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Invasive Species Report 2021



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Contents

Introduction	2
2021 Effort and summary	2
Effort	3
Areas within/adjacent to Parks Canada Jurisdiction.....	4
Dezadeash River.....	4
Sites adjacent to the Dezadeash River.....	4
Mush Lake Road entrance area	5
Thechàl Dhâl' area	5
Parks Canada infrastructure areas.....	5
Areas outside of Parks Canada Jurisdiction	5
Village of Haines Junction	5
Pine Creek	5
Haines Road and Alaska Highway	6
New Discoveries.....	6
Other relevant invasive species work	6
Recommendations and priorities for 2022	7
References	8
Appendices.....	9
Appendix 1. Summary of sites visited in 2021.....	9
Appendix 2. 2021 invasive planning (created at end of season in 2020).	10
Appendix 3. Plant removal notes for 12 species that are currently dealt with.	11

Introduction

Invasive species are defined as species that have been introduced to new habitat (exotic) and that also have negative impacts on the environment, economy, or human health. Invasive species out-compete native species for resources and have the ability to substantially change their surrounding environment over short periods of time. Many native species have coevolved together, forming interdependent relationships that are sensitive to change (Clements and DiTommaso 2012); as invasive species colonize an area and these important ecological interactions are altered, overall biodiversity may be reduced as a result (Smith et al. 2012). Invasive plant species tend to have particularly well adapted characteristics that help them move to and establish in new areas (Clements and DiTommaso 2012). They typically have good seed dispersal mechanisms that allow them to travel long distances. Additionally, they are good colonizers of newly disturbed habitat such as roadsides, recently cleared areas, and along river banks and gravel bars. Invasive plant seeds are commonly transported by vehicles travelling along road systems, by boats being used in multiple water sources, and by footwear being used in multiple locations. These characteristics, combined with a warming climate, have allowed invasive plant species from southern regions to disperse and establish themselves in Yukon (Bennett and Mulder 2009). Early detection and rapid removal are the best strategies to deal with invasive species, and wherever feasible, this strategy has been used by staff at Kluane National Park and Reserve (KNPR).

KNPR staff have been regularly monitoring and managing invasive species within and adjacent to KNPR since 2015. Prior to 2015 invasive species management was done by one warden, Lloyd Freese. Work continues annually from approximately June to September. Various iterations of a protocol have been used, but not strictly adhered to. The most important data recorded at each site visit are the number of person hours spent removing each species, which can then be used as an index for relative abundance of each species from year to year. Additionally, annual work includes updating occurrences of priority species locations and recording any new observations. Primarily, the time spent during site visits is used for removal and control. Each year's report contains a prioritized recommendations section that should be used to inform planning and actions for the following season.

This report summarizes work completed in 2021 (Appendix 1) and provides recommendations for future efforts to control invasive species within and adjacent to KNPR. Locations within park boundaries, on Parks Canada owned property, and locations that were deemed to have high potential for an incursion of invasive plants from outside of park boundaries (e.g., Dezadeash River boat launch) were prioritized over sites outside of Parks Canada jurisdiction and those with lower potential for an incursion into the park.

2021 Effort and summary

A late spring with an above average winter snowpack may have contributed to what was a late growing season. For example, some sweet clover patches along the highways and in Haines Junction were still in flower in early-mid September. Since many Resource Conservation projects including most invasive species work were curtailed in 2020 due to Covid-19, 2021 proved to be a busy season for staff. Invasive species work planning needed to be dynamic and flexible in order to accommodate other monitoring project priorities. In addition to Resource Conservation, Asset Management and Visitor Experience staff contributed valuable time and effort to the program. All of the high and medium/high priorities

identified at the end of 2020 (Appendix 2) were visited and control efforts were carried out. Many of the medium priorities as well as other opportunistically identified sites were also visited for control efforts. The following summary describes some notable sites, but does not detail every location visited.

Effort

A list of all locations visited and the number of person hours spent at each can be found in Appendix 1. Figure 1 summarizes the total number of hours spent across all years since 2015 when invasive species work began in KNPR. In 2021 an experienced staff member identified the subjective nature and potentially unreliable historic records with regards to recording total person hours. The same staff member was confident that the accuracy of recording person hours has increased over the last few years. Accurate records of effort should be maintained as best as possible, as these data can be used as an index of invasive plant proliferation across years.

In 2021, we visited approximately 30 locations and removed 10 of 12 previously identified plant species (for the purposes of this report, yellow sweet clover has been lumped with white sweet clover). White sweet clover management used the most person hours, as seen in Figure 2, and more person hours were used managing bird vetch than any other year. Appendix 3 describes the various methods of managing different species that is used as a guide for control actions at a given site for a given species. In many cases, more than one species existed at the same location. Approximately 96.25 total person hours were spent this year among 17 Parks Canada staff. This is the second highest number of person hours spent since 2015 when the program began.

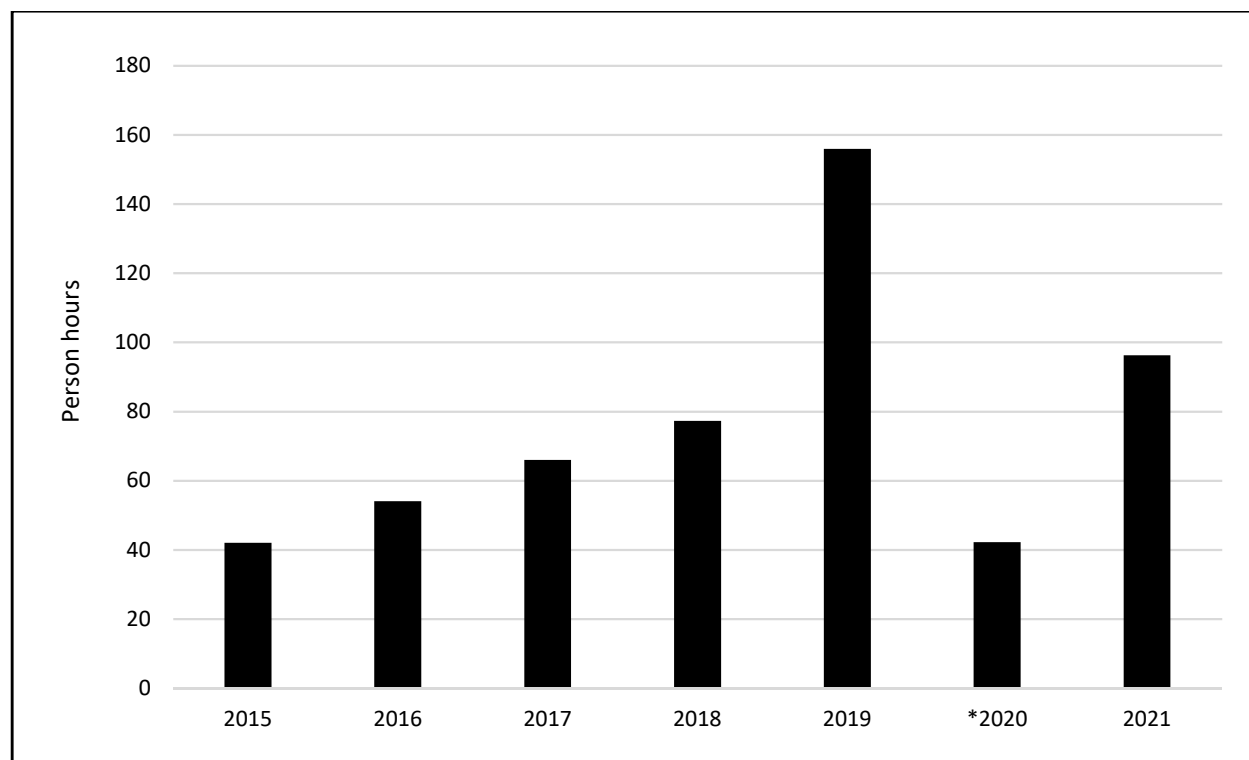


Figure 1. Total person hours used for field based invasive species management/control from 2015-2021.

*Invasive species work curtailed in 2020 due to COVID-19.

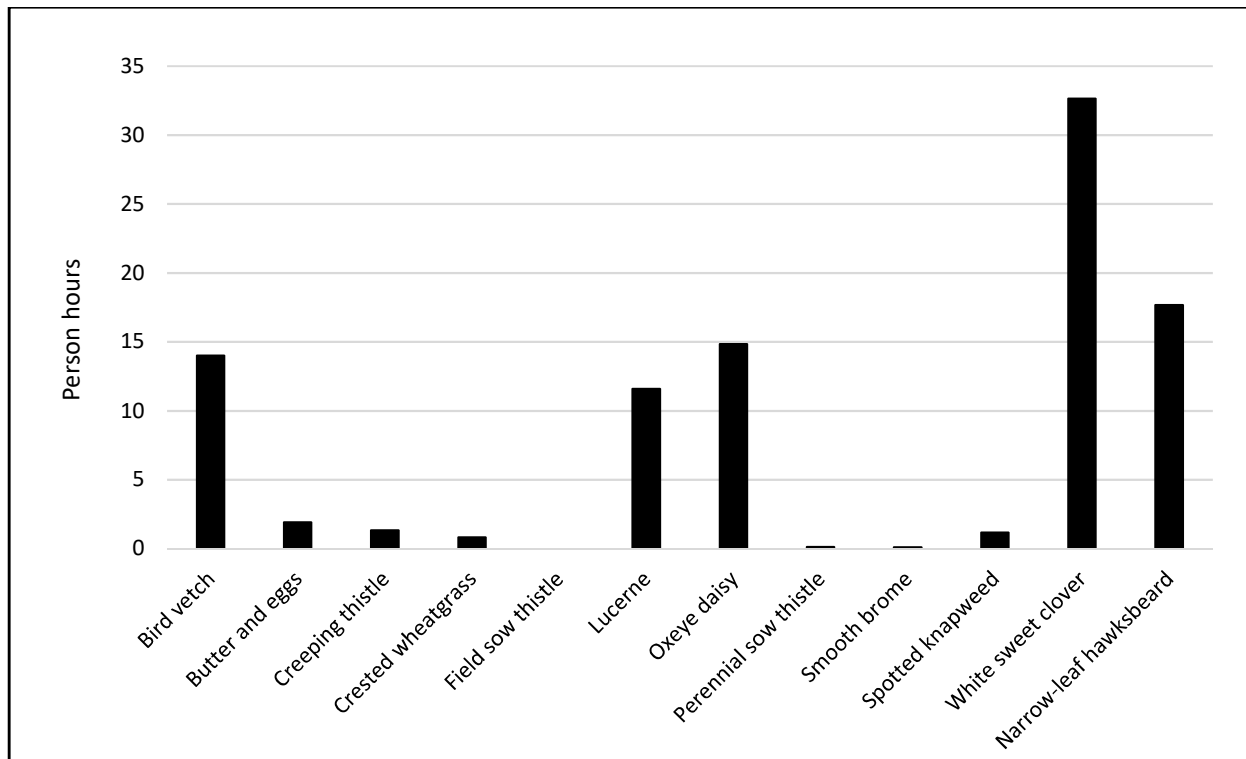


Figure 2. Total person hours used for managing each species in 2021.

Areas within/adjacent to Parks Canada Jurisdiction

Dezadeash River

The Dezadeash River white sweet clover patch (gravel bar downstream of the boat launch and within the park) was discovered in 2019 and was listed as a high priority in 2020 and 2021. After pulling in 2019 and 2020, no plants were observed in 2021. The river was in flood much later into the summer than usual which may have reduced the habitat availability during the growing season or obscured known locations of sweet clover. Narrow-leaf hawksbeard was also pulled at one of two known locations while canoeing down the Dezadeash River (paddling is the recommended mode of travel to access these sites). These sites should be revisited during low water in future seasons to confirm absence of invasive species and monitor for new locations (Table 1).

Sites adjacent to the Dezadeash River

Sites adjacent to the Dezadeash River were also high priority given that the river flows into the park. These include the boat launch and area between the two bridges. In 2020, narrow-leaf hawksbeard, white sweet clover, lucerne, and crested wheatgrass were removed from these areas. In 2021, only a few small sweet clover plants were pulled from the area between the two bridges. Some butter and eggs were found and pulled near the new Dezadeash River culvert on the Haines Road. The Dezadeash boat launch was visited in 2021 to check for white sweet clover but no plants were found, however, this site visit was very early in the season and no follow up visits were done. This site was also mowed early in the season, but no details were recorded regarding invasive species prevalence at that time.

Mush Lake Road entrance area

Based on suspicions from 2020, bird vetch presence was confirmed near the start of the Mush Lake Road along with perennial sow thistle (new species in the region) and oxeye daisy. All of the observable bird vetch and perennial sow thistle were pulled at this location during multiple visits over the summer. Oxeye daisy was abundant and not all of it could be pulled by season's end. The majority of these plants were on private properties, but property owners were consulted and were supportive of Parks Canada staff pulling invasive plants.

Thechàl Dhàl' area

White sweet clover was pulled from the Thechàl Dhàl' area (near the visitor centre, between the Ä'äy Chù West access road and the Alaska Highway), which is on federal lands set to become part of KNPR. The sweet clover here has expanded over the last two years. There was also smooth brome and narrow-leaf hawksbeard at this site – this is the first observation of smooth broom at this site. Smooth brome flowering heads were picked. The close proximity to hiking trails that lead into the park as well as the windy nature of the Ä'äy Chù valley may present future issues so this site should be closely monitored and managed.

Parks Canada infrastructure areas

Narrow-leaf hawksbeard, white sweet clover, lucerne, and oxeye daisy were removed around the administration and trades building parking areas and access roads as well as along Logan St. adjacent to the Admin building parking lot. Narrow-leaf hawksbeard, white sweet clover, and butter and eggs were removed near the northwest corner of the Parks Canada visitor reception center. Sweet clover was abundant in the ditches along the access road to the visitor center and mature plants were often too large to pull by hand. Narrow-leaf hawksbeard was observed in 2020 at recently disturbed sites (Otentik area, Kokanee Trail extension, and the new Kathleen Lake boat house) and was observed again in 2021 at all of these sites except the Otentik area.

Areas outside of Parks Canada Jurisdiction

Village of Haines Junction

Yellow sweet clover was observed along many streets within the village and a new patch was pulled along Logan St., between the Admin building parking lot and Tomlin Hill.

Bird vetch was not found on Logan Street in the locations previously identified and removed in 2018. Bird vetch was removed from the private property on MacIntosh St. after the property owner gave permission. Bird vetch was pulled in the adjacent alleyway and white sweet clover was observed in small patches along MacIntosh St. Bird vetch was also removed from a previously identified area in the alley near the Green Sprout on Lowell St.

Pine Creek

Pine Creek (at the culverts along Paint Mountain Road) was identified as a heavily infested site in 2020 with white sweet clover. Only a short amount of time could be spent at this site in 2021 and plants were beginning to go to seed on July 28. The removal efforts in 2020 appeared to reduce the number of plants at this site in 2021, however, many still remained after the 2021 site visit.

Haines Road and Alaska Highway

Along both the Haines Road and Alaska Highway spotted knapweed, creeping thistle, butter and eggs, and white sweet clover were removed from previously known and managed sites. The Haines Road corner south of the bridges (location of crested wheatgrass, butter and eggs) underwent construction in October 2020 to replace a culvert. While no new species were observed here in 2021, this site should be monitored to see if species begin to establish in the recently disturbed gravel.

New Discoveries

- Smooth field sowthistle (*Sonchus arvensis uliginosus*) was observed at same location as bird vetch and oxeye daisy near the start of the Mush Lake Road. These species were all occurring within the forest as well as adjacent to the road.
- Crested wheatgrass was found near the start of the horse trail that is approx. 300 meters past the Alaska highway pullout with outhouses north of the old farm which housed Parks Canada administration up to 2012.
- Smooth brome and narrow-leaf hawksbeard were found along the side of the access road at Thechàl Dhâl' adjacent to the sweet clover patch.
- Crested wheatgrass along the Haines Road near the new culverts and associated disturbed ground near the Deazadeash wetlands.

Other relevant invasive species work

New signs ("clean, drain, dry") were put up at Kathleen Lake boat launch and the beginning of the Alsek Valley Road to remind boaters of the actions they can take to reduce the risk of spreading aquatic invasive species via their boat. Additionally, angler surveys carried out in 2021 included questions relating to the time and location of last boat use as well as asking participants how concerned they were about aquatic invasive species in the Yukon. The Yukon Invasive Species Council spent at least one day at the Kathleen Lake boat launch to educate public about invasive species in the area. Yukon Invasive Species Council also coordinated a local weed pull within Haines Junction and worked with Parks Canada staff to identify common goals and key areas of concern.

Recommendations and priorities for 2022

Table 1. 2022 KNPR invasive species recommendations and priorities.

Action type	Priority level	Action
Operational	High	Continue to monitor and remove all invasive species at the location near the entrance of Mush Lake Road. Multiple site visits per season should be carried out. Checking in with land owners at the start of every season should clarify access permissions and maintain a positive relationship.
	High	Continue to monitor and remove all invasive species along Dezadeash River between the bridge and the Alsek Valley Road. Multiple canoe trips during low water levels are advised in order to adequately observe gravel bars and river banks. This may require balancing the timing of low water and the timing of plants beginning to go to seed.
	High	Multiple visits to the Thechàl Dhàl' site are advised, as the white sweet clover patch expanded in 2021. Smooth brome and narrow-leaf hawksbeard should also be pulled while at this site. Many person hours may be required at this site.
	Medium	Continue to monitor and manage recently disturbed areas to prevent new species establishment and expansion (e.g., Otentiks area, Kokanee Trail extension, new boat house, Logan Street construction areas from 2018-2019, new culvert on Haines Road near Dezadeash bridges).
	Medium	Maintain control of key sites outside of park boundaries to prevent spread (e.g., sweet clover at Pine Creek). This requires multiple site visits per year.
Logistical	High	Work with Champagne and Aishihik First Nations, Kluane First Nation Land Guardians, Yukon Invasive Species Council, Y2C2, and other Parks Canada departments to spread education, to coordinate efforts, and to build and foster relationships.
	High	Work with Parks Canada Visitor Experience staff to develop an interpretive public walk and include a volunteer weed-pull.
	Low	Compile an inventory of livestock numbers and locations around KNPR area. Use local knowledge and YG agriculture sources. This inventory will be valuable in monitoring potential vectors for transmission of disease to wildlife in and near KNPR.

References

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Appendices

Appendix 1. Summary of sites visited in 2021.

Species	Location	Coordinates	Dates Visited	Total Person Hours
White sweet clover	Admin building	60.7531, -137.5161	12-Jul-21	5
	Măt'ătăna Măn Nă'i	60.6277, -137.2880	30-Jun-21	0.5
	New boat house	60.5801, -137.2170		0.1
	Dezadeash River downstream	60.7432, -137.5156	13-Jul-21	0.67
	Dezadeash boat launch	60.7478, -137.5085		0.1
	Haines Road between Dezadeash bridges	60.7472, -137.5063		0.2
	Thechâl Dhâl'	61.0139, -138.5241	03-Jul-21	6.25
	Sulphur Creek	60.9406, -137.9964	03-Jul-21	1
	Pine Creek	60.8010, -137.5087	28-Jul-21	6
	Haines Hwy 800m S from Kath. L.	60.5787, -137.1984	14-Jul-21	1.33
	Visitor Reception Center	60.7627, -137.5156	13-Jul-21	5
Lucerne	Logan Street	60.75431, -137.5169	23-Aug-21	6.5
	Admin Building	60.7527, -137.5171	12-Jul-21	1.5
	Dezadeash Trail	60.757, -137.549		
	Haines Road between Dezadeash bridges	60.7472, -137.5062		0.1
	Măt'ătăna Măn slash burning area	60.5823, -137.2130	30-Jun-21	0.5
	Măt'ătăna Măn campfire talk circle	60.5778, -137.2085	30-Jun-21	0.5
	Măt'ătăna Măn Nă'i	60.6279, -137.2887	05-Jul-21	4
	Rock Glacier	60.4552, -137.0601	13-Jul-21	4
	Logan Street	60.75431, -137.5169	25-Aug-21	1
	Admin Building	60.7529, -137.5159	12-Jul-21	5
	Visitor Reception Center	60.7627, -137.5156	13-Jul-21	5
Narrow-leaf hawksbeard	Otentiks and new parking area	60.5763, -137.2088	27-Jun-21	0.1
	New boat house	60.5801, -137.2170	27-Jun-21	0.08
	Kokanee extension	60.5767, -137.2088	03-Sep-21	1
	Dezadeash River downstream @ same location as WSCL	60.7432, -137.5156	13-Jul-21	0.1
	Dezadeash River downstream	60.7490, -137.5492	13-Jul-21	0.1
	Dezadeash River downstream	60.7587, -137.5779	13-Jul-21	0.1
	Dezadeash boat launch	60.7478, -137.5081	13-Jul-21	0.1
	Haines Road between Dezadeash bridges	60.7468, -137.5055		0.1
	Rock Glacier	60.4554, -137.0595	27-Jun-21	6
	Thechâl Dhâl'	61.0139, -138.5241		
	Spotted knapweed	Alaska Highway next to Mt Logan Lodge	03-Jul-21	1.17
Creeping thistle	Haines Road north of Kathleen River	60.6114, -137.2575	27-Jun-21	1.33
Field Sow thistle	Biking/walking path adjacent to Alaska Highway near Ā'ây Chû East	60.9916, -138.4833		
	St Elias Community School	60.7564, -137.5072		
Butter and eggs	Visitor Reception Center	60.7627, -137.5156	13-Jul-21	0.5
	Haines Road on corner south of Dezadeash River	60.7436, -137.4999	26-Jul-21	1.42
Crested wheatgrass	Haines Road on highway corner south of Dezadeash River	60.7437, -137.5003	21-Aug-21	0.33
	Haines Road at northwest corner of 2nd Dezadeash bridge	60.7460, -137.5053	21-Aug-21	0.33
	Haines Road between Dezadeash bridges	60.7466, -137.5058	26-Jul-21	0.17
	Măt'ătăna Măn Nă'i	60.6276, -137.2882		
	Approx. 300 meters past the highway pullout with outhouses next to the farm	60.77373, -137.60455		
	Mush Lake Road Entrance	60.37228, -137.0631	14-Jul-21	9
Bird vetch	Alleyway either side of Green Sprout	60.7543, -137.5157	12-Jul-21	5
	Previously on Logan Street before 2019 construction work (may have moved)	60.75491, -137.5175		
	Near garden box across road from Bakery and on roadside near the admin building	60.7535, -137.5163	14-Jul-21	0.17
Oxeye daisy	Between Paved Trail and Alaska Hwy	60.7523, -137.5125	03-Jul-21	1.17
	Mush Lake Road Entrance	60.37228, -137.0631	24-Aug-21	13.5
	Perennial sow thistle	60.37228, -137.0631	08-Aug-21	0.13
Smooth brome	Thechâl Dhâl'	61.0139, -138.5241	01-Sep-21	0.1
Total Person Hours = 96.25				

Appendix 2. 2021 invasive planning (created at end of season in 2020).

Name	Notes
High	
Bird vetch at Mush Road	Need to make a multi-year plan to visit this site multiple times throughout the season to effectively control this plant at this location
Dezadeash River – white sweet clover	Plan to visit this site 2 times. First visit should be mid to late July so plants can be found easily but before they have gone to seed (approx. early Aug) and can be left on site rather than bagging and removing. Traveling the full section of river to Alsek Valley Road is more logistically complicated but recce to look for more sweet clover sites is warranted and also to pull NLHB at numerous locations along this stretch
Medium/High	
Dezadeash River boat launch and bridges	Remove invasives from this area to prevent seed dispersal down stream into park. Plants of concern: white sweet clover, lucerne, narrow-leaved hawksbeard, crested wheatgrass (?)
Recently disturbed sites (Otentiks, new campground parking areas, Kokanee Trail extension, new boat house, admin building)	Visit sites 2x to prevent invasives (mostly NLHB) from becoming established.
Thechâl Dhâl' white sweet clover	Need to visit multiple times. May not be many plants present at this site as the plants here may show up in large amounts every 2 nd year
Bird vetch in alley between Lowell and MacIntosh	Need to make a plan to tackle this site. Establish an agreement with property owners. The main site is very infested. The property across the alley now has plants on it (on private property/beyond the fence). Numerous plants exist along the alley adjacent to a number of properties (see previous years location data)
Spotted knapweed near Alsek Valley Road	Need to pull these plants before going to seed. Pulled on July 17 and August 13 in 2020 and had not gone to seed yet.
Creeping thistle on Haines Road	Need to pull these plants before going to seed. Pulled on July 17 and August 13 in 2020 and had not gone to seed yet.
Medium	
Rock Glacier	Get Asset to mow this site 2x
Mât'âtãna Mãn campfire circle and slash burning area	Mainly lucerne. Dug and pulled plants and roots in 2020. These sites are becoming under control with continued effort
Mât'âtãna Mãn Nà'i (Kathleen Lake Viewpoint)	Get Asset to mow this site 2x
Pine Creek	Prevent seeds from dispersing downstream into park. First pulled/cut white sweet clover next to Pine Creek in 2020 with help of 2 VE staff. Tons of plants and very large. Visit before going to seed so they can be left on site. Visited August 7 and plants had gone to seed already.
Sulphur Creek	Prevent seeds from dispersing downstream into park. Did not visit in 2020 due to lack of resources (much required for this site)
White sweet clover on roadside (Haines Road and Alaska Highway)	New sites popping up on Haines Road and Alaska Highway (including on KNPR side of roads). Need to ID and prioritize locations
Field sow thistle at St Elias Community School	Pulled in 2020 with 2 VE staff
Butter and eggs on Haines Road	Pulled once in 2020. Should be cutting instead of pulling?
Oxeye daisy across from admin building	Only a few plants near VOHJ planter across from Bakery. New plants established on admin building side of road from construction work in 2019

Appendix 3. Plant removal notes for 12 species that are currently dealt with.

Species	Notes on removal
White/yellow sweet clover	Goes to seed approx. early August. Plant can be left on site if seeds are not developed (you can clearly see the seeds once they are developed). Pulling or cutting will have to be repeated over a number of years to deplete the seed bank. If mature seed is not present, plants can be left where they are pulled. The plants quickly die once removed from the soil.
Narrow-leaf hawksbeard	Goes to seed early. Must bag plant as seeds develop and are viable even after being pulled. Pull after rainfall or wet soil around plant to effectively pull. Mechanical and chemical methods can also be used to control this plant.
Bird vetch	Spreads via roots and seed. Need to remove all root material. Mowing and herbicide control can also be used effectively, especially for larger areas.
Lucerne	Spreads mainly by roots. Need to either remove all root material or stress the plant with continued cutting/pulling.
Creeping thistle	Must not let go to seed, as the seeds are very long lived and many are produced. Regrows readily from any root left behind. Plants not as easy to see in Mid July but easier in early August. Must bag plants at any life stage. Mowing or cutting to reduce root reserves and seed production should be done a few times a season for several years. When hand-pulling use a shovel and remove as much of the root as possible.
Perennial sow thistle	If the whole plant cannot be removed, pick the flowering heads before they go to seed. Must bag plants at any life stage. Mowing or cutting to reduce root reserves and seed production should be done a few times a season for several years. When hand-pulling use a shovel and remove as much of the root as possible.
Field sow thistle	If the whole plant cannot be removed, pick the flowering heads before they go to seed. Must bag plants at any life stage. Mowing or cutting to reduce root reserves and seed production should be done a few times a season for several years. When hand-pulling use a shovel and remove as much of the root as possible.
Spotted knapweed	Must not let go to seed, as the seeds are very long lived and many are produced. Plants not as easy to see in Mid July but easier in early August. Must bag plants at any life stage.
Oxeye daisy	Put plants into clear garbage bags and then leave them in the sun to kill off the roots and roast the seeds.
Smooth brome	Mechanical treatment or herbicides may be required. Treatment with fire has shown promise in southern regions and would involve a timely prescribed burn in late spring which can remove the initial smooth brome growth forcing the plant to pull energy from its root reserves. Burning in early spring or fall may promote growth of rhizomatous smooth brome by removing litter from sod-bound plants.
Crested wheatgrass	Spreads primarily via seed but may also spread via rhizomes. As a perennial, when clumps of plants are removed, even small pieces of the root system are capable of regenerating into new plants. Put plants into clear garbage bags and then leave them in the sun to kill off the plants and roast the seeds. Treatment with fire is not recommended as prescribed burn research in US showed plants were slightly damaged or undamaged and regenerated rapidly as a result of prescribed fire.
Butter and eggs	Spreads by roots so need to remove all roots or stress the plant by continuously cutting multiple times throughout the year.