterial/fungal growth
1	7/15	5-12 mm	8/15	4 with fungal mycelia
2	11/15	10-15 mm	4/15	1 with mycelium
3	12/15	10-20 mm	3/15	1 with mycelium
4	8/15	15-20 mm	7/15	2 with mycelium

Average of samples	Average germinated	Range length of radicles	Average seeds not germinated	Average of fungal infections
	9.5/15 or 0.63	5-20 mm	5.5/15 or 0.36	2/15 or 0.13

Sample 2 – Not "Tumbled" plants

Plate #	Number of seeds germinated	Radicle length if germinated	Number of seeds not germinated	Number of seeds with Bacterial or fungal growth
1	14/15	10-12 mm	1	1 bacterial growth
2	14/15	10 mm	1	1 with mycelium
3	15/15	5-10 mm	0	0
4	14/15	10-12 mm	1	1 fungal mycelium

Average of Samples	Average germinated	Radicle length range	Average of seeds not germinated	Number of seeds with fungal growth
	14.3/15 or 0.95	5-12 mm	0.75/15 or 0.05	0.75/15 or 0.05

Conclusions:

1. There was a difference between the germination rate of the tumbled versus not tumbled plants indicating a higher germination rate for the non-tumbled plants. This may be an anomaly because the sample was from a single plant. If this study was repeated several samples from a variety of plants throughout the environmental reserve should be sampled.
2. The average germination rate for both tumbled and non-tumbled plants was 79%. This indicates that prior to the winter season almost 80% of the seeds produced are capable of germination. Given a typical plant producing some 3000 seeds this suggests that potentially there could be 2400 new seedlings given ideal conditions. A second germination test should be completed in the spring time using tumbleweeds that have overwintered to see if there is any deterioration in the germination rate.
3. Surface sterilization with 5% bleach reduced infection from surface board fungal spores or bacteria but even so there was a 5 to 13% rate of fungal or bacterial growth. This suggests that there is an attrition rate during germination from fungal or bacterial growth. A potential future study into the feasibility of using bacteria or fungi to control the spread of Baby's Breath should be considered.

Submitted by: Cathy Linowski and Lisa James

Reference:
Life History of Gypsophila paniculata, A. L. Darwent and R. T. Coupland, *Weeds*, Vol. 14, No. 4 (Oct., 1966), pp. 313-318 Published by: Weed Science Society of America and Allen Press
DOI: 10.2307/4040974