



2019 Invasive Plant Control Program in Kluane National Park and Reserve



Manon Fontaine (manon.fontaine@canada.ca)
Resource Conservation, Kluane National Park and Reserve
Parks Canada
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Introduction

Invasive species are non-native species that are established outside of their historical distribution and whose presence is considered by the Convention of Biological Diversity (CBD) to be the principal cause of biodiversity loss around the world¹. Invasive species represent a threat to ecological integrity by outcompeting, displacing, replacing native plants and transforming natural processes.

Not all exotic plants become invasive species and of the 154 introduced species of plants recognized in the Yukon, only 20 are aggressive and persistent enough to be deemed invasive². Although very few of them are currently established inside Kluane National Park and Reserve (KNPR), our reconnaissance and monitoring program indicates that the majority of invasive plant species bordering the park are growing on roadsides, gravel bars, and throughout Dakwākāda (Village of Haines Junction or VOHJ).

This year again, our efforts were aimed at preventing the introduction and controlling the spread of invasive plants within the park boundaries by systematically removing plants found along the pathways of infestation in an attempt to contain and eradicate the threats. Our monitoring and control activities were scheduled between June 28th and July 20th but opportunistic removal activities expanded until October 3rd.

Action Plan for 2019

Early Detection and Rapid Response

At KNPR we use the four steps of the Early Detection and Rapid Response (EDRR)³ strategy and management.

Prevent new invasions inside the Park

In 2019, we added three plants to our invasive species monitoring/control list: narrowleaf hawksbeard (*Crepis tectorum*), perennial sow thistle (also called field sow thistle - *Sonchus avensis*) and the crested wheatgrass (*Agropyron cristatum*). We also extended our range during the four-day period in which two Y2C2 crews participated in a KNPR/VOHJ joint program to remove invasive plants from new and targeted areas bordering the park and around the village. Those new areas were:

- near the Daku and Convention Centres
- around the Administration and Operations building
- on Willow Acres.

We took advantage of this visibility to include some public outreach and educate locals and visitors on KNPR's invasive species program.

¹ Retrieved on November 13th, 2019 from <https://www.cbd.int/invasive/>

² Retrieved on November 13th, 2019 from <https://www.yukoninvasives.com/index.php/en/invasive-species/definitions>

³ This strategy is used by YISC and most national and international organizations involved with invasive species management.

Early detection of new invaders

In order to better identify new invaders before their establishment and spread, staff involved with the invasives project extended the reconnaissance zone around VOHJ and in newly disturbed areas within KNPR and along the Dezadeash riverbeds.

Early detection of aggressive invasive species such as sweet clover and bird vetch (*Vicia cracca*) is especially important to us.

- In July, we identified a new area near the Administration and Operation building densely infested with bird vetch.
- In August, white sweet clover (*Melilotus albus*) was discovered inside the park, on a Dezadeash riverbed, downstream from the boat launch.
- In September, we received a report of sow thistle on the side of the Alaska highway in the A'ay Chu Valley.

Rapid Response

We repeatedly visited newly disturbed areas within KNPR throughout the season and systematically removed invasive species, mainly narrowleaf hawksbeard and lucerne (*Medicago spp.*) in an attempt to reduce seed bank, root growth and deplete available resources.

Late in the season, we detected two new patches of bird vetch on a private property and its bordering alley near the Administration and Operations building and obtained the owner's permission to remove the plants. In September, we cut 1615 stems of bird vetch from the 76.4 m² area.

In August, sweet clover was spotted on the shore of the Dezadeash River within the Park's boundary. On August 14th, we organised an extensive reconnaissance by canoe to map the spread of the infestation. We pulled both white sweet clover and narrowleaf hawksbeard. All 666 sweet clover stems were removed from a small riverine area located at approximately 0.75 km downstream of the boat launch. Narrowleaf hawksbeard was less abundant with 276 stems dispersed along 6 km of the Dezadeash river (between km 0.76 and km 6.73 downstream of the bridge).

Management of established and spreading invaders by containment, control and eradication

In order to tackle the threat efficiently, we repeatedly used a variety of species-specific combinations of treatments (cutting, digging, pulling and mowing) over the season to contain and control infestations, and to increase the potential to eradicate some invasive exotic plants.

Active Removal of Invasive Plants in 2019

Reconnaissance, monitoring and mapping

This season, we monitored a total 34 sites and with the participation of Y2C2 and VOHJ, we temporarily added three transects around VOHJ. In an attempt to deplete seed banks and root resources, eleven key sites continued to be targeted. We revisited, mapped, and treated them at least twice, but up to eight times in very sensitive areas, to remove plants and sprouts before seeds could form.

Of this year's eleven plant species of concern, one, the yellow sweet clover (*Melilotus officinalis*), was only observed around VOHJ while another, the sow thistle, has only been observed toward

the end of the season and still needs to be mapped and managed appropriately. This year, we also devoted time and energy in tracking and removing narrowleaf hawksbeard which is quickly spreading along both highway corridors.

Removal: pulling, digging and mowing

We started the season, in June, with a day of reconnaissance and planning before the arrival of the two Y2C2 crews. Five days were scheduled in July for invasive plants removal, of those, four were done together with Y2C2. Those scheduled removal days were supported with the mid-July mowing at Rock Glacier and World Heritage View pull-outs, and the monitoring of the Dezadeash river in August.

In 2019, we spent some extra effort to remove invasive plants in August and September. During the first weeks of July, the number of white sweet clover stems was surprisingly low but exploded later in the season. This delay, in particular, stimulated 16 opportunistic events in which we removed 8103 stems of invasive species (mainly white sweet clover) from around the Thechàl Dhâl area just outside of the park's boundary.

Table 1. Effort spent in hours during the 2019 season, including stem count for the removal of each of the eleven targeted invasive plant species per infested sites.

Species	# Treated Sites	# Stems	Person Hours Removal			Treatment Type
			Manual	Mechanical	Total	
Lucerne	26	21,116	43.3	12.5	55.8	PULL/DIG/MOW
White Sweet Clover	24	14,494	28.9		28.9	PULL/DIG
Narrowleaf Hawksbeard	25	12,740	30		30	PULL
Butter and Eggs	1	6,037	3.5		3.5	PULL
Yellow Sweet Clover	4	3,551	10.1		10.1	PULL/DIG
Bird Vetch	2	1,958	3.8		3.8	CUT
Oxeye Daisy	2	263	0.5		0.5	PULL
Crested Wheat Grass	1	240	0.5		0.5	PULL
Spotted Knapweed	1	180	1.4		1.4	PULL
Creeping Thistle	1	96	1.6		1.6	PULL
Perennial Sow Thistle	1	0	0		0	RECCI
TOTAL		60,675	123.6	12.5	136.1	

Table 2. Time in hours spent to manage invasive plant species in various locations in and around KNPR in 2019.

2019 Locations		Species	Management Action	Person Hours
Rock Glacier	Parking lot	Narrowleaf Hawksbeard	Pulling / Mowing	19.3
		Lucerne	Pulling / Mowing / Digging	
	Trail and Trailhead	None	Reconnaissance	
Kathleen Lake	Campfire Talk area	Lucerne	Pulling / Digging	3.6
	New Boat House	Narrowleaf Hawksbeard	Pulling	
	O' Tentiks	Narrowleaf Hawksbeard	Pulling	
	Campground road	None	Reconnaissance	
	Slash and Burn Pile area	None	Reconnaissance	
Haines Hwy Corridor	World Heritage site	Lucerne	Pulling / Mowing / Digging	51.3
		Crested Wheat Grass	Pulling	
		Narrowleaf Hawksbeard	Pulling	
		White Sweet Clover	Pulling / Digging	
		Narrowleaf Hawksbeard	Pulling	
	By Kathleen Lake	Creeping Thistle	Pulling	
	by Dezadeash River	Butter and Eggs	Pulling	
	Dezadeash Trail km 2.5	None found	Reconnaissance	
	Dezadeash River	White Sweet Clover	Pulling / Digging	
	Dezadeash River boat launch	Narrowleaf Hawksbeard	Pulling	
		White Sweet Clover	Pulling / Digging	
		Narrowleaf Hawksbeard	Pulling	
	Between bridges	Lucerne	Pulling / Digging	
		None	Reconnaissance	
		Lucerne	Pulling / Digging	
Admin Building	Back alley to EMO	Bird Vetch	Cutting	7
	Around building	Lucerne	Pulling / Digging	
	Logan street	Oxeye Daisy	Pulling	
Haines Junction Village	Library	Crested Wheat Grass	Reconnaissance	46.7
		Narrowleaf Hawksbeard	Reconnaissance	
		White Sweet Clover	Reconnaissance	
	Daku Centre	Narrowleaf Hawksbeard	Pulling	
		White Sweet Clover	Pulling / Digging	
		Yellow Sweet Clover	Pulling / Digging	
	Convention Centre	Narrowleaf Hawksbeard	Pulling	
		Lucerne	Pulling / Digging	
		Narrowleaf Hawksbeard	Pulling	
	Willow Acres	Lucerne	Pulling / Digging	
		White Sweet Clover	Pulling / Digging	
		Yellow Sweet Clover	Pulling / Digging	
	Near Top Spot	Yellow Sweet Clover	Pulling / Digging	
		Lucerne	Pulling / Digging	
		Narrowleaf Hawksbeard	Pulling	
Alaska Hwy Corridor	By Alsek Valley road	Oxeye Daisy	Pulling	28
		Narrowleaf Hawksbeard	Pulling	
		Lucerne	Pulling / Digging	
	Sulphur to Techai Dhai	Spotted Knapweed	Pulling	
	Ay Chu East Parking lot	White Sweet Clover	Pulling / Digging	
	Between Ay Chu East and West	None	Reconnaissance	
	By Techai Dhai Visitor Centre	None	Reconnaissance	
	Soldier Summit Parking	White Sweet Clover	Pulling / Digging	
	Techai Dhai Visitor Centre towards Destruction Bay	None	Reconnaissance	
		White Sweet Clover	Pulling / Digging	
		Lucerne	Pulling / Digging	
	Ay Chu causeway north side	Narrowleaf Hawksbeard	Pulling	
	Techai Dhai road	Perennial Sow Thistle	Reconnaissance	
		None	Reconnaissance	
TOTAL	34 general locations	11 invasive plant species		155.9 hrs

Effort

Since 2015, the invasive species management program has dedicated a total of 240 hours to field work. This field time spent in reconnaissance or actively pulling invasive plants has been steadily increasing from 42hrs in 2015 to 77.3hrs in 2018. In 2019, with the participation of two Y2C2 crews over a period of four days, a total of 155.8 hours were devoted to the project. This represents an increase of 371% over five years, although Park's staff direct involvement (72.8 hrs) was very similar to last year's.

During this year's program, an estimate of 60,670 invasive plant stems was removed from the landscape.

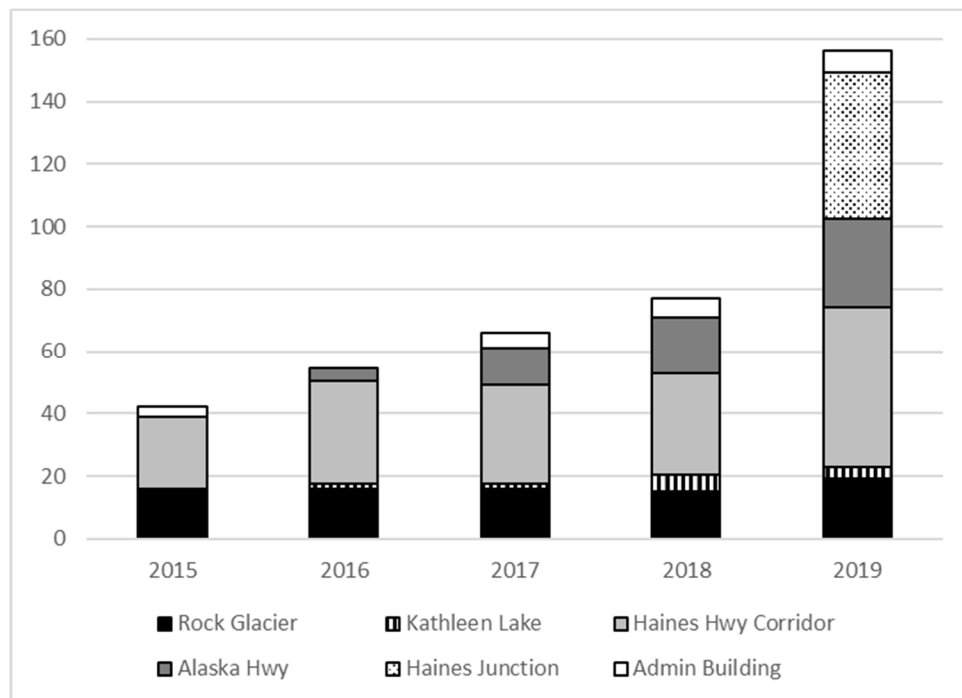


Figure 1. Comparison of the effort in hours spent on controlling activities in six main areas of treatment between 2015 and 2019.

Progress

Three targeted sites have shown a reduction in area since the beginning of the program and are, for now, partially free of invasive plants.

The left side of Rock Glacier trail's pull out was free of lucerne; the slash and burn area at Kathleen Lake; and the zone between the two Dezadeash bridges had no trace of invasive plants.

The area infested with spotted knapweed (*Centaurea stoebe*) has been steadily reducing in the past few years from 76.6 m² in 2017, to 38.4 m² in 2018, and 8.8 m² in 2019. Spotted knapweed relies solely on its long-lived seeds to spread, thus an increased effort should be spent eliminating its seed production.

The eradication of lucerne, sweet clover, and spotted knapweed requires long-term commitment (ten or twenty + years) and regular monitoring. Mature seeds are still present in those sites and can survive many years, waiting for an opportunity to germinate and establish themselves again.

Persistent but apparently confined species

The areas covered creeping thistle (*Cirsium arvense*) has been persistent and under control since it has been located. Although it seems to have slightly increased since 2018 the number of stems present and pulled has decreased from 60 to 46 stems.

Concerns

Lucerne, white sweet clover, and narrowleaf hawksbeard are expanding aggressively along the roadsides. This year, we spent 64.1 hours removing them from the edge of the park and 50.6 hours targeting them around the village of Haines Junction. This represents 73.9% of our seasonal removal effort. The 2019 road construction and soil disturbance in the village to replace water mains and the installation of the new fibre optic line along the Alaska Highway from Haines Junction to Beaver Creek could expand the extent of these invasive plants. Early season monitoring will be important in the years to come.

Sweet clover infesting drainages

Invasive species such as sweet clover can use water drainages as paths of spread and in 2019 we focussed some time and energy in controlling white sweet clover expansion from the vicinity of Sulphur lake and from the boat launch area of the Dezadeash river.

Sweet clover and narrowleaf hawksbeard on KNPR's riverbeds

Our main concern in 2019, is the discovery of patches of invasive plants inside the KNPR boundaries along the shores of the Dezadeash river. A patch of white sweet clover was monitored and removed some 0.75 km from the boat launch. We also removed narrowleaf hawksbeard from 13 locations spread over a distance of 6 km downstream of the boat launch.

Sweet Clover at Sulphur Lake

In August, we mapped a large patch (472 m²) of white sweet clover that was previously discovered in 2018, near Sulphur lake, on the west side of the highway. Because of time restriction, only a portion of it could be removed before seed maturity.

Species using vegetative propagation are problematic

Bird vetch, butter and eggs and creeping thistle use both vegetative and seed propagation to expand their range. To better control these three species, a combination of techniques is used to cause root starvation and deplete seed production, while minimizing soil disturbance. In 2019, it involved pulling plants during rainy days or when the soil was softer. It also involved cutting well-established plants early on and repeatedly over the summer.

Butter and eggs expansion

The patch of butter and eggs along the Haines Highway expanded from 18.2 m² in 2018 to 51.8 m² in July 2019. The size of the patch was smaller in September with 42.3 m² but the number of

stems was higher, 3259 compared to 2494 in July⁴. Because of its delicate root system and use of vegetative propagation, butter and eggs should be cut and not pulled in 2020.

New patch of bird vetch near the Administration and Operation building

In 2017, bird vetch was found in a small area along Logan Street near the KNPR Administration and Operations building. This year, road work kept the area disturbed throughout the season which might contribute to its propagation in 2020. In the same general area, two large patches of bird vetch were monitored on a private property which extended slightly along the back alley. At the end of the season, we obtain owner's permission for monitoring and manual control.

Perennial sow thistle in 'A'äy Chù' Valley

Perennial sow thistle was observed in August by Bruce Bennett, Yukon Conservation Data Centre, but has not yet been monitored or managed. In 2020, we need to revisit the causeway area in the 'A'äy Chù' valley and map the plants, keeping in mind that they gain height and flower later in the season. In YISC's 2016 road survey, there was no report of sow thistle anywhere on the Alaska highway, and it is important to monitor and manage this plant in this very windy area.

Recommendations

Invasive species represent a threat to the biodiversity of KNPR and efforts should be maintained to control their spread. In order for our long-term program to continue to be successful and for the invasive species problem to be manageable, the following recommendations should be taken into consideration for the next season.

1. The number one concern is sweet clover moving down the Dezadeash River and other waterways into KNPR. Thus:
 - Institute formal river surveys, down the Dezadeash in mid July and in August, dovetailing with sewage monitoring.
 - Consider reconnaissance patrols down the Jarvis and the 'A'äy Chù' rivers, as both have sweet clover present where the highway and the watercourse intersect.
 - Include Sulphur Lake in our targeted areas, because of the high density of sweet clover only a short distance from the waterways.
2. Involve and equip all staff to prevent the spread of invasive species from our own operations. This means:
 - Ensure equipment such as ATVs, mowers, trucks, trailers and boats are clean before moving to a subsequent location in the Park.
 - Monitor newly disturbed areas around Parks Canada infrastructures.
 - Reinstate staff weed pull events around the Administration and Operations building and at the Da Kù Centre with Champagne and Aishihik Land Guardians.

⁴ We started using stem count late in the 2018's season and are unable to compare last year stem and density results.

3. Maintain and expand our inventory of invasive plants and infested sites by mapping:
 - perennial sow thistle from Thechàl Dhâl' area;
 - all the narrowleaf hawksbeard and other yet unmapped invasive species present along the highways bordering the Park (see Rosie and YISC 2016).
 - Continue to monitor and treat areas known to have been affected by invasive species such as the Haines highway between Dezadeash bridges for sweet clover.
4. Increase the number of quick removal and reconnaissance events per species from two to at least three with more but shorter control activities and during an extended period covering most of the growing season.
5. Coordinate control actions with Yukon Invasive Species Council, Haines Junction Village and Y2C2 crews covering both KNPR and Village of Haines Junction.
6. Change some of the removal methods for species which spread by vegetative propagation to occur as early in the season as possible and consider cutting instead of pulling if roots can be damaged.

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