

Southern Lakes Roadways Invasive Plant “Patrol and Pull” Project Year 5 Report – 2019



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Summary of Activities, Key Findings, and Recommendations after Program Year Five (2019)

1. As in previous years, the Patrol and Pull (P&P) program area included the three major highways in the Southern Lakes region – the South Klondike Highway, the Tagish Road, and Atlin Road – as well as their side roads.
2. Methods used to survey and eradicate invasive plants remained the same. Roadways were surveyed from a slow moving vehicle and the location of each invasive plant or colony encountered was recorded and mapped. Small colonies and individual plants were pulled by hand and large colonies were mowed with a gas brush cutter. Species such as perennial sow thistle, knapweed, oxeye daisy and bird vetch were pulled and bagged for disposal when possible because it is important to remove their roots.
3. June was wetter than normal this year, and ended warmer than normal. As a result, invasive plants matured earlier in 2019 and the P&P survey took place about two weeks earlier than usual (most work occurred between July 10 – 24).
4. Results from five years of P&P suggest that the program has been successful at containing most colonies of invasive species along Southern Lakes roadways, and even eliminating some, though challenges remain. The following is a status report for each species:

► **Sweetclover** continues to be the most significant invasive species, though the level of infestation is light when compared to many other Yukon roadways. For that reason, P&P has been effective at containing sweetclover on these three highways. A few small colonies and isolated plants appear each year and are pulled, but there remain six notable sweetclover colonies at the following locations:

1. The intersection of the South Klondike and Alaska Highways (Carcross Cut-Off)
2. Kilometre 16-20 on the Tagish Road
3. The first one kilometer of the Robinson Subdivision Road
4. The intersection of the Tagish Road and the Alaska Highway (Jakes Corner)
5. Kilometre 16-18.5 on the Atlin Road
6. The gravel pit at Km 156 South Klondike Highway (new infestation; contaminated fill deposited there in 2017)

Patrol and Pull has been very effective at containing these colonies, and their overall size is diminishing. And except for the gravel pit at km 156 SKH, which is a new colony, the plant density in each colony also is diminishing each year. The colony at Jakes Corner has almost been eliminated. Reports from previous years noted concern that sweetclover still was expanding along the Atlin Road, despite efforts of P&P. However, 2019 marked a turning point as colony numbers and sizes were noticeably diminished on the Atlin Road. Likely, this is because those colonies grew as a result of recent road upgrades and thus are young colonies with a limited seedbank, which P&P is starting to exhaust.

► **Spotted knapweed** is a species of concern. There is a persistent colony on the Atlin Road, despite the fact that its plants are pulled every year. And in 2019, knapweed was recorded for the first time on the SKH, at two locations (with four plants total). This species can become very difficult to control, if allowed to expand and gain a foothold; it should be monitored closely and eradication efforts should continue.

► **Perennial sow thistle** colonies have been recorded at seven locations in past years, with the most significant occurrences on the Tagish Road. Every year small colonies have been pulled, or flower heads have been clipped at large colonies. As of 2019, four of the small colonies have not grown back, suggesting that persistent pulling was effective at eliminating them. However, three colonies growing on the Tagish Road are proving to be tenacious and are not responding to pulling and clipping. It may be prudent to consider the use of an herbicide to eliminate these persistent colonies, as this may be the only way to prevent them from gaining a strong foothold and spreading to other areas.

► **Altai lyme grass** mainly occurs on southern portions of the SKH, from Carcross south into BC. Populations remain largely unchanged, and this species is mostly in a state of monitoring. The exceptions are two small colonies, one outside of the heavy infestation zone on the SKH and one on the Tagish Road. Both colonies have been eliminated after three/four years of pulling. Atlin Road remains free of lyme grass. There is concern that this species may spread into the Carcross dunes and compete with rare or endemic plant species growing there, but so far this has not occurred.

► **Oxeye daisy** occurs on the Atlin Road and SKH. Small but persistent colonies are recorded each year on the BC side of the SKH, and a large, persistent colony is still present on the Atlin Road. Other single plant occurrences were recorded in previous years' surveys, but pulling them seems to have been effective, as they did not recur in 2019. An herbicidal treatment is recommended for the large colony growing on the Atlin Road, because mowing has not eliminated this tenacious colony and it is too large for pulling.

► **Yellow lucerne:** Isolated plants continue to appear each year along a ~500 m stretch of the Atlin Road. Each year, the plants are pulled and while the species does not appear to be spreading, it should be monitored.

► **Unscented chamomile** plants were encountered near a driveway on the Atlin Road from 2015 – 2017 and were pulled each year. No plants were found in this location in 2018 or 2019, so it appears that P&P has effectively eliminated this invasive species from the area.

► **Bird vetch** is still present at the entrance to a driveway on the Atlin Road. Since most of the colony is growing on private land, no eradication efforts were undertaken. Yukon Government may want to contact this property owner to discuss the potential spread of this species from their property. Bird vetch is an invasive species that is difficult to eradicate once it becomes established.

5. The model of sweetclover population dynamics has been updated with less emphasis placed on reconstructing historical explanations for specific sweetclover infestations (e.g., elapsed time since road reconstruction), to one emphasising the resilience of sweetclover populations based on the size of the seedbed, regardless of its history.

6. To manage the spread of sweetclover, it still is important to ensure that road upgrade and maintenance work do not use granular materials transported from borrow pits that are contaminated with sweetclover seeds. Private landowners also may be contributing to the spread of sweetclover when upgrading their driveways through the use of materials from contaminated pits. This emphasizes the importance of eliminating sweetclover from public borrow pits.

7. The annual appearance of single sweetclover plants reflects the fact that seeds continue to be distributed and bare ground continues to be exposed along these roadways. It seems likely that snowploughing, particularly the practice of scraping shoulders to bare soil each spring, is a major factor contributing to this mechanism of dispersal and propagation.

8. We recommend that YG HPW consider the development of an herbicidal spraying program to strategically address persistent and problematic colonies of invasive plants. Targets to consider include:

- Sweetclover growing on contaminated fill that was deposited at the km 156 gravel pit on the SKH
- The persistent spotted knapweed colony growing at km 12.5 on the Atlin Road
- Two persistent colonies of sow thistle growing at km 5.5 and km 19.5 on the Tagish Road
- The large and persistent colony of oxeye daisy growing at km 3 on the Atlin Road

1 Introduction

This report documents work performed during the 2019 Patrol and Pull (P&P) invasive plant control program on Southern Lakes roadways. The work was conducted for YG HPW by *Yucan Planning* under contract no. C00050087 and is the fifth consecutive year of the control program (2015-2019). The overall scope, methods, and goals of P&P were presented in the 2015 and 2016 reports, to which the reader is referred for specific details. This report provides an update on the status of invasive plant populations in the study area, along with an evaluation of the P&P program's effectiveness after five years of implementation.

The roadways surveyed/patrolled in this program include:

1. The South Klondike Highway (SKH) from its intersection with the Alaska Highway to the Alaska-BC border (note that the section of the SKH from Carcross to the Alaska border was added to the control program in 2016 onward, but was not patrolled in 2015)
2. The Atlin road from km 0 to the BC border
3. The entirety of the Tagish Road.

As in previous years, all side roads along these three roadways were also surveyed/patrolled (e.g., Annie Lake Road, 10-Mile Road, etc.). The breakdown of kilometres of highway and side roads surveyed/patrolled is enumerated in Table 1.

TABLE 1: Roadways Surveyed/Patrolled

		Km Surveyed				
Road Name		2015	2016	2017	2018	2019
South Klondike Highway (km 24-158)		44	134	134	134	134
	Kookatsoon Lake Road	0.75	0.5	0.5	0.75	0.75
	Mosquito Road	1.25	1	1	1	0.5
	CCC Road	2.5	2.5	2.5	2.5	2.5
	Cowley Lake Road	2	2	2	2	1.5
	Ingo's Road	1	1	1	1	1
	Percival Road	1	0.5	0.5	0.5	0.5
	Linville Road	0.5	0.5	0.5	0.5	0.5
	Narrow Gauge Road	1.5	0.5	1	1	1.5
	Robinson Subdivision Road	5.5	5.5	5.5	5.5	5.5
	Annie Lake Road (and feeders)	30	30	30	30	30
	Meadows Road	0.5	0.5	0.5	0.5	0.5
	Lewes Lake Road	1.5	1	1	1.5	1.5
	Bill Pringle Road	0.5	0.5	0.5	0.5	0.5
	Watson Lake Subdivision Road	2	2.5	2.5	2.5	2.5
Tagish Road (km 0-54)		54	54	54	54	54
	Airport Road	1.5	1.5	1.5	1.5	1.5
	Chootla Subdivision Road	2.5	2.5	2.5	2.5	1.5
	Crag Lake Road	1	1	1	1	1
	10 Mile Road	2	0.5	0.5	1	2
	Taku Subdivision roads	7	8	8	8	8
	Tagish Estates Road	3.5	3.5	2	2	4.5

		Km Surveyed				
Road Name		2015	2016	2017	2018	2019
	Tagish River Road	1.5	1.5	1.5	1	1.5
	Pennycook Road	2	2	3	2	2
	Secret Valley Road	1	1.5	1	1	1.5
Atlin Road (km 0-41)		41	41	41	41	41
	Lubbock River Road	2	1	1	2	1
	Snafu Campground Road	1	1	1	1	1
	Tarfu Campground Road	2	2	2	1	1
	Camp Yukon Road	1	1	1	1	1
Total Kilometres Surveyed		217	304	304	302	306

2 Update & Summary of Patrol and Pull Methodologies

Methods and Timing: The methods utilized in 2019 were essentially unchanged from the previous four years, and entail a slow speed (≤ 40 Km/hr) patrol of roadways looking for invasive plant species growing in or near the right of way (ROW). When an invasive plant is encountered, the surveyor stops the vehicle to confirm its identity, record its location by GPS, photograph it if deemed necessary, and eradicate the plant(s) by pulling or mowing, whichever is appropriate for that species.

The survey/patrol is generally conducted over the course ~2-3 weeks from mid-July through early August, during the period when plants have matured enough to be readily spotted, but are not yet in seed. The program is most effective if the roadways are driven/patrolled twice in the season for multiple reasons. First, young shoots sometimes are missed by the brush-cutter and can grow viable flower heads within a week or two after mowing the larger plants. Second, it has been our experience that no single patrol is 100% effective in spotting every invasive plant, so the second drive/patrol functions to catch those plants missed during the first drive/patrol. Finally, two patrols ensure that late-emerging plants are detected, which is particularly important in summers with unusual weather and to detect some specific plant species, like sow thistle.

June of 2019 was wetter than most years and the month ended with a warm period that lasted into the middle of July. These were optimal growing conditions for plants, including invasives. The result was that most invasive plants matured earlier than previous years. Consequently, this year's P&P was conducted between July 10-24, which is approximately two weeks earlier than previous years.

Equipment: Single plants or colonies of ~10-20 mature plants or less are either pulled by hand or cut at the base using a small pruning shear. Colonies larger than ~10-20 plants are mowed using a gas-powered brush cutter with a steel 3-bladed cutting head.

3 Report on Individual Roadways

3.1 South Klondike Highway and Side Roads

Patrol and Pull was conducted along 134 kilometres of the South Klondike Highway (SKH) from the Carcross Corner (km 158) to the Alaska-BC border (km 24), along with approximately 50 kilometres of side roads. A total of 117 stops were made to document and remove invasive plants. In terms of species present and location of colonies, there was a similar occurrence of invasive plants in 2019 compared to previous survey years (2015-2018), and again, the predominant invasive species was sweetclover, though the extent of sweetclover infestation on SKH remains limited and under control.

Sweetclover: In broad terms, the overall distribution of sweetclover infestations has not changed along the SKH. In 2018, we noted that the size of most colonies was smaller compared to the previous three years, and in 2019 colonies were reduced in size again. In addition to multi-plant colonies, eleven single plant colonies were encountered, compared to four in 2018, eight in 2017, and 21 in 2016 (10 were found in 2015, but the study area was smaller). All sweetclover plants encountered (46 locations) were cut or pulled.

As noted in previous years' reports, there are three significant and persistent sweetclover infestations on the SKH:

1. At the Carcross Corner (~75 m²)
2. Along the first kilometer of the Robinson Subdivision Road (~100 m²)
3. Km 156 gravel pit (~0.25 ha)

A fourth infestation just south of the Nares River Bridge in Carcross has been essentially eliminated for the time being due to road realignment completed in conjunction with construction of a new approach to the Nares River bridge. Close monitoring of this location in the coming years will be prudent, in order to mow/contain new plants that may germinate in the disturbed soil.

The three remaining large colonies were mowed with a brush cutter in 2019, similar to previous years. The colony at the Carcross Corner is reducing in size and density, and is not spreading down the SKH (i.e., it is being contained to the south). However, the adjacent infestation along the Alaska Highway ROW, which is outside of the Patrol and Pull area, is becoming thicker. The colony on the Robinson Subdivision Road was slow to develop this year, but it eventually grew to a size seen in previous years and was mowed in late July. That colony is becoming less dense with mowing, but has not yet diminished in overall area. The colony in the km 156 gravel pit first grew in 2018, after contaminated fill was deposited there during reconstruction of the nearby section of Alaska Highway in 2017 (from Cowley Creek to the Carcross Cutoff). In 2019, we mowed the gravel pit area as part of Patrol and Pull, but the colony is well established and will need more aggressive treatment. Options are discussed in Section 4.

Besides the heavy infestation in the km 156 pit, we inspected the other three active gravel pits along the SKH, located at km 112, 129 (Lewes Lake) and km 151 (Mosquito Road). One small sweetclover colony (~0.5 m² of plants) was encountered in the km 151 pit, and ~2 m² of sweetclover plants were growing along ~250 m of roadway near its entrance. The other two pits were free of invasive plants. Every year since 2015, we have found one or two small sweetclover colonies in the km 151 pit; the colonies are not always in the same location, but they are always growing within 75 m of the pit entrance.

Similar to previous years, side roads off the SKH were found to be free of invasive plants in 2019, with four exceptions: 1) the large patch of sweetclover already mentioned along the Robinson Subdivision Road, 2) a colony of ~50 yellow sweetclover plants near km 4 Annie Lake Road, 3) three single-plant white sweetclover colonies and a 15-plant colony between km 1-4 Annie Lake Road, and 4) a small colony of ~ 0.5 m² growing along Emerald Way (Watson River Subdivision, Carcross). All plants in these colonies were mowed.

Altai Lyme Grass: A total of 60 colonies of Altai lyme grass were encountered on the SKH in 2019, in the same locations as in 2016, 2017, and 2018 (note that the section of highway between Carcross (km 105) and the BC-Alaska border (km 24) was not surveyed/patrolled in 2015). As in those three years, the area near the BC-Alaska border (between km 24 and 56) is the most significant area of infestation, with 53 colonies varying in size from 1 to 25 m². The colonies generally are within the highway right-of-way; however, a very large infestation (>100 m²) occurs in Carcross between the Nares River Bridge (km 105) and Montana Services gas station (km 106), and extends well beyond the highway right-of-way. It was disturbed heavily this year due to road realignment for the new Nares River Bridge approach and may have been reduced in size as a result.

Altai lyme grass is a perennial that grows in large, tight tufts that are very well rooted, which makes eradication challenging. Hand pulling is difficult and only is practical in cases of very small infestation where tufts are young and small, making it is possible to pull the roots. Mowing also is mostly ineffectual for eliminating perennial grass species like Altai lyme grass. Consequently, the colonies of Altai lyme grass encountered on the SKH generally have not been pulled or mowed during the course of this study, but their location and size have been monitored. Two exceptions are: 1) a small colony at km 28 Tagish Road (see Section 3.2), and 2) a small colony at km 144 SKH. Both colonies were eradicated in 2018 and 2017, resp.

We can report that while the large colonies of Altai lyme grass on the SKH are significant in size, they do not appear to be expanding, at least during the five years of this study. For more discussion regarding management options for Altai lyme grass, see Section 4.

Other Species of Invasive Plants: In 2019, isolated populations of four other invasive plant species were found along the South Klondike Highway. These species include:

- *Yellow sweetclover:*
 - o A persistent colony is still present near km 108.5 of the SKH (RHS), and has been documented in every survey year since 2015. However, the size of the infested area has reduced from ~100 m² in 2015 to ~0.5 m² in 2019, presumably due to mowing efforts during the Patrol and Pull program.
 - o Three new small infestations of yellow sweetclover (50 plants total) were found near km 4 of the Annie Lake Road; all plants in this colony were pulled.
- *Perennial sow thistle:*
 - o Perennial sow thistle was found at three locations during the 2015, 2016, and 2017 Patrol and Pull surveys. Starting in 2018, no sow thistle plants were encountered along the SKH, and the same was true again in 2019. Therefore, it is likely that the Patrol and Pull method has succeeded in eliminating sow thistle along the SKH, or at least has prevented the

species from becoming more firmly established. As discussed in Section 4, sow thistle is difficult to eradicate once it has become well established in an area.

- *Yellow clematis:*
 - o Ever since the Patrol and Pull program began in 2015, this species has been found growing on both sides of the road along a 100 m section near km 105; this is the area in front of the CTFN building and Montana Services gas station in Carcross. Although the colony (~50 m²) is fairly extensive within this section, yellow clematis is not strongly invasive. The species is perhaps best classified as a persistent non-native plant, rather than invasive, and probably is not spreading aggressively in this area. It was therefore felt that removal of the plants was not a priority. Further discussion about managing this species is included in Section 4.
- *Oxeye daisy:*
 - o One small oxeye daisy colony consisting of 5 flowering plants and 5 leaf rosettes was encountered in 2019 near km 79.5 SKH (RHS). All plants encountered were removed and bagged for disposal. This is in the same colony/location identified in previous Patrol and Pull surveys (2016-2018).
 - o One colony identified in previous years at km 46 in BC (RHS) was found to be no longer present. However, there was a sign at that location indicating that the area had been sprayed with an herbicide by the Northwest BC Invasive Plant Council on July 17, five days prior to our survey. The sign noted that the area was sprayed with Clearview to control for yellow hawkweed (Darrell Hill, NWIPC Field Coordinator, personal communication 2019). However, there was no indication that hawkweed was growing there, and no dead hawkweed plants were found. When contacted, NWIPC was not able to provide us with additional information regarding the herbicide application, but we suspect that there was a miscommunication within NWIPC regarding plant identification or the area slated for spraying.
- *Spotted knapweed:*
 - o Two small colonies (3 plants) were located near km 77.5 (RHS); and km 80 (1 plant; RHS), both in BC. This is the first time spotted knapweed has been identified on the SKH. However, these plants are difficult to recognize from the road, even when flowering, so it is possible that we missed them in previous years. The km 77.5 location also contained a sign indicating the area had been sprayed with Clearview by NWIPC on July 17, specifically to control spotted knapweed. However, during our survey five days later we observed that the plants were still very much alive. We pulled the plants and bagged them for disposal. NWIPC was not able to provide us additional information regarding the herbicide application.

3.2 Tagish Road and Side Roads

The entire Tagish Road (54 km) between Jake's Corner and the intersection with South Klondike Highway was surveyed/patrolled, along with approximately 24 kilometres of side roads. A total of 42 stops were made to document and remove invasive plants. The survey also included the HPW Carcross maintenance station, where sweetclover plants growing in the compound were documented and mowed. As in previous years, the primary invasive species found growing along the Tagish Road was sweetclover.

Sweetclover: A total of 47 stops were made to document and remove sweetclover, compared to 44 in 2015, 57 in 2016, and 54 each in 2017 and 2018. All sweetclover plants encountered were cut or pulled.

Overall, the number and location of sweetclover colonies along the Tagish Road were similar to those encountered in 2015-2018, and includes about three dozen small to medium sized colonies that have been persistent over the five years of Patrol and Pull. On a positive note, the extent and density of the largest colonies are becoming reduced each year, sometimes dramatically so. It is particularly noteworthy that the colony at Jake's Corner (km 0) has been substantially reduced, with no plants at all encountered this year on the south side (RHS) and far fewer plants on the north side. This is despite a large growth of sweetclover at Jake's Corner along the Alaska Highway side, which developed after road improvement work in 2017. The other persistent colonies of sweetclover on the Tagish Road are found between km 16-20.5, and cover a cumulative, discontinuous area of roughly 350 m².

When surveying side roads, we found small but persistent colonies of sweetclover at four locations in the Taku Subdivision in Tagish, as well as along the first 200 m of Ten Mile Road. None of these colonies are new; they were all present in previous survey years.

Other Species of Invasive Plants: Isolated populations of other invasive plant species found in the Tagish Road area in 2019 include:

- *Yellow sweetclover:*
 - o ~10 m² at km 21 (just south of the Tagish Bridge) – Same location documented in previous years. All plants were pulled or mowed.
 - o ~5 m² at km 53 (RHS) – Same location as documented in previous years. All plants were pulled.
- *Perennial sow thistle:*
 - o ~5 m² near km 5.5 Tagish Road (LHS) – Same location documented in previous years. All plants were removed and bagged for disposal.
 - o ~50 m² near km 19.5 Tagish Road (RHS) – An extensive infestation in the same location documented in previous years. Plants were just beginning to flower and many were still developing flower shoots. Only the shoots with flowers were removed. Additional control methods will be required to contain this infestation (see Section 4).
 - o 20 plants near km 41 Tagish Road (RHS) – this is a reoccurrence of a location identified in 2015, 2016 and 2017, but where no plants were found in 2018. All plants were removed and bagged for disposal.

- *Altai lyme grass:*
 - o A small colony was noted at km 28 (RHS) in survey years 2015 – 2018, and each year the plants were pulled. The size of the colony was reduced each year and in 2019, no plants were found in this location. Presumably, this colony has been eliminated as the result of four years of plant pulling during Patrol and Pull.

3.3 Atlin Road and Side Roads

Patrol and Pull was conducted along 41 kilometers of the Atlin Road from the intersection with the Tagish Road to the Yukon-BC border, as well as approximately 4 kilometers of side roads. A total of 49 stops were made to document and remove invasive plants. Like the other two roadways, sweetclover is the main species of concern, but we appear to have stemmed the tide in 2019 as the plant density in sweetclover colonies is now decreasing, and it should be noted that the sow thistle colonies on Atlin Road appear to have eradicated by the Patrol and Pull Program.

Sweetclover: Similar to the other two roadways, the primary invasive species encountered along the Atlin Road was sweetclover. In terms of side roads, only the first kilometer of the Lubbock River Road and the access roads to the Snafu and Tarfu Lake campgrounds were surveyed because no sweetclover habitat exists further down these roads (even the first kilometer of these roads contains essentially no sweetclover habitat). No sweetclover (or other invasive plants) were found on any of the side roads.

A total of 43 sweetclover colonies were encountered along the Atlin Road in 2019. All plants encountered were cut or pulled. This is a considerable decrease from the number of colonies encountered in 2018 (58), and more in line with years previous to that (40 in 2017, 31 in 2016, and 40 in 2015). Of the 43 colonies, 8 were single-plants and other colonies varied in size from 0.5 m² to 50 m². While in 2018 there was a concern about the increased number and growing size of some colonies, this year, it was noteworthy that all colonies were greatly reduced in size and density. These results are discussed in more detail in Section 4.

Other Species of Invasive Plants: Isolated populations of other invasive plant species encountered along the Atlin Road in 2019 include:

- *Spotted knapweed:*
 - o Fifteen flowering plants and 10 leaf rosettes were found near km 12.5 (LHS). All plants were removed, including roots, and bagged for disposal. This infestation was in the same location as in 2016, 2017, and 2018, and pulling plants appears to be holding it in check; however this colony should be monitored closely because of its potential to expand and the difficulty of controlling this species.
- *Oxeye daisy:*
 - o Two patches of oxeye daisy were again found growing within 100 m of the entrance to two private properties at km 3 (RHS). This location, which covers an area of ~100 m², has been documented every year since 2016. Oxeye daisy is a perennial and best controlled through pulling/bagging or herbicide spraying, as mowing does not kill the plants; however, these two patches were too big to pull and were mowed with the hope of at least curtailing their spread by seed. Further discussion regarding control of oxeye daisy is included in Section 4.

- *Unscented chamomile:*
 - o In the 2015-2017 Patrol and Pull surveys, a patch of unscented chamomile was found to be growing near the entrance of a private driveway at km 10.5 (RHS). The plants were pulled every year of those surveys, which apparently was effective, as no plants were encountered at this driveway in 2018 and 2019.
- *Bird vetch:*
 - o A ~10 m² colony of bird vetch is still present at the start of the driveway mentioned above at km 10.5. This colony was recorded in 2016, 2017 and 2018, as well. Bird vetch is a species of concern because it can spread quickly into wooded areas and grow over native vegetation. We pulled all bird vetch plants growing along the portion of the driveway that bisects the ROW, but none were pulled on the private property adjoining the ROW.
- *Yellow Lucerne:*
 - o Seven small plants were found near km 19.5 (LHS) and 4 small plants near km 20 (RHS) in 2019. The plants are in the same general vicinity as a two-plant colony that was found in 2016 and 2018, and a single plant discovered in 2017. All plants were pulled and bagged for disposal.
- *Perennial sow thistle:*
 - o The two colonies of sow thistle encountered and pulled in 2015, 2016, and 2017 (at km 9.5 and km 10.0) did not recur in 2018 or 2019. Three years of pulling plants in these colonies appears to have eradicated the species from Atlin Road. However, continued monitoring around km 9 – 10 would be prudent.

4 Update on the Overall Occurrence of Invasive Plants on Southern Lakes Roadways

Patrol and Pull reports from previous years discussed the extent of invasive plant infestations along Southern Lakes roadways and evaluated the risk posed by each species. In this section we provide an update to those assessments.

4.1 Sweetclover

Because of its broad distribution and the number of plants/colonies present, sweetclover remains the primary invasive plant species of concern growing along Southern Lakes Roadways. But it should be noted that the level of sweetclover infestation along Southern Lakes Roadways is well below levels seen on many other highways in Yukon, and the Patrol and Pull program appears to be keeping it in check.

In 2018 we noted that, with the exception of the six large colonies, the level of infestation was much less severe than in previous years. In 2019, all areas showed another level of decline in number, size and density of plants, including the heavily infested areas (the exception being the gravel pit at km 156 SKH). However, the most persistent infestations have not been eliminated after five years of Patrol and Pull, even though they are being contained and thinned. In addition, a few new colonies appear every year because sweetclover seeds continue to be introduced by wind or vehicles, or because bare mineral soil is being exposed as a result of activities such as spring blading of road shoulders and driveway maintenance by residents.

Large Colonies: Six large sweetclover colonies mentioned in previous years' reports continue to persist, though a couple are becoming substantially reduced in size and density. These large colonies occur at the following locations:

1. The intersection of the South Klondike Highway and Alaska Highway
2. Kilometre 16-20 on the Tagish Road
3. The first one kilometer of the Robinson Subdivision Road
4. The intersection of the Tagish Road and the Alaska Highway
5. Kilometre 16-18.5 on the Atlin Road
6. The gravel pit at Km 156 South Klondike Highway (infestation identified in 2018).

We have observed that the first five large colonies on the list are being contained by Patrol and Pull mowing efforts, and are not spreading. This effect is seen most dramatically at the intersection of the Tagish Road and the Alaska Highway, where the colony on the Tagish Road side of the intersection has almost been eliminated (sweetclover continues to grow thick along that portion of the Alaska Highway—outside of the P&P area). The density of plants in the other colonies has decreased as well, which suggests that their seedbanks are becoming slowly reduced after five years of mowing (see more discussion below).

The 0.25 ha infestation at the km 156 SKH gravel pit, which was first reported in 2018, in 2019 consisted of mature two-year old plants, growing mostly on soil waste piles, which originated from fill that was excavated during road upgrade work conducted at the Carcross Cutoff in 2017. A second, nearby patch of sweetclover plants ($\sim 10 \text{ m}^2$) is growing on the active pit face. This year, the entire infestation was mowed by hand, using the brush cutter. The use of a larger mowing machine would not have been practical because of

uneven ground in some parts of the pit and steep slopes in other parts. We strongly recommend that HPW institute measures to eliminate this infestation due to its large size risk of spreading sweetclover seeds if granular materials from this pit are transported to construction sites. Hand mowing such a large area may not be realistic in the long-term because it is so labour intensive; consequently, this site would be a candidate for considering the use of an herbicidal treatment.

Small and Isolated Colonies: Small sweetclover colonies (<20 plants), as well as single isolated plants, were still encountered on these roadways at a frequency comparable to last year. But the Patrol and Pull program seems to be keeping them in check, too, as they are not growing in size or number. The persistence of small colonies may be best interpreted as the presence of well-established, but localized, seedbanks. Single plants are probably the result of seed dispersal from existing colonies or contamination by vehicle. In both cases, continued mowing and pulling should eventually exhaust these seedbank, but the role of ground disturbance, particularly along shoulders, and the use of contaminated fill, especially for roadway and driveway maintenance, should not be dismissed. These issues are discussed in more detail below.

Further Evaluation of Previous Hypotheses Regarding Sweetclover Population Dynamics: In previous reports, we hypothesized that the size of a colony and extent of the seedbank along roadways would be positively correlated with the time that had elapsed since the most recent roadwork/upgrades. Under this hypothesis, roadways that were upgraded more recently were predicted to have smaller colonies and less extensive seedbanks because colonies and seedbanks have not had much time to build up, compared to roadways that were upgraded ten or more years ago where seeds have had more time to accumulate from within the colony.

In the 2018 report, we rejected the above model because we had not observed a strong pattern correlating the size and persistence of a colony to the time elapsed since road reconstruction. Moreover, we were finding that the model was not particularly useful in our attempts to explain the current population dynamics of sweetclover along these roadways, especially along the Tagish Road and SKH. But we have come to moderate this opinion after the 2019 survey, mostly because of observations made along the Atlin Road, where there has been a series of staged road upgrades over the past ten years that has functioned as an unintended experiment to test the model. What we had been observing in previous years is that new sweetclover colonies still are appearing each year along the Atlin Road (much more so than along the other two roadways), more or less in correlation to recent ground disturbances. Up until 2018, mowing did not seem to be containing or thinning the colonies; but that course seems to be reversing now. This suggests that reconstruction work had the initial effect of promoting colony development, due to exposure of bare mineral soil, and perhaps the introduction of contaminated fill, but has not been a sufficient number of generations of growth to build-up a large new seedbank. Consequently, it appears that after five years of mowing/pulling and depleting the seedbank, sweetclover populations are now trending downward. We interpret this as support for the model which postulates that a colony left to grow for many years will establish a large seedbank in the soil and become resilient, while a colony that is mowed soon after it appears will be less resilient.

While this model can be substantiated, it may have limited utility because the outcome (colony growth and resilience) is also strongly dependent on the level of seed contamination in fill that is used during the road reconstruction (this factor is discussed later, below). In large part, that is why we have shifted our emphasis somewhat away from reconstructing historic reasons (i.e., coming up with "Just-So" hypotheses) to explain

why a particular section of roadway is contaminated with sweetclover, or how that history explains colony size and persistence.

Instead, we are shifting our emphasis towards thinking of colonies in more general terms that were laid out in previous reports, namely that sweetclover colonies exist in three population states along Southern Lakes roadways:

1. Colonies supported by well-established, large seedbanks (these are often large colonies)
2. Incipient colonies supported by moderate seedbanks
3. Isolated plants/colonies resulting from recent seed dispersal/germination events

In the 2018 report, we essentially concluded that recognizing these three population states amounted to a truism, and thus was not very useful from a management standpoint. But while it is a simple concept, we believe it actually captures the essence of sweetclover population dynamics discussed in the paragraphs above and should be central to any strategies of containment and eradication — again, moving away from explanations for how or why a particular colony became established (e.g., due to roadwork ten years ago) to one of documenting and qualifying the extent of the seedbank, which is best done by observing a colony's response to mowing/pulling—colonies that persist year after year in response to mowing likely have a large seedbank (i.e., they are resilient colonies), while those that can be thinned or eliminated by mowing reflect the presence of a small or residual seedbank.

Despite the de-emphasis on historic events responsible for the spread of sweetclover, this simple way of characterizing the population state of colonies would be incomplete without taking into account some considerations of the processes responsible for the spread and propagation of sweetclover colonies. Based on patterns observed through 2019, and expanding on those discussed in the 2018 report, we have concluded that the following processes and activities play an important role in the persistence and spread of sweetclover along Southern Lakes roadways:

1. Naturally, the use of fill material contaminated with sweetclover seeds during road reconstruction is a primary vector for the introduction and spread of sweetclover. The new colony at the km 156 pit on the SKH exemplifies this point. In addition, we have observed that private individuals may be spreading sweetclover when they contract for the transportation of gravel and road mix for driveway reconstruction. This vector of seed transport, both by HPW and private individuals, can be reduced by managing sweetclover infestations in gravel pits.
2. Even when only clean fill is used on a road reconstruction site, general ground-disturbing activities at the site can liberate buried sweetclover seeds and expose areas of bare mineral soil on which they can germinate. That process cannot be eliminated, but follow-up measures can be instituted to prevent sweetclover from becoming well established after construction is complete. First, the placement of organic soils over bare mineral soil will favour the germination and growth of native plants, as sweetclover is not such a strong competitor in organic-rich soils. Second, aggressive seeding with competitive grasses immediately after construction will reduce the foothold gained by sweetclover. Third, mowing sweetclover plants in the first years after reconstruction will exhaust the exposed seedbank and prevent the new generation from building up a seedbank.

3. Sweetclover strongly outcompetes native plants on bare mineral soil, especially if that soil is continually disturbed. That is why sweetclover grows so well on the shoulders of roads, but less well further into the ROW, where the soil organic content is higher, the ground is infrequently disturbed, and other species have a competitive advantage. In that regard, snow ploughing probably is a major contributor to the distribution and germination of sweetclover colonies, particularly the practice of scraping the shoulders down to bare soil each spring. This activity creates an ideal seedbed for sweetclover germination the following summer, and undoubtedly exposes and spreads seeds along the shoulder. Moreover, scraping the shoulders apparently does not kill the root of overwintering first year sweetclover plants (as a biannual it takes two seasons for sweetclover plants to mature). However, scraping does remove native plants that would otherwise compete sweetclover. When it comes to shoulder scraping, considerations for safety and road maintenance likely take precedence over sweetclover management, but it is worth pointing out that this activity may be one of the principle mechanisms bolstering sweetclover colonies along roadways.

4. In any discussion of seedbanks, it is worth re-iterating the longevity of sweetclover seeds when buried in the ground. They have been shown to be viable for at least 15 years after burial, and perhaps even over 50 years. Archaeological and paleontological studies have shown that seeds of other species in the pea family (e.g., lupines) can remain viable for centuries or perhaps even millennia. These data underscore the possibility that sweetclover may appear along any stretch of road simply by disturbing the ground, if plants previously grew on the site. That consequence is unavoidable, but the actions mentioned in Point 2 (above) can be enacted to prevent the development of a resilient colony.

4.2 Yellow Sweetclover

There are 7 yellow sweetclover colonies in the project area: one plant each on the Atlin Road, Tagish Road, South Klondike Highway, and Annie Lake Road. The number has varied from 4 colonies in 2015 and 2016, to seven in 2017, and 5 in 2018. Yellow and white sweetclover are very similar plants, and some taxonomists consider them to be conspecific. All yellow sweetclover encountered on these roadways should be treated identically to white sweetclover. The reason its distribution is worth noting is because the yellow colour potentially provides a secondary means of tracking the spread of sweetclover and seed sources.

4.3 Spotted Knapweed

In 2019, three spotted knapweed infestations were recorded: one on the Atlin Road, in the same location as in previous years, and two new locations on the SKH within 500 m of each other. The latter two were small (4 plants total).

The infestation on the Atlin Road near km 12.5 is small, but is proving to be persistent. In 2015, when this patch was encountered for the first time, it was very dense. All plants were pulled and it did not regrow in 2016, suggesting effective eradication. However, a new colony was found in 2016 only 20 m away from the supposedly eradicated colony. It contained four flowering plants and ten leaf rosettes (immature plants), which were pulled. Then, in 2017, eleven plants near the flowering stage and many small leaf rosettes were recorded and pulled in this same general location. During follow-up in 2018, twenty flowering plants and 20 leaf rosettes were pulled, and this year we pulled 15 flowering plants and 10 leaf rosettes. Clearly, this colony is very persistent, with a well-established seedbank. It should be monitored closely, as it is important to ensure that the colony does not keep its foothold and become the progenitor of a knapweed infestation in Southern Yukon.

The concern and approach to spotted knapweed are similar to those for oxeye daisy. It has strong invasive tendencies, and if allowed to take hold can form dense stands that reduce the quantity and quality of forage crops in agricultural fields (i.e., hay and pasture) and potentially reduce the vigour and diversity of native plants. Spotted knapweed is a biannual or short-lived perennial plant that reproduces and spreads by seeds, which are produced in abundance and are highly mobile. Pulling of plants can be effective for small populations, but the entire plant, including root, must be pulled. Herbicidal spraying has been found to be necessary in many areas of western North America to control knapweed, mainly because mowing has been shown to be ineffective as it does not kill the plants. Likewise, the complete extrication of every individual plant through hand pulling is not realistic for large infestations.

4.4 Perennial Sow Thistle

In previous years, we reported the presence of seven sow thistle colonies in the study area:

1. Tagish Road: Four colonies, including one fairly extensive colony at Km 19.5 (~50 m²), one medium-sized patch at km 5.5, and two small patches at Kms 3 and 41.
2. Atlin Road: two small colonies at Km 9.5 and Km 10
3. SKH: one small colony at Km 157.5

Pulling sow thistle plants during the Patrol and Pull survey seems to have been partially effective at eradicated them, as no plants were encountered at four of the known locations in 2019. However, three colonies on the Tagish Road did regrow in 2019: all plants in one small colony and one medium-sized colony were pulled, but the large colony was too big to pull individual plants, so only the flower heads were pulled.

Given the persistence of the one large colony, it may be prudent to conduct an herbicidal spraying program to eliminate it, as this may be the only way to prevent them from becoming the seed source for the species to spread.

4.5 Altai Lyme Grass

Populations of Altai lyme grass remain essentially unchanged from previous years. There are 60 significant colonies growing along southern portions of the SKH, with 53 occurring in the vicinity of the BC-Alaska border between Km 24 and 56. The SKH colonies range in size from 1-25 m². However, there also is a very large infestation of >100 m² in Carcross between the Nares River Bridge (Km 105) and Montana Services gas station (Km 106). Because this species grows in tight, large tufts that are very well rooted, it is nearly impossible to effectively pull the plants in a colony of any significant size. Mowing also is not effective, since it is a grass that will simply regrow. Consequently, none of the usual Patrol and Pull methods for eradication could be employed at the extensive colonies growing along the SKH.

At the small colony growing on the Tagish Road at km 28 (RHS), all plants were pulled and bagged In 2015, 2016, and 2017. In 2018 only 3 plants were found and bagged, and in 2019 no plants were encountered. It appears that that Patrol and Pull has eliminated this colony. A small colony at km 144 SKH was eliminated in 2017 after three years of pulling. In all five years of this program, no Altai lyme grass has been found growing on the Atlin Road.

Altai lyme grass is a challenging species in terms of assessing its level of threat and deciding on the appropriate management response. It is not an extremely invasive species, yet it will readily colonize newly

disturbed ground, particularly nutrient-poor sandy soil; and it is tenacious, forming dense patches when it gains a foothold. Because it is a tufted grass that develops strong root systems, pulling it by hand is difficult, and only realistic for small patches or young plants. And like other grasses with strong root systems, mowing will not eliminate it, either.

Altai lyme grass is a species of concern around the Carcross Desert area, where small patches of the grass have become well established. The concern is that it will spread into this unique boreal dune system and outcompete an endemic sedge that only grows in these dune systems. So far there is no evidence that this is occurring, and Altai lyme grass distribution is limited to the road ROW along the South Klondike Highway south of Carcross to the BC-Alaska border. In the immediate vicinity of Carcross, however, it has spread outside of the ROW and there is a large patch (over 100 m² in size) near the Montana Service Station.

4.6 Oxeye Daisy

In 2019, two oxeye daisy infestations were encountered: one along the BC portion of the SKH, and one along the Atlin Road. These colonies were present in the same locations in 2017 and 2018, with all plants either pulled or mowed in all three years. The infestation on the Atlin Road is particularly notable because it is very large.

In 2017, four isolated, single plants of oxeye daisy were encountered along other stretches of the three roadways. These also were pulled and bagged and no oxeye daisy plants were found at these locations in 2018 or 2019. From these results, we conclude that Patrol and Pull has been effective in containing larger infestations and eliminating new small colonies.

Oxeye daisy has the potential to become problematic, in particular when it spreads into grassy ecosystems and hay fields. Experience in northern British Columbia shows that it is best to stop this species early in the colonization event, as it is very difficult to eradicate once it is established. It spreads both by seed and vegetatively through roots (rhizomes), and can grow into dense, persistent colonies that outcompete and displace both native and agronomic grass species. The impact is especially damaging to hayfields and pastures. Mowing is generally ineffective for exterminating oxeye daisy, as the whole plant must be pulled, including the roots. Elsewhere (e.g., British Columbia) herbicidal spraying has been found to be the best management tool.

The oxeye daisy infestation on the Atlin Road is too large to control by pulling plants. As the next-best option, the area was mowed in 2017, 2018, and 2019, during the plants' flowering stage, and this has prevented the spread of the plants by seed. But as noted above, this will not eliminate the colony. To control this site effectively, we recommend treatment with an herbicide.

4.7 Bird Vetch

As in previous years, we encountered a colony of bird vetch approximately 5 m² in size growing at the entrance to a private driveway at km 10.5 of the Atlin Road. In 2016 we approached the property owner, who said he was aware of the presence of the plants and that he had been battling infestations on his property. Apparently, a previous owner planted the vetch, along with the scentless camomile that was found along this same driveway in 2015-2017. The property has changed ownership since 2017 and we tried to contact the new owner in 2018 and 2019, but the gate to the driveway was closed both years. Yukon

Government may want to contact this property owner to discuss the potential spread of bird vetch from their property.

Bird vetch is another invasive species that is difficult to eradicate once it becomes established. It can spread quickly and grow over other vegetation soon after its first appearance. It is considered to be a problematic species in interior Alaska, and infestations have been found in Whitehorse and Dawson as well. Because of its potential to be problematic, it should be given priority for monitoring and control.

4.8 Yellow Lucerne

In 2016, two lucerne plants were pulled on the Atlin Road near km 20. No plants were encountered in that location in 2017, but one large plant was found there in 2018, and in 2019 four small plants were found growing in the same vicinity. In addition, seven small plants were encountered in a new location in 2019, within 500 m of the known site at km 20. At this time, yellow lucerne does not represent a serious threat in Southern Lakes because there is no sign of an established colony or deep seedbank. However, it would be prudent to re-examine this stretch of road annually to ensure that any germinating lucerne is pulled or cut. Yellow lucerne is an invasive plant that can take over agricultural fields and severely reduce crop growth. It already is problematic in the Haines Junction area, where it has invaded hay fields and roadside areas. Pulling is an effective way to control small yellow lucerne infestations.

4.9 Yellow Clematis

This non-native, vine-like climbing plant has been observed for many years in the Carcross area, as well as in Whitehorse. It is not strongly invasive, does not appear to be a problematic species, and is not spreading in any significant way. We did not pull or cut any clematis encountered during this study, and we do not believe that any control measures need to be taken at this time, other than continued monitoring.

4.10 Unscented Chamomile

In 2015, 2016, and 2017, unscented chamomile was encountered on both sides of the entrance to a private driveway on the Atlin Road at km 10.5. This is the same driveway where bird vetch was found and discussed above (Section 4.7). Each year from 2015 – 2017, the unscented chamomile was pulled during the Patrol and Pull survey, and in both 2018 and 2019 no chamomile plants were encountered. (Shasta daisy, a non-invasive ornamental plant, was also found growing along this driveway in past years, but pulling in the course of the Patrol and Pull program eliminated it in 2017).

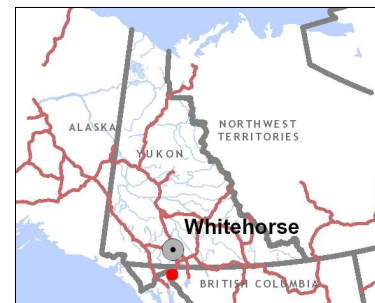
Unscented chamomile is only weakly invasive in Yukon, and the current control measures appear to be adequate at managing the species.

2019 MAPS

Note: overlap of the locations of different species occurs on these maps. As a result some plant locations are not visible.

Southern Lakes Roadways 2019 Invasive Plant Survey

S. Klondike Highway km 25-40



Legend

- Highway Kilometre Posts
- White sweetclover
- Yellow sweetclover
- Yellow lucerne
- Yellow clematis
- Spotted knapweed
- Scentless chamomile
- Perennial sowthistle
- Oxeye daisy
- Bird vetch
- Altai lyme grass

1: 80,000



4.1 0 2.03 4.1 Kilometers

Yukon Albers
Produced from: Yukon Lands Viewer

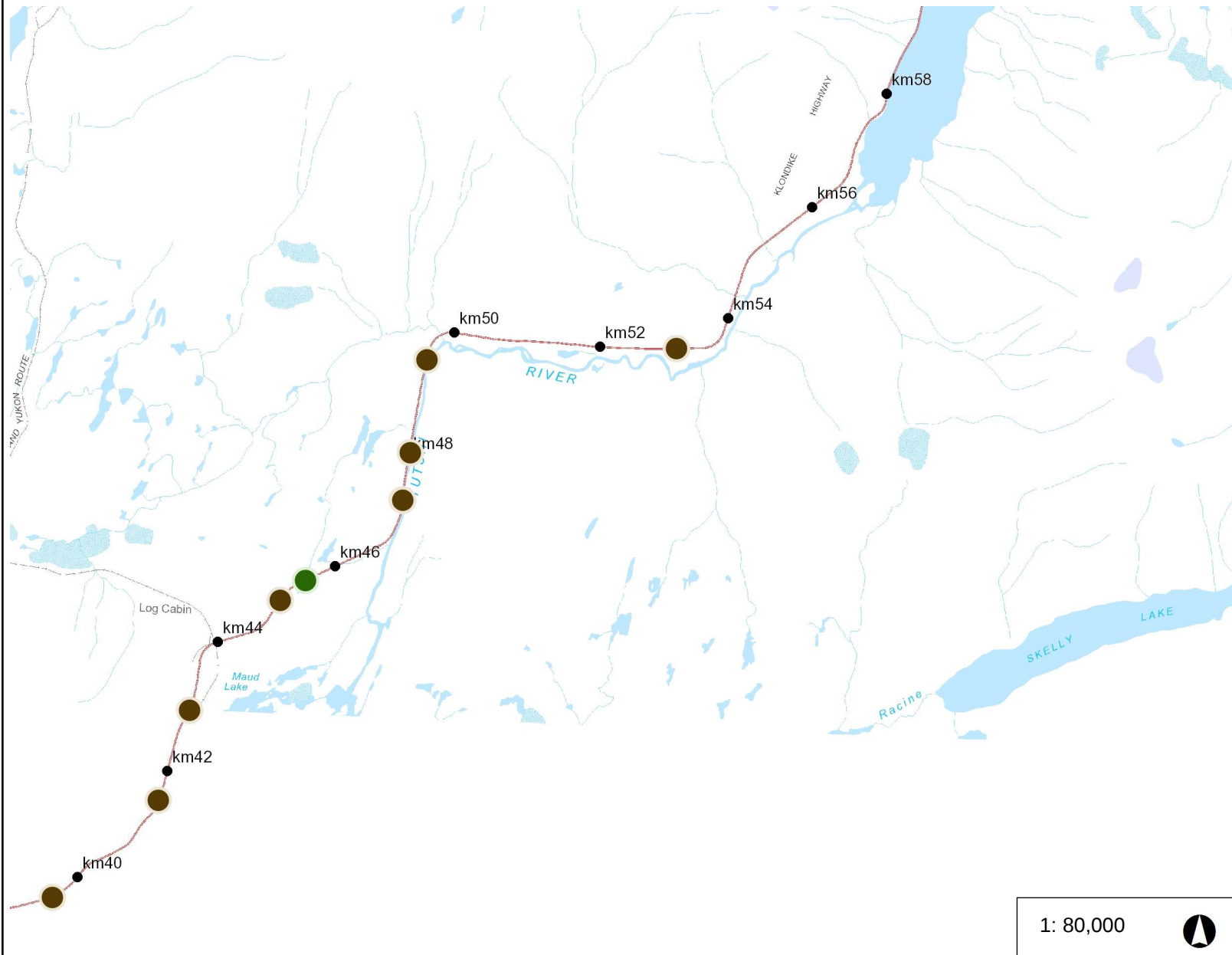
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Date Printed: 09-Aug-2019

Notes

Map 1

Southern Lakes Roadways 2019 Invasive Plant Survey

S. Klondike Highway km 40-58



Legend

- Highway Kilometre Posts
- White sweetclover
- Yellow sweetclover
- Yellow lucerne
- Yellow clematis
- Spotted knapweed
- Scentless chamomile
- Perennial sowthistle
- Oxeye daisy
- Bird vetch
- Altai lyme grass

1: 80,000



4.1 0 2.03 4.1 Kilometers

Yukon Albers
Produced from: Yukon Lands Viewer

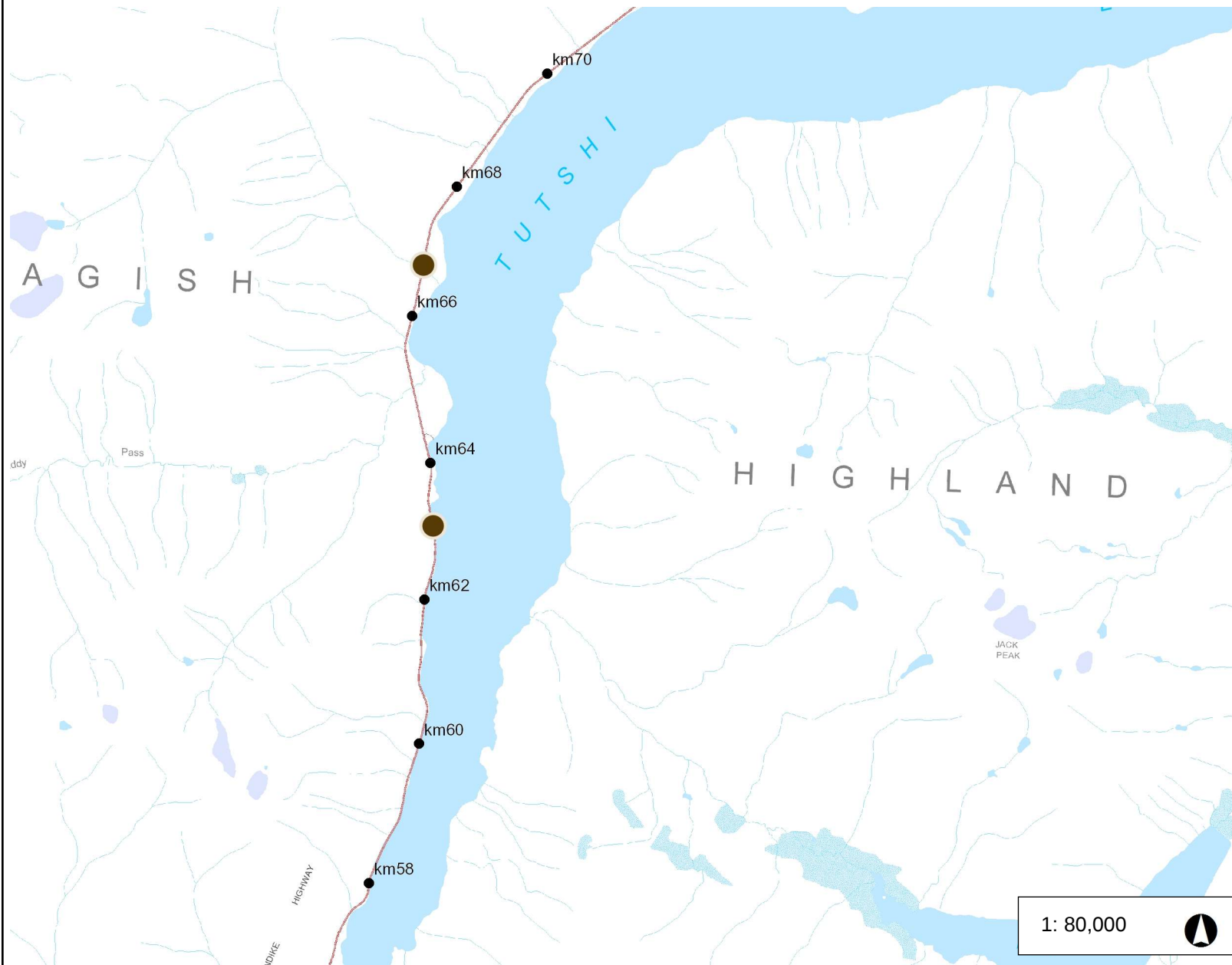
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Notes

Map 2

Southern Lakes Roadways 2019 Invasive Plant Survey

S. Klondike Highway km 56-70



Legend

- Highway Kilometre Posts
- White sweetclover
- Yellow sweetclover
- Yellow lucerne
- Yellow clematis
- Spotted knapweed
- Scentless chamomile
- Perennial sowthistle
- Oxeye daisy
- Bird vetch
- Altai lyme grass

1: 80,000



4.1 0 2.03 4.1 Kilometers

Yukon Albers
Produced from: Yukon Lands Viewer

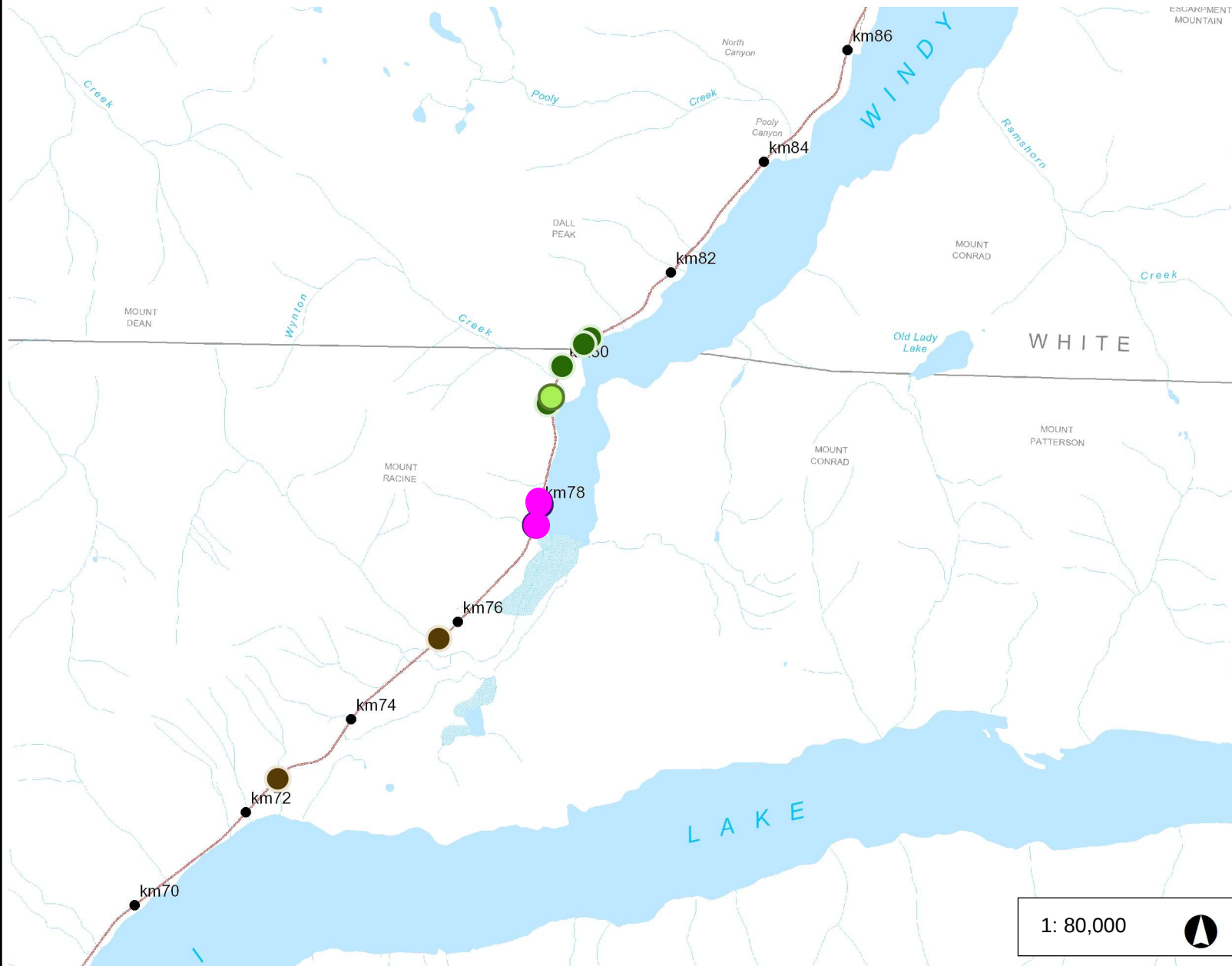
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Notes

Map 3

Southern Lakes Roadways 2019 Invasive Plant Survey

S. Klondike Highway km 70-86



Legend

- Highway Kilometre Posts
- White sweetclover
- Yellow sweetclover
- Yellow lucerne
- Yellow clematis
- Spotted knapweed
- Scentless chamomile
- Perennial sowthistle
- Oxeye daisy
- Bird vetch
- Altai lyme grass

1: 80,000



4.1 0 2.03 4.1 Kilometers

Yukon Albers
Produced from: Yukon Lands Viewer

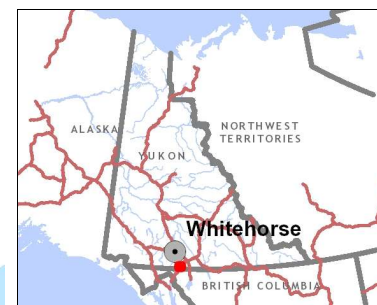
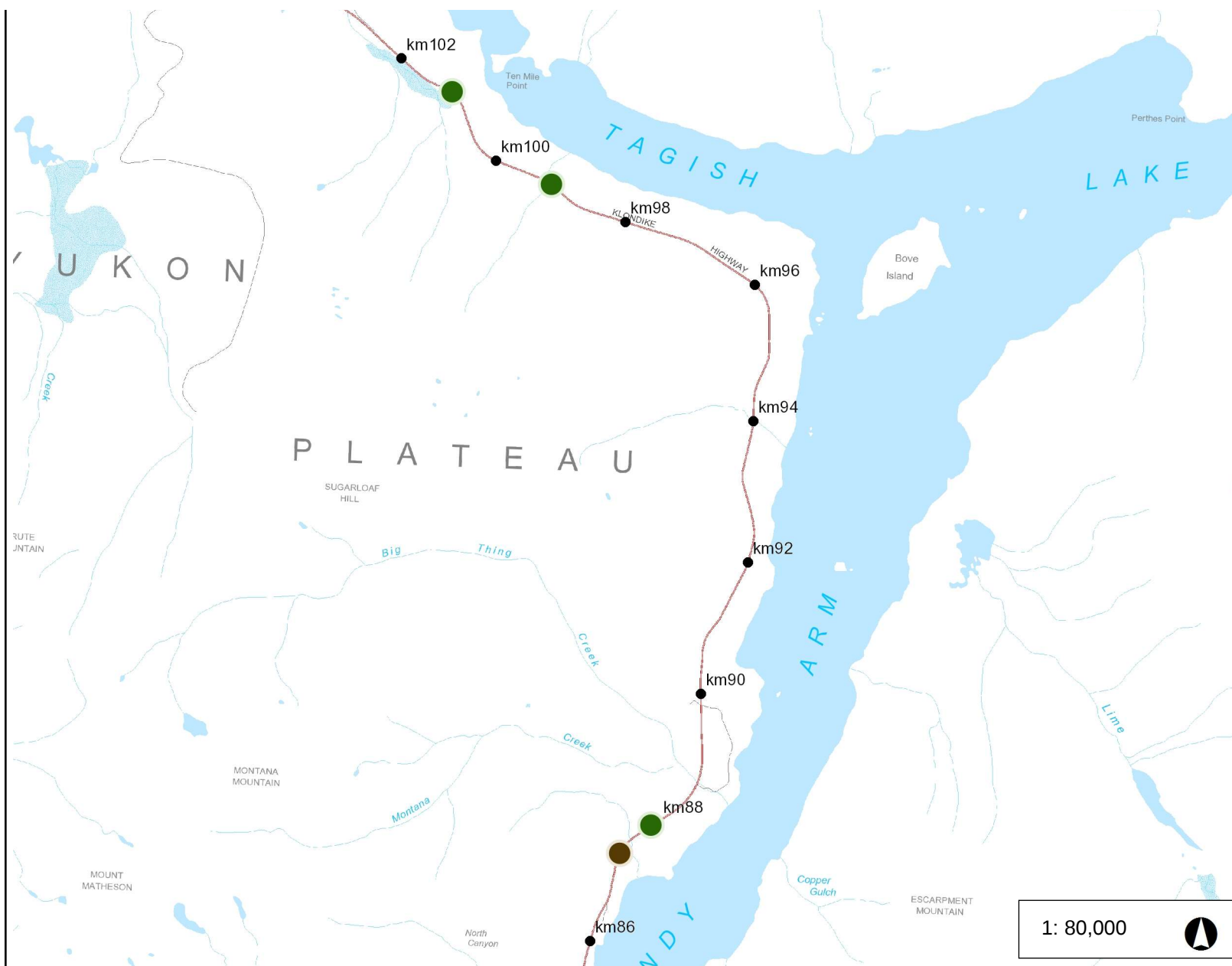
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Notes

Map 4

Southern Lakes Roadways 2019 Invasive Plant Survey

S. Klondike Highway km 86-102



Legend

- Highway Kilometre Posts
- White sweetclover
- Yellow sweetclover
- Yellow lucerne
- Yellow clematis
- Spotted knapweed
- Scentless chamomile
- Perennial sowthistle
- Oxeye daisy
- Bird vetch
- Altai lyme grass

1: 80,000



4.1 0 2.03 4.1 Kilometers

Yukon Albers
Produced from: Yukon Lands Viewer

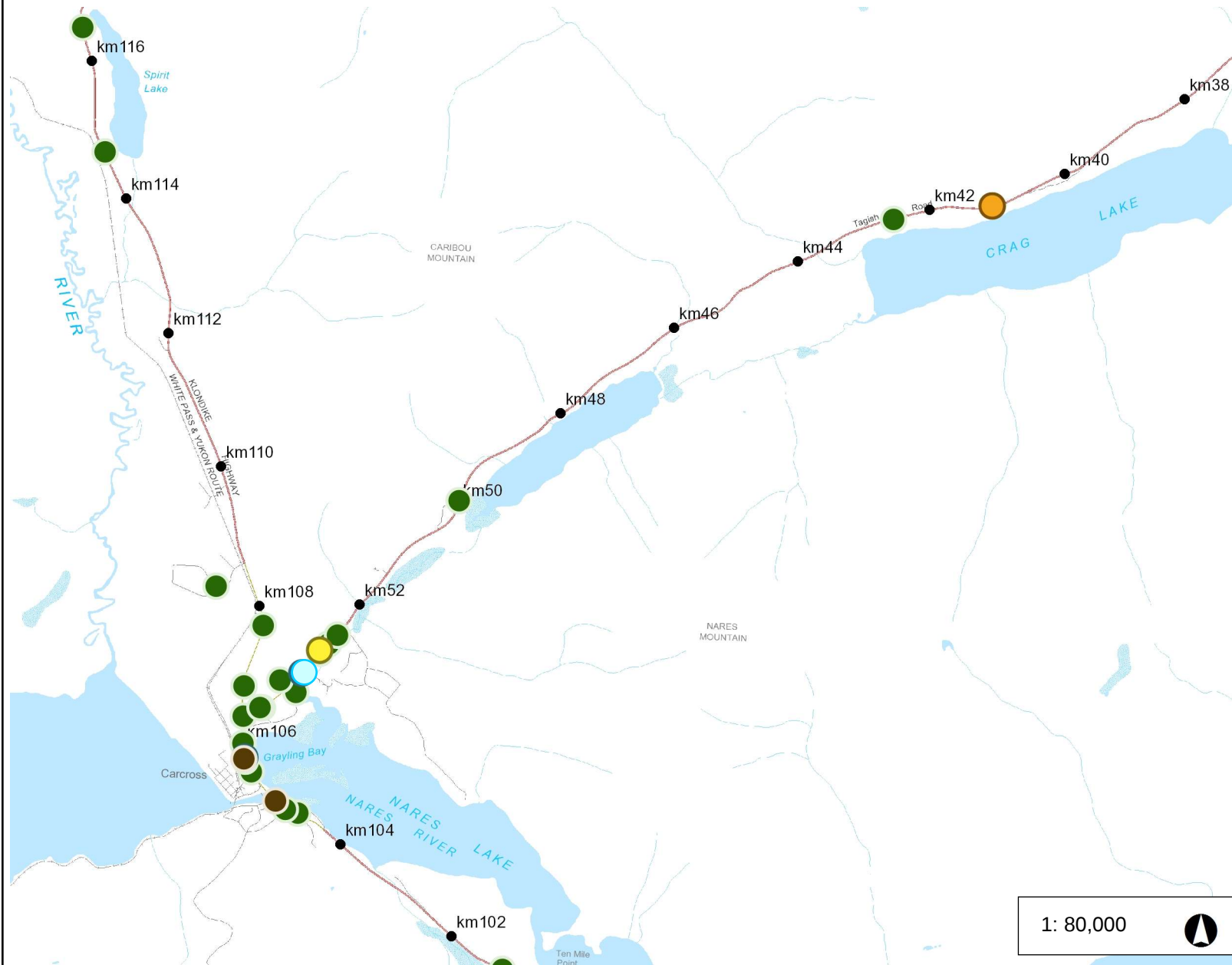
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Notes

Map 5

Southern Lakes Roadways 2019 Invasive Plant Survey

S. Klondike Highway km 102-116 and Tagish Road km 39-55



Legend

- Highway Kilometre Posts
- White sweetclover
- Yellow sweetclover
- Yellow lucerne
- Yellow clematis
- Spotted knapweed
- Scentless chamomile
- Perennial sowthistle
- Oxeye daisy
- Bird vetch
- Altai lyme grass

1: 80,000



4.1 0 2.03 4.1 Kilometers

Yukon Albers
Produced from: Yukon Lands Viewer

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Notes

Map 6

Southern Lakes Roadways 2019 Invasive Plant Survey

S. Klondike Highway km 116-130



Legend

- Highway Kilometre Posts
- White sweetclover
- Yellow sweetclover
- Yellow lucerne
- Yellow clematis
- Spotted knapweed
- Scentless chamomile
- Perennial sowthistle
- Oxeye daisy
- Bird vetch
- Altai lyme grass

Notes

Map 7

4.1 0 2.03 4.1 Kilometers

Yukon Albers
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Southern Lakes Roadways 2019 Invasive Plant Survey

S. Klondike Highway km 130-144



Legend

- Highway Kilometre Posts
- White sweetclover
- Yellow sweetclover
- Yellow lucerne
- Yellow clematis
- Spotted knapweed
- Scentless chamomile
- Perennial sowthistle
- Oxeye daisy
- Bird vetch
- Altai lyme grass



1: 80,000



4.1 0 2.03 4.1 Kilometers

Yukon Albers
Produced from: Yukon Lands Viewer

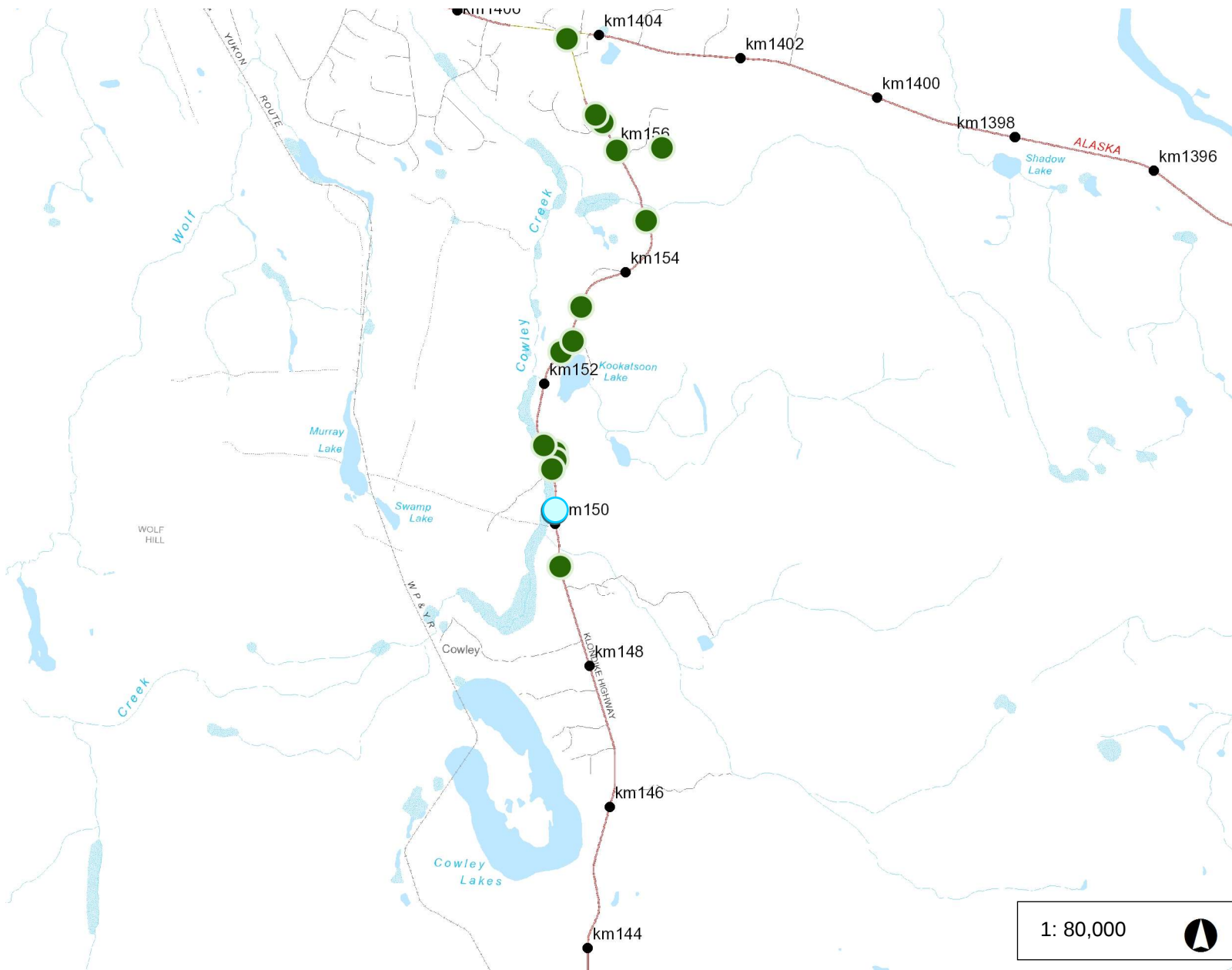
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Notes

Map 8

Southern Lakes Roadways 2019 Invasive Plant Survey

S. Klondike Highway km 144-157



Legend

- Highway Kilometre Posts
- White sweetclover
- Yellow sweetclover
- Yellow lucerne
- Yellow clematis
- Spotted knapweed
- Scentless chamomile
- Perennial sowthistle
- Oxeye daisy
- Bird vetch
- Altai lyme grass

Notes

Map 9

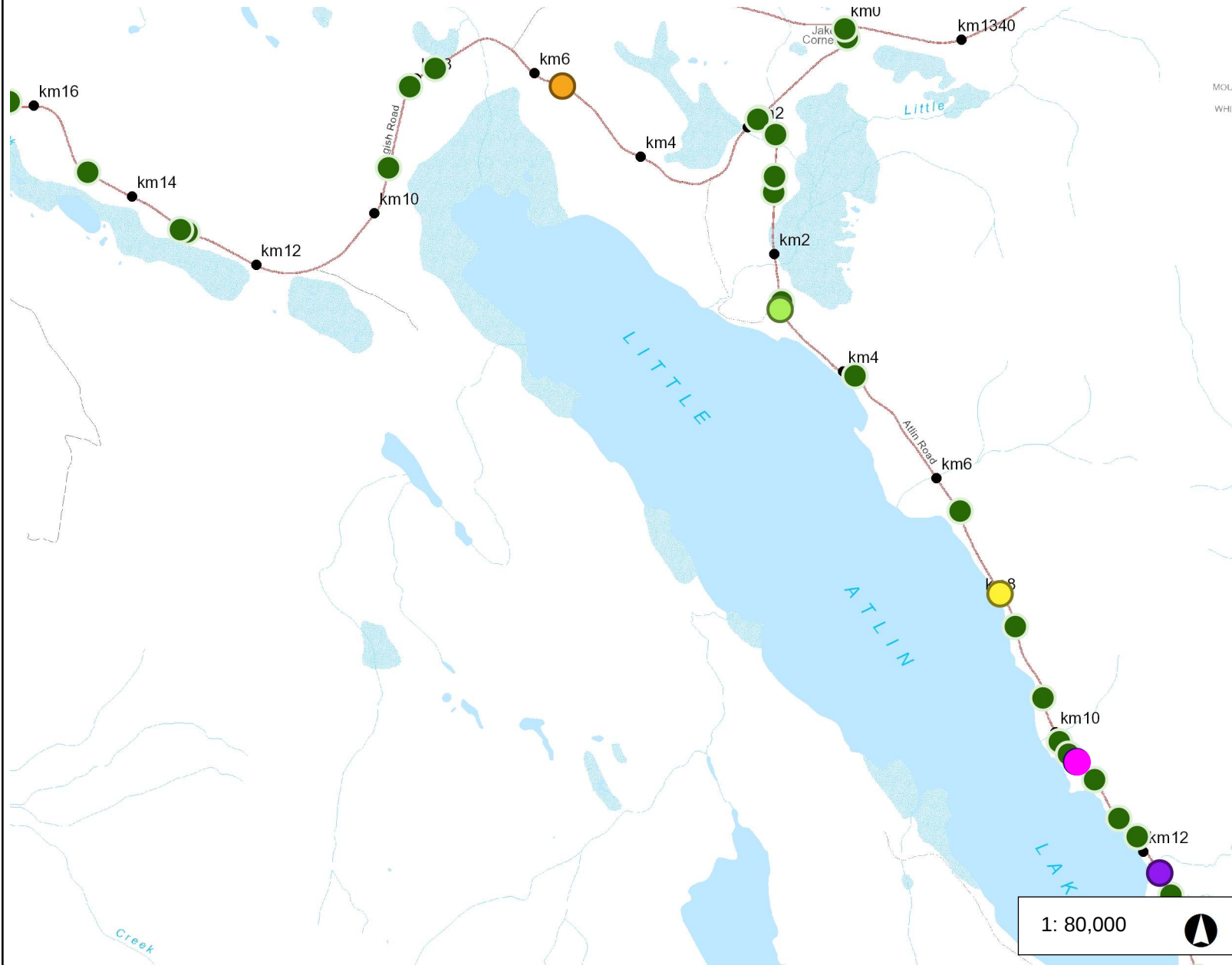
4.1 0 2.03 4.1 Kilometers

Yukon Albers
Produced from: Yukon Lands Viewer

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Southern Lakes Roadways 2019 Invasive Plant Survey

Tagish Road km 0-16 and Atlin Road km 0-12



Legend

- Highway Kilometre Posts
- White sweetclover
- Yellow sweetclover
- Yellow lucerne
- Yellow clematis
- Spotted knapweed
- Scentless chamomile
- Perennial sowthistle
- Oxeye daisy
- Bird vetch
- Altai lyme grass

Notes

Map 10

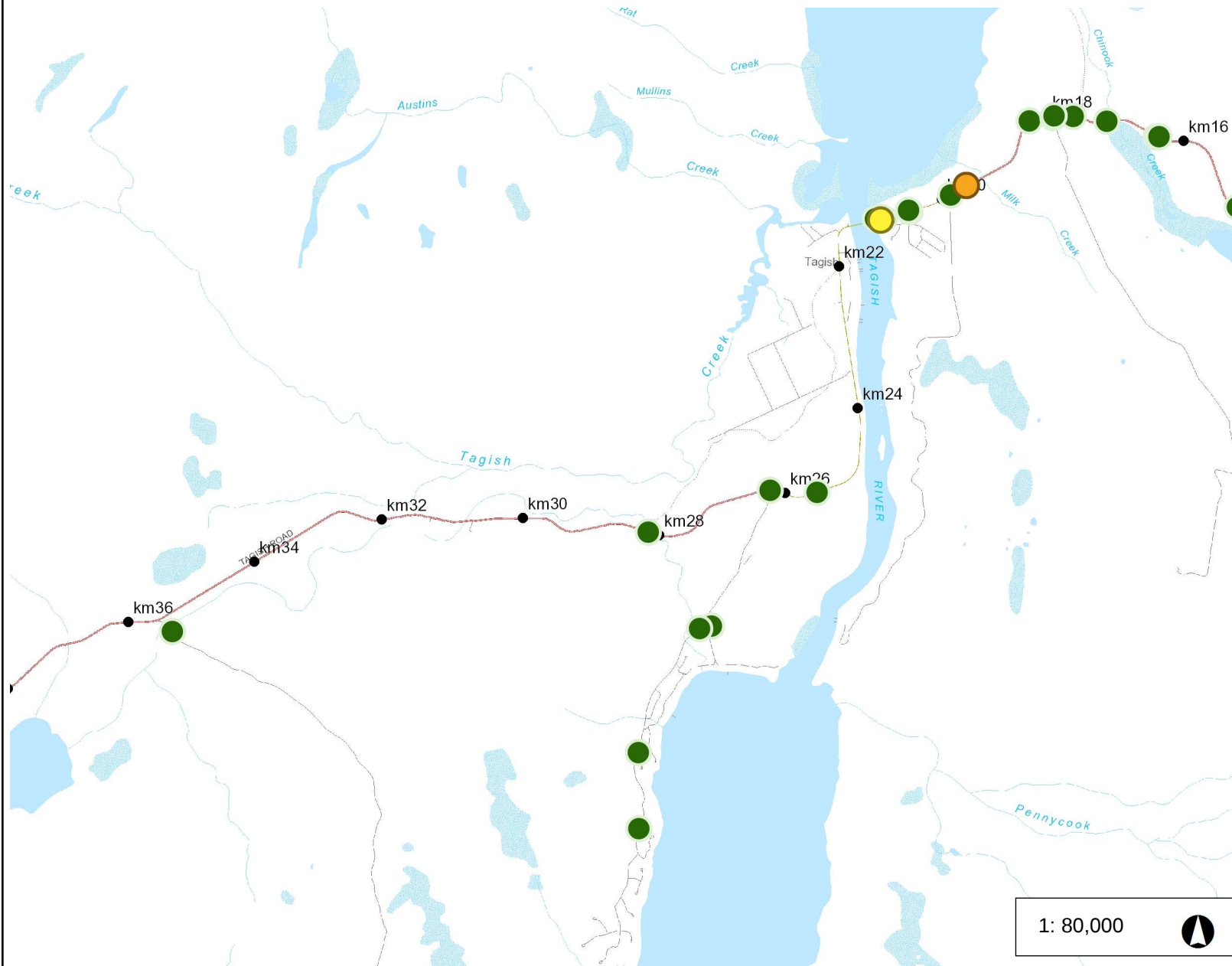
4.1 0 2.03 4.1 Kilometers

Yukon Albers
Produced from: Yukon Lands Viewer

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Southern Lakes Roadways 2019 Invasive Plant Survey

Tagish Road km 16-38



Legend

- Highway Kilometre Posts
- White sweetclover
- Yellow sweetclover
- Yellow lucerne
- Yellow clematis
- Spotted knapweed
- Scentless chamomile
- Perennial sowthistle
- Oxeye daisy
- Bird vetch
- Altai lyme grass

1: 80,000



4.1 0 2.03 4.1 Kilometers

Yukon Albers
Produced from: Yukon Lands Viewer

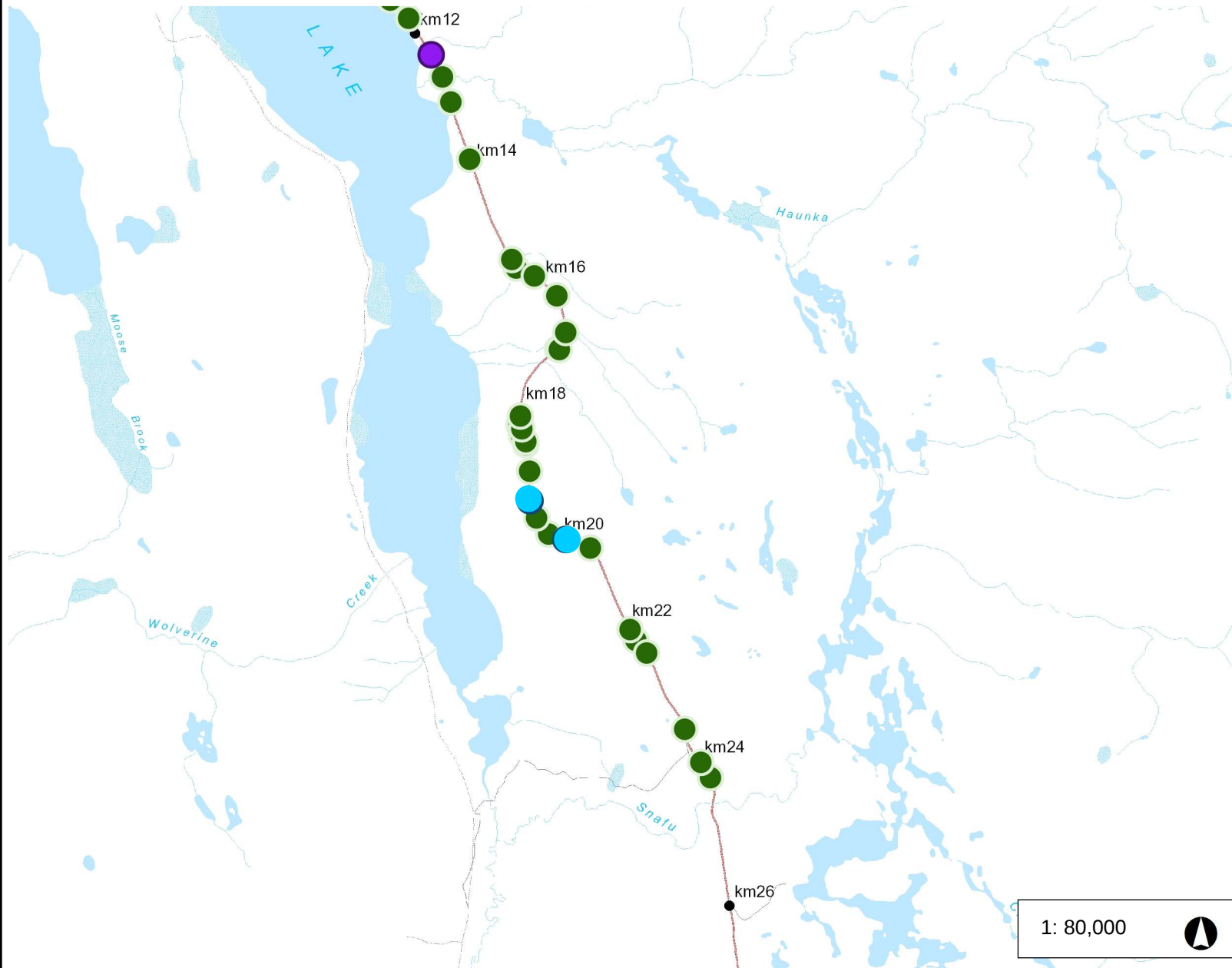
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Notes

Map 11

Southern Lakes Roadways 2019 Invasive Plant Survey

Atlin Road km 12-27



Legend

- Highway Kilometre Posts
- White sweetclover
- Yellow sweetclover
- Yellow lucerne
- Yellow clematis
- Spotted knapweed
- Scentless chamomile
- Perennial sowthistle
- Oxeye daisy
- Bird vetch
- Altai lyme grass

1: 80,000



4.1 0 2.03 4.1 Kilometers

Yukon Albers
Produced from: Yukon Lands Viewer

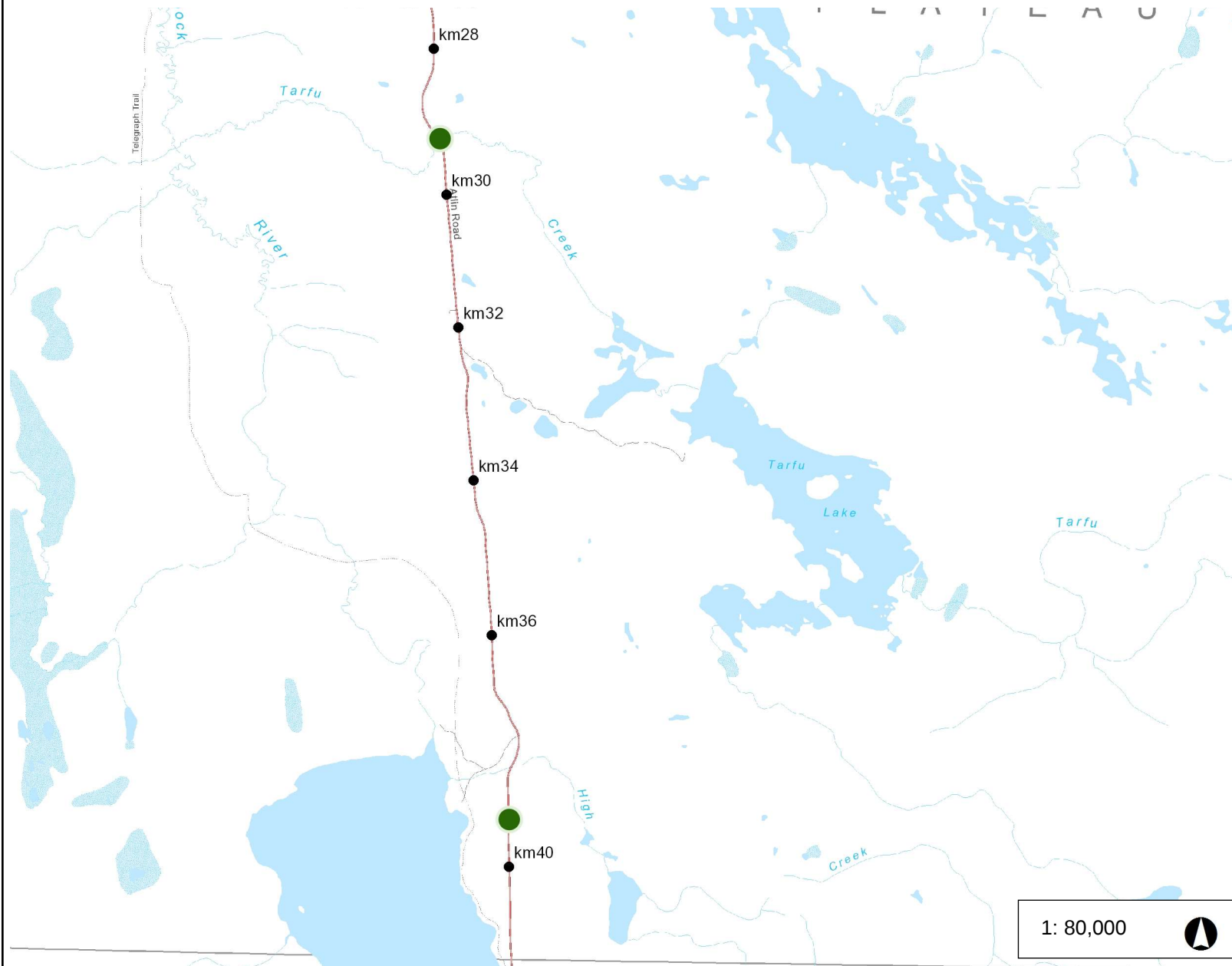
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Date Printed: 09-Aug-2019

Notes

Map 12

Southern Lakes Roadways 2019 Invasive Plant Survey

Atlin Road km 28-41



Legend

- Highway Kilometre Posts
- White sweetclover
- Yellow sweetclover
- Yellow lucerne
- Yellow clematis
- Spotted knapweed
- Scentless chamomile
- Perennial sowthistle
- Oxeye daisy
- Bird vetch
- Altai lyme grass

Notes

Map 13

4.1 0 2.03 4.1 Kilometers

Yukon Albers
Produced from: Yukon Lands Viewer

This map is a user generated static output from an Internet mapping site and is for reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable. THIS MAP IS NOT TO BE USED FOR NAVIGATION.
Date Printed: 09-Aug-2019

2019 DATA LOGS

Table 2. South Klondike Highway 2019 Invasive Plant Survey

Data collected in WGS 84

Nearest Km	Side of Road	Site ID	Mapping Latitude	Mapping Longitude	Recorded Latitude	Recorded Longitude	Species	Notes	Photo File Name
25	LHS	SKH-19-62	59.635798	-135.16	59° 38' 8.874" N	135° 9' 35.856" W	Altai lyme grass	10 m2	SKH-19-62 DSCF6586.JPG
25	LHS	SKH-19-63	59.635722	-135.16	59° 38' 8.598" N	135° 9' 36.156" W	Altai lyme grass	10 m2	SKH-19-63 DSCF6587.JPG
25	RHS	SKH-19-64	59.635883	-135.1595	59° 38' 9.180" N	135° 9' 34.170" W	Altai lyme grass	5 m2	SKH-19-64 DSCF6589.JPG
25	RHS	SKH-19-65	59.63646	-135.1578	59° 38' 11.256" N	135° 9' 28.080" W	Altai lyme grass	5 m2	SKH-19-65 DSCF6590.JPG
25.5	LHS	SKH-19-61	59.637888	-135.1535	59° 38' 16.398" N	135° 9' 12.690" W	Altai lyme grass	4 m2	SKH-19-61 DSCF6585.JPG
25.5	RHS	SKH-19-66	59.638972	-135.1505	59° 38' 20.298" N	135° 9' 1.794" W	Altai lyme grass	10 m2	SKH-19-66 DSCF6591.JPG
26	LHS	SKH-19-60	59.63966	-135.1496	59° 38' 22.776" N	135° 8' 58.416" W	Altai lyme grass	3 patches, 1 m2 each	SKH-19-60 DSCF6584.JPG
26	RHS	SKH-19-67	59.640045	-135.1486	59° 38' 24.162" N	135° 8' 55.110" W	Altai lyme grass	2 patches, 10 and 5 m2	SKH-19-67 DSCF6592.JPG
26	RHS	SKH-19-68	59.640395	-135.148	59° 38' 25.422" N	135° 8' 52.620" W	Altai lyme grass	3 patches, 5, 10 and 20 m2	SKH-19-68 DSCF6593.JPG
26	RHS	SKH-19-69	59.64182	-135.1453	59° 38' 30.552" N	135° 8' 43.014" W	Altai lyme grass	3 patches, 5, 10 and 10 m2	SKH-19-69 DSCF6594.JPG
26	RHS	SKH-19-70	59.642398	-135.1442	59° 38' 32.634" N	135° 8' 39.012" W	Altai lyme grass	25 m2	SKH-19-70 DSCF6595.JPG
26.5	LHS	SKH-19-58	59.644757	-135.14	59° 38' 41.124" N	135° 8' 23.994" W	Altai lyme grass	3 m2	SKH-19-58 DSCF6582.JPG
26.5	LHS	SKH-19-59	59.644522	-135.1404	59° 38' 40.278" N	135° 8' 25.578" W	Altai lyme grass	2 m2	SKH-19-59 DSCF6583.JPG
26.5	RHS	SKH-19-71	59.64569	-135.1381	59° 38' 44.484" N	135° 8' 17.190" W	Altai lyme grass	30 m2	SKH-19-71 DSCF6596.JPG
27	RHS	SKH-19-72	59.64656	-135.1366	59° 38' 47.616" N	135° 8' 11.706" W	Altai lyme grass	5 m2	SKH-19-72 DSCF6597.JPG
28	LHS	SKH-19-56	59.658153	-135.1246	59° 39' 29.352" N	135° 7' 28.428" W	Altai lyme grass	1 m2	SKH-19-56 DSCF6580.JPG
28	LHS	SKH-19-57	59.655257	-135.1266	59° 39' 18.924" N	135° 7' 35.874" W	Altai lyme grass	5 m2	SKH-19-57 DSCF6581.JPG
28	RHS	SKH-19-73	59.654312	-135.1276	59° 39' 15.522" N	135° 7' 39.414" W	Altai lyme grass	5 m2	SKH-19-73 DSCF6598.JPG
28	RHS	SKH-19-74	59.6567	-135.1254	59° 39' 24.120" N	135° 7' 31.308" W	Altai lyme grass	5 m2	SKH-19-74 DSCF6599.JPG
28	RHS	SKH-19-75	59.657382	-135.125	59° 39' 26.574" N	135° 7' 30.168" W	Altai lyme grass	2 patches, 1 m2 each	SKH-19-75 DSCF6600.JPG
28.5	LHS	SKH-19-55	59.661198	-135.1212	59° 39' 40.314" N	135° 7' 16.176" W	Altai lyme grass	3 m2	SKH-19-55 DSCF6579.JPG
29	LHS	SKH-19-54	59.664983	-135.1172	59° 39' 53.940" N	135° 7' 1.830" W	Altai lyme grass	10 m2	SKH-19-54 DSCF6578.JPG
29	RHS	SKH-19-76	59.663227	-135.1186	59° 39' 47.616" N	135° 7' 6.870" W	Altai lyme grass	2 patches, 1 and 2 m2	SKH-19-76 DSCF6601.JPG
29.5	LHS	SKH-19-52	59.669812	-135.1088	59° 40' 11.322" N	135° 6' 31.632" W	Altai lyme grass	2 m2	SKH-19-52 DSCF6576.JPG
29.5	LHS	SKH-19-53	59.669272	-135.11	59° 40' 9.378" N	135° 6' 36.132" W	Altai lyme grass	5 m2	SKH-19-53 DSCF6577.JPG
29.5	RHS	SKH-19-77	59.669028	-135.1103	59° 40' 8.502" N	135° 6' 37.182" W	Altai lyme grass	2 m2	SKH-19-77 DSCF6602.JPG
30	RHS	SKH-19-78	59.671792	-135.1054	59° 40' 18.450" N	135° 6' 19.272" W	Altai lyme grass	2 m2	SKH-19-78 DSCF6603.JPG
31	LHS	SKH-19-51	59.677923	-135.0975	59° 40' 40.524" N	135° 5' 50.886" W	Altai lyme grass	2 m2	SKH-19-51 DSCF6575.JPG
31.5	RHS	SKH-19-79	59.683772	-135.0942	59° 41' 1.578" N	135° 5' 39.144" W	Altai lyme grass	4 m2	SKH-19-79 DSCF6604.JPG
32	RHS	SKH-19-80	59.687758	-135.0951	59° 41' 15.930" N	135° 5' 42.240" W	Altai lyme grass	15 m2	SKH-19-80 DSCF6605.JPG
32	RHS	SKH-19-81	59.688417	-135.0953	59° 41' 18.300" N	135° 5' 43.086" W	Altai lyme grass	25 m2	SKH-19-81 DSCF6606.JPG
32.5	RHS	SKH-19-82	59.691528	-135.0956	59° 41' 29.502" N	135° 5' 44.256" W	Altai lyme grass	15 m2	SKH-19-82 DSCF6607.JPG
33.5	LHS	SKH-19-48	59.697258	-135.0779	59° 41' 50.130" N	135° 4' 40.320" W	Altai lyme grass	2 patches, 1 m2 each	SKH-19-48 DSCF6572.JPG

Nearest Km	Side of Road	Site ID	Mapping Latitude	Mapping Longitude	Recorded Latitude	Recorded Longitude	Species	Notes	Photo File Name
33.5	LHS	SKH-19-49	59.697255	-135.0779	59° 41' 50.118" N	135° 4' 40.392" W	Altai lyme grass	2 patches, 5 m2 each	SKH-19-49 DSCF6573.JPG
33.5	LHS	SKH-19-50	59.697025	-135.0807	59° 41' 49.290" N	135° 4' 50.628" W	Altai lyme grass	5 m2	SKH-19-50 DSCF6574.JPG
33.5	RHS	SKH-19-83	59.69771	-135.076	59° 41' 51.756" N	135° 4' 33.744" W	Altai lyme grass	5 m2	SKH-19-83 DSCF6608.JPG
34.5	LHS	SKH-19-47	59.70342	-135.0671	59° 42' 12.312" N	135° 4' 1.506" W	Altai lyme grass	2 m2	SKH-19-47 DSCF6569.JPG
35	LHS	SKH-19-46	59.7093	-135.0614	59° 42' 33.480" N	135° 3' 41.100" W	Altai lyme grass	5 m2	SKH-19-46 DSCF6568.JPG
36	LHS	SKH-19-44	59.711838	-135.053	59° 42' 42.618" N	135° 3' 10.776" W	Altai lyme grass	5 m2	SKH-19-44 DSCF6566.JPG
36	LHS	SKH-19-45	59.711525	-135.0562	59° 42' 41.490" N	135° 3' 22.362" W	Altai lyme grass	15 m2	SKH-19-45 DSCF6567.JPG
37	LHS	SKH-19-43	59.71771	-135.0449	59° 43' 3.756" N	135° 2' 41.784" W	Altai lyme grass	1 m2	SKH-19-43 DSCF6565.JPG
37	RHS	SKH-19-84	59.718455	-135.0434	59° 43' 6.438" N	135° 2' 36.324" W	Altai lyme grass	2 m2	SKH-19-84 DSCF6609.JPG
38	LHS	SKH-19-42	59.722953	-135.022	59° 43' 22.632" N	135° 1' 19.260" W	Altai lyme grass	0.5 m2	SKH-19-42 DSCF6564.JPG
38	RHS	SKH-19-85	59.722092	-135.0267	59° 43' 19.530" N	135° 1' 36.078" W	Altai lyme grass	2 patches, 1 m2 each	SKH-19-85 DSCF6610.JPG
39.5	RHS	SKH-19-86	59.726083	-134.9993	59° 43' 33.900" N	134° 59' 57.480" W	Altai lyme grass	1 m2	SKH-19-86 DSCF6611.JPG
41.5	LHS	SKH-19-41	59.738642	-134.9743	59° 44' 19.110" N	134° 58' 27.522" W	Altai lyme grass	4 m2	SKH-19-41 DSCF6563.JPG
43	RHS	SKH-19-87	59.749958	-134.9675	59° 44' 59.850" N	134° 58' 3.042" W	Altai lyme grass	5 m2	SKH-19-87 DSCF6612.JPG
45	RHS	SKH-19-88	59.764028	-134.9463	59° 45' 50.502" N	134° 56' 46.836" W	Altai lyme grass	2 m2	SKH-19-88 DSCF6613.JPG
45.5	RHS	SKH-19-sign	59.766607	-134.9403	59° 45' 59.784" N	134° 56' 25.206" W	No weeds	Sign indicating Clearview herbicide applied on 17/07/2019 for yellow hawkweed	SKH-19-sign DSCF6614.JPG
47.5	LHS	SKH-19-40	59.777072	-134.9174	59° 46' 37.458" N	134° 55' 2.724" W	Altai lyme grass	3 m2	SKH-19-40 DSCF6562.JPG
47.5	RHS	SKH-19-89	59.777025	-134.9173	59° 46' 37.290" N	134° 55' 2.118" W	Altai lyme grass	2 m2	SKH-19-89 DSCF6615.JPG
48	LHS	SKH-19-38	59.78295	-134.9159	59° 46' 58.620" N	134° 54' 57.078" W	Altai lyme grass	2 m2	SKH-19-38 DSCF6561.JPG
49.5	RHS	SKH-19-90	59.794543	-134.9126	59° 47' 40.356" N	134° 54' 45.462" W	Altai lyme grass	35 m2	SKH-19-90 DSCF6616.JPG
53	RHS	SKH-19-91	59.79711	-134.8515	59° 47' 49.596" N	134° 51' 5.526" W	Altai lyme grass	1 m2	SKH-19-91 DSCF6617.JPG
58	RHS	SKH-19-92	59.828677	-134.8019	59° 49' 43.236" N	134° 48' 6.864" W	White sweetclover	1 plant	SKH-19-92 DSCF6618.JPG
63	RHS	SKH-19-93	59.874203	-134.7897	59° 52' 27.132" N	134° 47' 22.842" W	Altai lyme grass	1 m2	SKH-19-93 DSCF6619.JPG
66.5	RHS	SKH-19-94	59.906472	-134.7944	59° 54' 23.298" N	134° 47' 39.690" W	Altai lyme grass	10 m2	SKH-19-94 DSCF6620.JPG
72.5	RHS	SKH-19-95	59.947013	-134.7315	59° 56' 49.248" N	134° 43' 53.472" W	Altai lyme grass	25 m2	SKH-19-95 DSCF6621.JPG
75.5	LHS	SKH-19-37	59.965053	-134.6931	59° 57' 54.192" N	134° 41' 35.196" W	Altai lyme grass	1 m2	SKH-19-37 DSCF6560.JPG
77.5	RHS	SKH-19-96a	59.979535	-134.6702	59° 58' 46.326" N	134° 40' 12.888" W	Spotted knapweed	3 plants; sign indicating Clearview herbicide applied on 17/07/2019	SKH-19-96a DSCF6622.JPG, and 2 more photos
78	RHS	SKH-19-97	59.98209	-134.6694	59° 58' 46.332" N	134° 40' 12.840" W	Spotted knapweed	1 plant	SKH-19-97 DSCF6625.JPG
79.5	LHS	SKH-19-35	59.99459	-134.6684	59° 59' 40.524" N	134° 40' 6.072" W	White sweetclover	35 m2 along 100m	SKH-19-35 DSCF6558.JPG
79.5	RHS	SKH-19-36	59.99459	-134.6684	59° 59' 40.524" N	134° 40' 6.072" W	White sweetclover	2 m2	SKH-19-36 DSCF6559.JPG
79.5	RHS	SKH-19-98	59.995422	-134.6675	59° 59' 43.518" N	134° 40' 2.880" W	Oxeye daisy	5 flowering plants + 5 leaf rosettes	SKH-19-98 DSCF6626.JPG

Nearest Km	Side of Road	Site ID	Mapping Latitude	Mapping Longitude	Recorded Latitude	Recorded Longitude	Species	Notes	Photo File Name
80	LHS	SKH-19-34	59.999287	-134.6651	59° 59' 57.432" N	134° 39' 54.294" W	White sweetclover	0.5 m2	SKH-19-34 DSCF6557.JPG
80.5	LHS	SKH-19-32	60.002902	-134.6584	60° 0' 10.446" N	134° 39' 30.168" W	White sweetclover	1 m2 along 50 m	SKH-19-32 DSCF6555.JPG
80.5	LHS	SKH-19-33	60.00212	-134.6599	60° 0' 7.632" N	134° 39' 35.742" W	White sweetclover	1 m2 along 25 m	SKH-19-33 DSCF6556.JPG
87	RHS	SKH-19-99	60.05059	-134.5908	60° 3' 2.124" N	134° 35' 26.874" W	Altai lyme grass	3 m2	SKH-19-99 DSCF6627.JPG
88	RHS	SKH-19-100	60.054215	-134.5833	60° 3' 15.174" N	134° 34' 59.808" W	White sweetclover	8 plants	SKH-19-100 DSCF6628.JPG
99	RHS	SKH-19-101	60.133355	-134.6132	60° 8' 0.078" N	134° 36' 47.496" W	White sweetclover	3 plants	SKH-19-101 DSCF6629.JPG
101	RHS	SKH-19-102	60.14443	-134.6386	60° 8' 55.464" N	134° 37' 46.980" W	White sweetclover	7 plants	SKH-19-102 DSCF6630.JPG
104.5	LHS	SKH-19-19	60.162923	-134.6906	60° 9' 46.524" N	134° 41' 26.304" W	White sweetclover	0.5 m2	SKH-19-19 DSCF6531.JPG
105	RHS	SKH-19-20	60.163335	-134.6938	60° 9' 48.006" N	134° 41' 37.518" W	White sweetclover	10 m2	SKH-19-20 DSCF6532.JPG
105	RHS	SKH-19-103	60.164335	-134.6963	60° 9' 51.606" N	134° 41' 46.542" W	Altai lyme grass	0.5 m2	SKH-19-103 DSCF6631.JPG
105.5	RHS	SKH-19-21	60.167843	-134.7025	60° 10' 4.236" N	134° 42' 9.072" W	White sweetclover	2 m2	SKH-19-21 DSCF6536.JPG
105.5	RHS	SKH-19-22	60.168033	-134.7029	60° 10' 4.920" N	134° 42' 10.356" W	Altai lyme grass	100m2	SKH-19-22 DSCF6537.JPG
105.5	RHS	SKH-19-23	60.169127	-134.7041	60° 10' 8.856" N	134° 42' 14.730" W	White sweetclover	5 plants	SKH-19-23 DSCF6538.JPG
105.5	RHS	SKH-19-24	60.169613	-134.7043	60° 10' 10.608" N	134° 42' 15.312" W	Yellow clematis	25 m2	SKH-19-24 DSCF6539.JPG
105.5	LHS	SKH-19-25	60.169418	-134.7045	60° 10' 9.906" N	134° 42' 16.086" W	Altai lyme grass	25 m2	SKH-19-25 DSCF6540.JPG
106	LHS	SKH-19-18	60.171333	-134.7048	60° 10' 16.800" N	134° 42' 17.382" W	White sweetclover	0.5 m2	SKH-19-18 DSCF6530.JPG
107	RHS	SKH-19-26	60.178442	-134.7051	60° 10' 42.390" N	134° 42' 18.210" W	White sweetclover	1 plant	SKH-19-26 DSCF6544.JPG
107.5	LHS	SKH-19-17	60.186012	-134.7008	60° 11' 9.642" N	134° 42' 2.940" W	White sweetclover	1 plant	SKH-19-17 DSCF6457.JPG
108.5	RHS	SKH-19-27	60.194353	-134.7064	60° 11' 39.672" N	134° 42' 23.154" W	Yellow sweetclover	0.5 m2 along 50 m	SKH-19-27 DSCF6545.JPG
108.5	RHS	SKH-19-28	60.193668	-134.7057	60° 11' 37.206" N	134° 42' 20.634" W	Perennial sowthistle	5 plants	SKH-19-28 DSCF6546.JPG
114.5	RHS	SKH-19-29	60.243975	-134.7442	60° 14' 38.310" N	134° 44' 39.084" W	White sweetclover	3 plants	SKH-19-29 DSCF6549.JPG
116.5	RHS	SKH-19-30	60.25929	-134.7508	60° 15' 33.444" N	134° 45' 3.024" W	White sweetclover	1 plant	SKH-19-30 DSCF6550.JPG
124.5	RHS	SKH-19-31	60.33012	-134.7677	60° 19' 48.432" N	134° 46' 3.870" W	White sweetclover	2 m2	SKH-19-31 DSCF6551.JPG
135.5	RHS	SKH-19-105	60.414113	-134.8329	60° 24' 50.808" N	134° 49' 58.488" W	White sweetclover	1 plant	SKH-19-105 DSCF6654.JPG
136	LHS	SKH-19-106	60.420823	-134.8339	60° 25' 14.964" N	134° 50' 2.076" W	White sweetclover	1 plant	SKH-19-106 DSCF6655.JPG
138	LHS	SKH-19-16	60.438087	-134.8413	60° 26' 17.112" N	134° 50' 28.500" W	White sweetclover	1 plant	SKH-19-16 DSCF6456.JPG
140	RHS	SKH-19-107	60.450443	-134.8468	60° 27' 1.596" N	134° 50' 48.438" W	White sweetclover	1 plant	SKH-19-107 DSCF6656.JPG
142	LHS	SKH-19-15	60.466838	-134.8623	60° 28' 0.618" N	134° 51' 44.160" W	White sweetclover	3 plants	SKH-19-15 DSCF6448.JPG
149.5	RHS	SKH-19-01	60.53346	-134.8747	60° 32' 0.456" N	134° 52' 29.058" W	White sweetclover	0.5 m2	SKH-19-01 DSCF6431.JPG
150	LHS	SKH-19-14	60.54026	-134.8767	60° 32' 24.936" N	134° 52' 35.964" W	Yellow clematis	0.5 m2	SKH-19-14 DSCF6447.JPG
150.5	RHS	SKH-19-02	60.547523	-134.877	60° 32' 51.084" N	134° 52' 37.350" W	White sweetclover	0.5 m2 in gravel pit	SKH-19-02 DSCF6432.JPG
150.5	RHS	SKH-19-03	60.546538	-134.8768	60° 32' 47.538" N	134° 52' 36.588" W	White sweetclover	2 plants	SKH-19-03 DSCF6433.JPG
150.5	RHS	SKH-19-04	60.54544	-134.8777	60° 32' 43.584" N	134° 52' 39.690" W	White sweetclover	2 m2 along 250m	SKH-19-04 DSCF6434.JPG
151	LHS	SKH-19-13	60.548325	-134.8799	60° 32' 53.970" N	134° 52' 47.796" W	White sweetclover	5 plants	SKH-19-13 DSCF6446.JPG

Nearest Km	Side of Road	Site ID	Mapping Latitude	Mapping Longitude	Recorded Latitude	Recorded Longitude	Species	Notes	Photo File Name
152.5	LHS	SKH-19-12	60.559923	-134.8765	60° 33' 35.724" N	134° 52' 35.442" W	White sweetclover	3 plants	SKH-19-12 DSCF6445.JPG
152.5	RHS	SKH-19-104	60.561317	-134.8737	60° 33' 40.740" N	134° 52' 25.158" W	White sweetclover	5 plants	SKH-19-104 DSCF6632.JPG
154.5	LHS	SKH-19-11	60.576513	-134.8565	60° 34' 35.448" N	134° 51' 23.274" W	White sweetclover	1 plant	SKH-19-11 DSCF6444.JPG
155	RHS	SKH-19-05	60.56557	-134.8719	60° 33' 56.052" N	134° 52' 18.894" W	White sweetclover	3 plants	SKH-19-05 DSCF6435.JPG
156	RHS	SKH-19-06	60.58504	-134.8645	60° 35' 6.144" N	134° 51' 52.074" W	White sweetclover	1 plant	SKH-19-06 DSCF6436.JPG
156	RHS	SKH-19-10	60.58556	-134.8532	60° 35' 8.016" N	134° 51' 11.448" W	White sweetclover	2,500 m2, km 156 gravel pit	SKH-19-10a DSCF6441.JPG, plus 5 more photos
156.5	RHS	SKH-19-07	60.588415	-134.8683	60° 35' 18.294" N	134° 52' 5.712" W	White sweetclover	50 m2, start of Carcross Corner section	SKH-19-07 DSCF6437.JPG
156.5	RHS	SKH-19-08	60.589322	-134.8701	60° 35' 21.558" N	134° 52' 12.282" W	White sweetclover	50 m2, end of Carcross Corner section	SKH-19-08 DSCF6438.JPG
157	LHS	SKH-19-09	60.598567	-134.878	60° 35' 54.840" N	134° 52' 40.752" W	White sweetclover	25 m2, Carcross corner	SKH-19-09a DSCF6439.JPG, SKH-19-09b DSCF6440.JPG
0.5	RHS	Annie Lk-19-01	60.449503	-134.8526	60° 26' 58.212" N	134° 51' 9.354" W	White sweetclover	1 plant	Annie Lk-19-01 DSCF6449.JPG
1	RHS	Annie Lk-19-02	60.44588	-134.8609	60° 26' 45.168" N	134° 51' 39.156" W	White sweetclover	1 plant	Annie Lk-19-02 DSCF6450.JPG
3	RHS	Annie Lk-19-03	60.43695	-134.891	60° 26' 13.020" N	134° 53' 27.696" W	White sweetclover	15 plants	Annie Lk-19-03 DSCF6451.JPG
4	RHS	Annie Lk-19-04	60.433827	-134.9018	60° 26' 1.776" N	134° 54' 6.396" W	White sweetclover	1 plant	Annie Lk-19-04 DSCF6452.JPG
4	RHS	Annie Lk-19-05	60.430168	-134.9031	60° 25' 48.606" N	134° 54' 11.310" W	Yellow sweetclover	1 plant	Annie Lk-19-05 DSCF6453.JPG
4	LHS	Annie Lk-19-06	60.430448	-134.9031	60° 25' 49.614" N	134° 54' 11.280" W	Yellow sweetclover	35 plants	Annie Lk-19-06 DSCF6454.JPG
4	LHS	Annie Lk-19-07	60.432867	-134.9034	60° 25' 58.320" N	134° 54' 12.384" W	Yellow sweetclover	5 plants	Annie Lk-19-07 DSCF6455.JPG
0	RHS	Emerald Way-19-01	60.190677	-134.7128	60° 11' 26.436" N	134° 42' 46.200" W	White sweetclover	0.5 m2	Emerald Way-19-01 DSCF6547.JPG
0	RHS	Robinson-19-01	60.475997	-134.8623	60° 28' 33.588" N	134° 51' 44.136" W	White sweetclover	10 plants	Robinson-19-01 DSCF6552.JPG
0.5	RHS	Robinson-19-02	60.475952	-134.8576	60° 28' 33.426" N	134° 51' 27.210" W	White sweetclover	30 plants	Robinson-19-02 DSCF6553.JPG
1	LHS	Robinson-19-03	60.477192	-134.846	60° 28' 37.890" N	134° 50' 45.438" W	White sweetclover	20 m2 over 150 m, thinly spread	Robinson-19-03 DSCF6554.JPG
0.5	LHS	Robinson-19-04	60.47653	-134.8533			White sweetclover	50 m2 over 200 m	No photo

Table 3. Tagish Road 2019 Invasive Plant Survey

Data collected in WGS 84

Nearest Km	Side of Road	Site ID	Mapping Latitude	Mapping Longitude	Recorded Latitude	Recorded Longitude	Species	Notes	Photo File Name
0	LSH	TR-19-11	60.338142	-133.984533	60° 20' 17.310" N	133° 59' 4.320" W	White sweetclover	35 plants	TR-19-11 DSCF6421.JPG
0	RHS	TR-19-12	60.339228	-133.985175	60° 20' 21.222" N	133° 59' 6.630" W	White sweetclover	25 m2, spread out at Jake's Corner	TR-19-12 DSCF6424.JPG
2	RHS	TR-19-13	60.327922	-134.005975	60° 19' 40.518" N	134° 0' 21.510" W	White sweetclover	1 m2	TR-19-13 DSCF6502.JPG
2	LHS	TR-19-28	60.32778	-134.00632	60° 19' 40.008" N	134° 0' 22.752" W	White sweetclover	1 plant	TR-19-28 DSCF6518.JPG
5.5	LHS	TR-19-27	60.331317	-134.055223	60° 19' 52.740" N	134° 3' 18.804" W	Perennial sowthistle	5 m2	TR-19-27 DSCF6517.JPG
7.5	LHS	TR-19-26	60.333105	-134.087022	60° 19' 59.178" N	134° 5' 13.278" W	White sweetclover	6 plants	TR-19-26 DSCF6515.JPG
8	LHS	TR-19-25	60.330772	-134.093257	60° 19' 50.778" N	134° 5' 35.724" W	White sweetclover	10 m2	TR-19-25 DSCF6514.JPG
9.5	RHS	TR-19-29	60.320648	-134.098045	60° 19' 14.334" N	134° 5' 52.962" W	White sweetclover	20 plants	TR-19-29 DSCF6522.JPG
13	RHS	TR-19-14	60.312068	-134.147817	60° 18' 43.446" N	134° 8' 52.140" W	White sweetclover	1 M2 along 50 m	TR-19-14 DSCF6503.JPG
13	LHS	TR-19-24	60.31233	-134.149473	60° 18' 44.388" N	134° 8' 58.104" W	White sweetclover	1 plant	TR-19-24 DSCF6513.JPG
14.5	RHS	TR-19-30	60.319145	-134.172943	60° 19' 8.922" N	134° 10' 22.596" W	White sweetclover	25 plants	TR-19-30 DSCF6523.JPG
16.5	LHS	TR-19-23	60.327598	-134.193672	60° 19' 39.354" N	134° 11' 37.218" W	White sweetclover	10 m2	TR-19-23 DSCF6512.JPG
16.5	RHS	TR-19-31	60.327625	-134.192988	60° 19' 39.450" N	134° 11' 34.758" W	White sweetclover	100 m2 along 400 m	TR-19-31 DSCF6524.JPG
17	RHS	TR-19-32	60.329367	-134.206123	60° 19' 45.720" N	134° 12' 22.044" W	White sweetclover	25 m2 along 500 m; many small plants	TR-19-32 DSCF6525.JPG
17	RHS	TR-19-35	60.316652	-134.261828	60° 18' 59.946" N	134° 15' 42.582" W	White sweetclover	3 m2	TR-19-35 DSCF6528.JPG
17.5	LHS	TR-19-22	60.329858	-134.214558	60° 19' 47.490" N	134° 12' 52.410" W	White sweetclover	250 m2 along 600m	TR-19-22 DSCF6511.JPG
18	LHS	TR-19-21	60.329647	-134.219565	60° 19' 46.728" N	134° 13' 10.434" W	White sweetclover	2 plants	TR-19-21 DSCF6510.JPG
18	RHS	TR-19-33	60.329863	-134.219343	60° 19' 47.508" N	134° 13' 9.636" W	White sweetclover	3 m2	TR-19-33 DSCF6526.JPG
18.5	LHS	TR-19-20	60.32915	-134.225488	60° 19' 44.940" N	134° 13' 31.758" W	White sweetclover	12 plants	TR-19-20 DSCF6509.JPG
19.5	RHS	TR-19-40	60.320925	-134.240775	60° 19' 15.330" N	134° 14' 26.790" W	Perennial sowthistle	50 m2 over 50 m	TR-19-40 DSCF6666.JPG
20	LHS	TR-19-19	60.319683	-134.244637	60° 19' 10.860" N	134° 14' 40.692" W	White sweetclover	5 m2 along 25 m	TR-19-19 DSCF6508.JPG
20.5	LHS	TR-19-18	60.31748	-134.254655	60° 19' 2.928" N	134° 15' 16.758" W	White sweetclover	25 m2 along 100 m	TR-19-18 DSCF6507.JPG
20.5	RHS	TR-19-34	60.317647	-134.255038	60° 19' 3.528" N	134° 15' 18.138" W	White sweetclover	20 plants	TR-19-34 DSCF6527.JPG
21	LHS	TR-19-16	60.316335	-134.261952	60° 18' 58.806" N	134° 15' 43.026" W	Yellow sweetclover	10 m2	TR-19-16 DSCF6505.JPG
21	LHS	TR-19-17	60.316492	-134.261043	60° 18' 59.370" N	134° 15' 39.756" W	White sweetclover	5 plants	TR-19-17 DSCF6506.JPG
21	RHS	TR-19-36	60.31647	-134.263245	60° 18' 59.292" N	134° 15' 47.682" W	White sweetclover	5 plants	TR-19-36 DSCF6529.JPG
25.5	LSH	TR-19-10	60.28232	-134.275905	60° 16' 56.352" N	134° 16' 33.258" W	White sweetclover	10 plants	TR-19-10 DSCF6413.JPG
26	LHS	TR-19-09	60.28241	-134.287633	60° 16' 56.676" N	134° 17' 15.480" W	White sweetclover	1 m2	TR-19-09 DSCF6408.JPG
28	LHS	TR-19-08	60.276783	-134.31774	60° 16' 36.420" N	134° 19' 3.864" W	White sweetclover	1 m2	TR-19-08 DSCF6407.JPG
41	RHS	TR-19-41	60.240982	-134.523325	60° 14' 27.534" N	134° 31' 23.970" W	Perennial sowthistle	20 plants	TR-19-41 DSCF6667.JPG
42.5	LHS	TR-19-07	60.238918	-134.547717	60° 14' 20.106" N	134° 32' 51.780" W	White sweetclover	2 plants	TR-19-07 DSCF6405.JPG

Table 4. Atlin Road 2019 Invasive Plant Survey

Data collected in WGS 84

Nearest Km	Side of Road	Site ID	Mapping Latitude	Mapping Longitude	Recorded Latitude	Recorded Longitude	Species	Notes	Photo File Name
0.5	RHS	AR-19-01	60.325942	-134.0018	60° 19' 33.390" N	134° 0' 6.474" W	White sweetclover	5 m2 along 50 m	AR-19-01 DSCF6458.JPG
1	RHS	AR-19-02	60.318775	-134.00193	60° 19' 7.590" N	134° 0' 6.942" W	White sweetclover	18 plants	AR-19-02 DSCF6459.JPG
3	RHS	AR-19-03	60.304308	-133.99963	60° 18' 15.510" N	133° 59' 58.680" W	Oxeye daisy	100 m2	AR-19-03 DSCF6460.JPG
8	RHS	AR-19-04	60.269702	-133.94326	60° 16' 10.926" N	133° 56' 35.748" W	Yellow sweetclover	0.5 m2	AR-19-04 DSCF6461.JPG
8.5	RHS	AR-19-05	60.26569	-133.93927	60° 15' 56.484" N	133° 56' 21.372" W	White sweetclover	2 m2	AR-19-05 DSCF6462.JPG
9.5	RHS	AR-19-06	60.256925	-133.93199	60° 15' 24.930" N	133° 55' 55.170" W	White sweetclover	2 plants	AR-19-06 DSCF6463.JPG
10	RHS	AR-19-07	60.25154	-133.92768	60° 15' 5.544" N	133° 55' 39.642" W	White sweetclover	3 plants	AR-19-07 DSCF6464.JPG
10.5	RHS	AR-19-08	60.24963	-133.92447	60° 14' 58.668" N	133° 55' 28.074" W	White sweetclover	1 plant	AR-19-08 DSCF6465.JPG
10.5	RHS	AR-19-09	60.249128	-133.92329	60° 14' 56.862" N	133° 55' 23.850" W	Bird vetch	10 m2 at driveway	AR-19-09 DSCF6466.JPG
11	RHS	AR-19-10	60.246945	-133.91871	60° 14' 49.002" N	133° 55' 7.344" W	White sweetclover	25 plants	AR-19-10 DSCF6467.JPG
12	RHS	AR-19-11	60.240005	-133.9078	60° 14' 24.018" N	133° 54' 28.080" W	White sweetclover	3 plants	AR-19-11 DSCF6468.JPG
12.5	RHS	AR-19-12	60.235557	-133.902	60° 14' 8.004" N	133° 54' 7.206" W	Spotted knapweed	15 flowering plants and 10 leaf rosettes	AR-19-12 DSCF6469.JPG
14	RHS	AR-19-13	60.222737	-133.89189	60° 13' 21.852" N	133° 53' 30.798" W	White sweetclover	1 plant	AR-19-13 DSCF6470.JPG
15.5	RHS	AR-19-14	60.209405	-133.87976	60° 12' 33.858" N	133° 52' 47.130" W	White sweetclover	4 plants	AR-19-14 DSCF6471.JPG
17	RHS	AR-19-15	60.19954	-133.86904	60° 11' 58.344" N	133° 52' 8.550" W	White sweetclover	15 plants	AR-19-15 DSCF6472.JPG
18	RHS	AR-19-16	60.189977	-133.87821	60° 11' 23.916" N	133° 52' 41.562" W	White sweetclover	10 plants	AR-19-16 DSCF6473.JPG
18.5	RHS	AR-19-17	60.188732	-133.87751	60° 11' 19.434" N	133° 52' 39.048" W	White sweetclover	10 plants	AR-19-17 DSCF6474.JPG
18.5	RHS	AR-19-18	60.187568	-133.87639	60° 11' 15.246" N	133° 52' 34.992" W	White sweetclover	5 m2	AR-19-18 DSCF6475.JPG
19	RHS	AR-19-19	60.184308	-133.87533	60° 11' 3.510" N	133° 52' 31.200" W	White sweetclover	5 plants, farm driveway; more on property	AR-19-19 DSCF6476.JPG
20	RHS	AR-19-20	60.176582	-133.87028	60° 10' 35.694" N	133° 52' 12.996" W	White sweetclover	20 plants	AR-19-20 SCF6477.JPG
20	RHS	AR-19-21	60.17596	-133.86602	60° 10' 33.456" N	133° 51' 57.684" W	Yellow lucerne	4 small plants	AR-19-21 DSCF6478.JPG
20	RHS	AR-19-22	60.176088	-133.86585	60° 10' 33.918" N	133° 51' 57.060" W	White sweetclover	1 plant	AR-19-22 DSCF6479.JPG
20.5	RHS	AR-19-23	60.174967	-133.85987	60° 10' 29.880" N	133° 51' 35.538" W	White sweetclover	1 plant	AR-19-23 DSCF6480.JPG
22.5	RHS	AR-19-24	60.163658	-133.8481	60° 9' 49.170" N	133° 50' 53.142" W	White sweetclover	2 plants	AR-19-24 DSCF6481.JPG
23.5	RHS	AR-19-25	60.152795	-133.83556	60° 9' 10.062" N	133° 50' 8.004" W	White sweetclover	2 m2 in old gravel pit	AR-19-25 DSCF6482.JPG
24.5	RHS	AR-19-26	60.14687	-133.82893			White sweetclover	3 plants	no photo
39.5	LHS	AR-19-27	60.017617	-133.79607	60° 1' 3.420" N	133° 47' 45.834" W	White sweetclover	0.5 m2	AR-19-27 DSCF6483.JPG
29	LHS	AR-19-28	60.101787	-133.81662	60° 6' 6.432" N	133° 48' 59.832" W	White sweetclover	7 plants	AR-19-28 DSCF6484.JPG
24	LHS	AR-19-29	60.148745	-133.83139	60° 8' 55.482" N	133° 49' 53.004" W	White sweetclover	20 plants	AR-19-29 DSCF6485.JPG
22.5	LHS	AR-19-30	60.162133	-133.84537	60° 9' 43.680" N	133° 50' 43.344" W	White sweetclover	3 plants	AR-19-30 DSCF6486.JPG
22	LHS	AR-19-31	60.164987	-133.84961	60° 9' 53.952" N	133° 50' 58.578" W	White sweetclover	1 plant	AR-19-31 DSCF6487.JPG

Nearest Km	Side of Road	Site ID	Mapping Latitude	Mapping Longitude	Recorded Latitude	Recorded Longitude	Species	Notes	Photo File Name
19.5	LHS	AR-19-32	60.178548	-133.87336	60° 10' 42.774" N	133° 52' 24.108" W	White sweetclover	1 plant	AR-19-32 DSCF6488.JPG
18.5	LHS	AR-19-33	60.187955	-133.87643	60° 11' 16.638" N	133° 52' 35.130" W	White sweetclover	3 plants	AR-19-33 DSCF6489.JPG
18.5	LHS	AR-19-34	60.189535	-133.87749	60° 11' 22.326" N	133° 52' 38.946" W	White sweetclover	4 plants	AR-19-34 DSCF6490.JPG
17	LHS	AR-19-35	60.199438	-133.86861	60° 11' 57.978" N	133° 52' 6.996" W	White sweetclover	5 plants	AR-19-35 DSCF6491.JPG
17	LHS	AR-19-36	60.201568	-133.86712	60° 12' 5.646" N	133° 52' 1.638" W	White sweetclover	0.5 m2	AR-19-36 DSCF6492.JPG
16.5	LHS	AR-19-37	60.206083	-133.86952	60° 12' 21.900" N	133° 52' 10.284" W	White sweetclover	1 m2 in old gravel pit	AR-19-37 SCF6493.JPG
16	LHS	AR-19-38	60.20848	-133.87522	60° 12' 30.528" N	133° 52' 30.792" W	White sweetclover	50 m2 along 150 m, many small plants	AR-19-38 DSCF6494.JPG
15.5	LHS	AR-19-39	60.210452	-133.88089	60° 12' 37.626" N	133° 52' 51.186" W	White sweetclover	2 m2	AR-19-39 DSCF6496.JPG
13.5	LHS	AR-19-40	60.229758	-133.89686	60° 13' 47.130" N	133° 53' 48.690" W	White sweetclover	3 plants	AR-19-40 DSCF6497.JPG
13	LHS	AR-19-41	60.232845	-133.89909	60° 13' 58.242" N	133° 53' 56.718" W	White sweetclover	11 plants	AR-19-41 DSCF6498.JPG
11.5	LHS	AR-19-42	60.242207	-133.91246	60° 14' 31.944" N	133° 54' 44.838" W	White sweetclover	1 plant	AR-19-42 DSCF6499.JPG
6.5	LHS	AR-19-43	60.279842	-133.95366	60° 16' 47.430" N	133° 57' 13.164" W	White sweetclover	1 m2 in old right-of-way	AR-19-43 DSCF6500.JPG
1	RHS	AR-19-45	60.320743	-134.00181	60° 19' 14.676" N	134° 0' 6.516" W	White sweetclover	2 plants	AR-19-45 DSCF6682.JPG
10	RHS	AR-19-46	60.250022	-133.92534	60° 15' 0.078" N	133° 55' 31.218" W	White sweetclover	0.5 m2	AR-19-46 DSCF6685.JPG
19.5	LHS	AR-19-47	60.18065	-133.87508	60° 10' 50.340" N	133° 52' 30.276" W	Yellow lucerne	7 young plants	AR-19-47 DSCF6686.JPG
18	LHS	AR-19-48	60.191108	-133.87791	60° 11' 27.990" N	133° 52' 40.458" W	White sweetclover	1 plant	AR-19-48 DSCF6687.JPG
3	LHS	AR-19-49	60.305237	-133.99933	60° 18' 18.852" N	133° 59' 57.582" W	White sweetclover	15 plants	AR-19-49 DSCF6688.JPG
4	LHS	AR-19-44	60.296287	-133.9806	60° 17' 46.632" N	133° 58' 50.154" W	White sweetclover	0.5 m2, small plants	AR-19-44 DSCF6501.JPG

Nearest Km	Side of Road	Site ID	Mapping Latitude	Mapping Longitude	Recorded Latitude	Recorded Longitude	Species	Notes	Photo File Name
50	RHS	TR-19-42	60.202297	-134.65328	60° 12' 8.268" N	134° 39' 11.808" W	White sweetclover	1 plant	TR-19-42 DSCF6668.JPG
52.5	LHS	TR-19-05	60.183993	-134.684455	60° 11' 2.376" N	134° 41' 4.038" W	White sweetclover	5 plants	TR-19-05 DSCF6403.JPG
52.5	LHS	TR-19-06	60.185127	-134.68232	60° 11' 6.456" N	134° 40' 56.352" W	White sweetclover	30 m2	TR-19-06 DSCF6404.JPG
53	LHS	TR-19-02	60.180298	-134.690825	60° 10' 49.074" N	134° 41' 26.970" W	Yellow clematis	5 m2	TR-19-02 DSCF6401.JPG
53	LHS	TR-19-03	60.180298	-134.690825	60° 10' 49.074" N	134° 41' 26.970" W	White sweetclover	3 plants	TR-19-03 DSCF6400.JPG
53	LHS	TR-19-04	60.182813	-134.68648	60° 10' 58.128" N	134° 41' 11.328" W	White sweetclover	25 m2	TR-19-04 DSCF6402.JPG
53	RHS	TR-19-37	60.183197	-134.686602	60° 10' 59.508" N	134° 41' 11.766" W	Yellow sweetclover	5 m2	TR-19-37 DSCF6541.JPG
53.5	LHS	TR-19-15	60.17787	-134.692147	60° 10' 40.332" N	134° 41' 31.728" W	White sweetclover	1 plant	TR-19-15 DSCF6504.JPG
53.5	RHS	TR-19-38	60.179322	-134.696192	60° 10' 45.558" N	134° 41' 46.290" W	White sweetclover	25 m2, HPW grader station	TR-19-38 DSCF6542.JPG
54	LHS	TR-19-01	60.17582	-134.700298	60° 10' 32.952" N	134° 42' 1.074" W	White sweetclover	10 m2	TR-19-01 DSCF6399.JPG
54	RHS	TR-19-39	60.174698	-134.70499	60° 10' 28.914" N	134° 42' 17.964" W	White sweetclover	0.5 m2	TR-19-39 DSCF6543.JPG
54	RHS	TR-19-43	60.175835	-134.700908	60° 10' 33.006" N	134° 42' 3.270" W	White sweetclover	1 plant	TR-19-43 DSCF6669.JPG
0	RHS	Taku Blvd-19-01	60.265002	-134.30425	60° 15' 54.006" N	134° 18' 15.300" W	White sweetclover	1 m2	Taku Blvd-19-01 DSCF6409.JPG
0.5	LHS	10-Mile Rd-19-01	60.262703	-134.435657	60° 15' 45.732" N	134° 26' 8.364" W	White sweetclover	18 plants along 100 m	10-Mile Rd-19-01 DSCF6406.JPG
2	LHS	Reid Rd-19-01	60.265355	-134.301318	60° 15' 55.278" N	134° 18' 4.746" W	White sweetclover	25 m2 at fire hall	Reid Rd-19-01 DSCF6412.JPG
2	RHS	Taku Blvd-19-02	60.249388	-134.318632	60° 14' 57.798" N	134° 19' 7.074" W	White sweetclover	10 plants	Taku Blvd-19-02 DSCF6410.JPG
3	RHS	Taku Blvd-19-03	60.239948	-134.31796	60° 14' 23.814" N	134° 19' 4.656" W	White sweetclover	5 plants	Taku Blvd-19-03 DSCF6411.JPG