
Southern Lakes Roadways Invasive Plant “Patrol and Pull” Project Year 4 Report – 2018



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1 Introduction

This report documents work performed during the 2018 Patrol and Pull invasive plant control program on Southern Lakes roadways. The work was conducted for YG HPW by *Yucan Planning* under contract no. C00043970 and is the fourth consecutive year of the control program (2015, 2016, 2017, 2018). The overall scope, methods, and goals of the Patrol and Pull program 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 Patrol and Pull program's effectiveness after four 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 to these three roadways were also surveyed/patrolled (e.g., Annie Lake Road, 10-Mile Road, etc.). The total kilometres of highway and side roads surveyed/patrolled is enumerated in Table 1.

TABLE 1: Roadways Surveyed/Patrolled

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

Road Name		Km Surveyed 2015	Km Surveyed 2016	Km Surveyed 2017	Km Surveyed 2018
	Taku Subdivision roads	7	8	8	8
	Tagish Estates Road	3.5	3.5	2	2
	Tagish River Road	1.5	1.5	1.5	1
	Pennycook Road	2	2	3	2
	Secret Valley Road	1	1.5	1	1
Atlin Road (km 0-41)		41	41	41	41
	Lubbock River Road	2	1	1	2
	Snafu Campground Road	1	1	1	1
	Tarfu Campground Road	2	2	2	1
	Camp Yukon Road	1	1	1	1
Total Kilometres Surveyed		217	304	304	302

2 Update on Patrol and Pull Methodologies

Methods and Timing: The methods utilized in 2018 were essentially unchanged from the previous three 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 conducted over the course ~2-3 weeks in late July through early August when plants have developed enough to be readily spotted, but are not yet in seed. In the 2017 report we concluded, and want to emphasize here again, that 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-mower 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 in 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.

Spring of 2018 was cool and all plants, including invasives, initially were slow to grow. However, warm weather in late June and July meant that like other years the period from late July to early August still was the optimal time to conduct the Patrol and Pull, as essentially all invasive plants in the region had matured enough to be visible.

Equipment: Single plants or colonies of ~10 mature plants or less are either pulled by hand or cut at the base using a small pruning shear. Colonies larger than ~10 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 109 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 2018 compared to previous survey years (2015-2017), and again, the predominant invasive species was sweetclover.

Sweetclover: In gross terms, the overall distribution of sweetclover infestations has not changed along the SKH, but the size of most colonies was smaller in 2018 compared to previous years, and the number of single plant locations continues to decline: only four single-plant colonies were encountered in 2018 compared to eight in 2017, and 21 in 2016 (10 were found in 2015, but the study area was smaller). All sweetclover plants encountered (38 locations) were cut or pulled.

In all four years of Patrol and Pull, there have been three large 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. Just south of the Nares River Bridge (50 m²) in Carcross (this infestation was reduced considerably in 2018 due to road realignment and clearing work conducted in conjunction with the construction of a new bridge approach)

As in previous years, all three colonies were mowed with a brush cutter in 2018.

In addition, a fourth new and large infestation was found this year in the new gravel pit developed by YG HPW at km 156 of the SKH (2 km south of the Carcross Corner). The ~0.25 ha sweetclover colony consisted of all first year plants that were mostly growing on a soil waste pile deposited on top of/behind the active face of the pit, though some plants were growing on the active face itself. This new gravel pit was developed in winter 2016 and subsequently used in conjunction with reconstruction work conducted at the Carcross Corner (intersection of SKH and the Alaska Highway) in 2017. As far as we could determine, the waste soil pile consists of grubbing material that was removed from the Alaska Highway right-of-way during reconstruction of the roadbed – soil which was known to be heavily infested with sweetclover prior to the project. Summer 2018 was the first growing season on the waste pile post-construction, and resulted in a heavy growth of first-year plants. Since sweetclover is a bi-annual, regrowth of larger plants and a significant seed crop is expected in 2019. This should be considered a red-flag issue in terms of containing and managing sweetclover on the South Klondike Highway, and aggressive control measures should be enacted (these are discussed in Section 4).

During the survey/patrol, we inspected the other three active gravel pits along the SKH, located at km 112, 129 (Lewes Lake) and km 151 (Mosquito Road). Two small colonies of sweetclover (totalling ~2 m² of plants growing along ~200 m of roadway) were encountered near the entrance of the km 151 pit, but 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 2018, with five exceptions: 1) the large patch of sweetclover already mentioned along the Robinson Subdivision Road, 2) a colony of ~16 (yellow) sweetclover plants near km 11 Annie Lake Road, 3) three plants at km 3 Annie Lake Road, 4) a single plant at km 1 Annie Lake Road, and 5) a small colony growing along ~50 m of the shoulder (RHS) on the Watson River Subdivision Road.

Altai Lyme Grass: A total of 57 colonies of Altai lyme grass were encountered on the SKH in 2018, in the same locations as in 2016 and 2017 (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 two 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 (>100m²) 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.

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 144 SKH that was eradicated in 2017 and 2) a colony of three plants on the Tagish Road (see Section 3.2).

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

Other Species of Invasive Plants: In 2018, isolated populations of four other invasive plant species were found along the South Klondike Highway. These species include:

- *Yellow sweetclover:*
 - A large patch of ~20 m² is still present near km 108.5 of the SKH (RHS), and has been documented in every survey since 2015. However, the size of the infested area has reduced from ~100 m² in 2015 to ~20 m², presumably due to Patrol and Pull mowing. In addition, one new colony of yellow sweetclover (16 plants) was found near km 11 of the Annie Lake Road; all plants in this colony were pulled or mowed.
- *Perennial sow thistle:*
 - Perennial sow thistle was found at three locations in previous years' Patrol and Pull. In 2018, no perennial sow thistle plants were encountered along the SKH, including the three previous known locations. 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 dematis:*
 - As in 2015, 2016 and 2017, this species was 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 growth (~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 Two small oxeye daisy colonies were encountered in 2018, including 3 plants near km 79.5 (in BC) and 15 plants near km 46 (also in BC); both colonies were identified in previous Patrol and Pull surveys (2016-2017). The latter colony is located within 500 m of an old herbicide spraying sign posted by the Northwest BC Invasive Plant Council, which reports spraying an oxeye daisy colony with Tordan 22 in 2012 (Darrell Hill, NWIPC Field Coordinator, personal communication 2016). As in previous years, all plants encountered in 2018 were removed and bagged for disposal. A single, isolated plant was found (and removed) near the Carcross Corner during the 2017 survey/patrol, but pulling it seems to have been effective, as no oxeye daisy plants were found there in 2018.

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 19 kilometres of side roads. A total of 54 stops were made to document and remove invasive plants. However, only the first few kilometers of 10 Mile Road and Pennycook Road were surveyed because it became apparent that there was not adequate habitat for sweetclover further down the roads, and no invasive plants were encountered beyond their intersections with Tagish Road. All other side roads were surveyed for their entire length. This year, we again included the HPW Carcross maintenance station in the survey and mowed the sweetclover growing in the compound.

Sweetclover: As in previous years, the primary invasive species found growing along the Tagish Road was sweetclover; all plants encountered were cut or pulled. A total of 47 stops were made to document and remove sweetclover, compared to 44, 57, and 54 in 2015, 2016, and 2017, respectively.

Overall, the number and location of sweetclover colonies were similar to those encountered in 2015-2017, and includes about three dozen small to medium sized colonies that have been persistent over the years of Patrol and Pull. On a positive note, the extent and density of the largest colonies were found to be reduced in 2018, sometimes dramatically so. The three largest colonies are still found at: Jake's Corner (~50 m²), between km 16-20.5 of the Tagish Road (~ 250 m² cumulative), and near km 11 (75 m²). It is particularly noteworthy that the colony at Jake's Corner has been substantially reduced, with no plants at all encountered this year on the north side (RHS) and far fewer plants on the south side.

Regarding the side roads, small but significant colonies of sweetclover were found at four locations in the Taku Subdivision, as well as along the first 200 m of Ten Mile Road. These colonies were all present in previous years; none are new.

Other Species of Invasive Plants: Isolated populations of other invasive plant species found in the Tagish Road area in 2018 include:

- *Yellow sweetclover:*
 - o ~5 m² at km 21 (south of the Tagish Bridge) – Same location documented in previous years. All plants were pulled or mowed.

- o ~6 plants at km 0.5 Ten Mile Road – This is a new location. All plants were pulled.
- *Perennial sow thistle:*
 - o ~0.5 m² near km 3 Tagish Road (RHS) – This is a new location. All plants were removed and bagged for disposal.
 - 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).
- *Altai lyme grass:*
 - o 3 plants near km 28 (RHS) – Same location documented in 2015-2017. All plants were removed and bagged for disposal. The size of this colony/infestation has been progressively reduced and all but eliminated since 2015, presumably the result of three 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 5 kilometers of side roads. A total of 64 stops were made to document and remove invasive plants.

Sweetclover: Similar to the other two roadways, the primary invasive species encountered along the Atlin Road was sweetclover. All plants encountered were cut or pulled. In terms of side roads, only the first two 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 58 sweetclover colonies were encountered along the Atlin Road in 2018, which is a finding of concern because it is a considerable increase compared to 40 in 2017, 31 in 2016, and 40 in 2015. Of the 58 colonies, 18 were single plants and the rest varied in size from 0.5 m² to 250 m². Also of concern is the fact that some colonies are growing in size, despite being cut/pulled during past Patrol and Pull surveys. For example, the colonies between km 16 and 18.5, which were large in 2015 and small to non-existent in 2016-2017, were larger again in 2018. Some possible reasons for this increase are discussed in Section 4.

Other Species of Invasive Plants: Isolated populations of other invasive plant species encountered along the Atlin Road in 2018 include:

- *Spotted knapweed:*
 - o Twenty flowering plants and 20 leaf rosettes were again found near km 12.5 (LHS). All plants with roots were removed and bagged for disposal. This infestation was documented in the same location as in 2017 and 2016, and pulling plants appears to be holding it in check; however this colony should be monitored closely because of its potential to expand and become uncontrollable.

- *Oxeye daisy:*
 - o Two patches of oxeye daisy spread over an area of $\sim 100 \text{ m}^2$ were again found growing within 100 m of the entrance to two private properties at km 3. This location was also documented in 2016 and 2017. Oxeye daisy is a perennial and best controlled through pulling and bagging, 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.
- *Bird vetch:*
 - o A $\sim 5 \text{ m}^2$ 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 and 2017, as well. Bird vetch is a species of high concern as it can spread very quickly into wooded areas and smother 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 One plant was found near km 20 in 2018, in the same location that a two-plant colony was found in 2016, which in turn is approximately 500 m distance from a single plant discovered in 2017. The single plant was pulled and bagged for disposal.

4 Update on the 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 threat posed by each species. Here, we provide an update to those assessments.

4.1 Sweetclover

In terms of plant/colony numbers and extent of infestation, sweetclover remains the primary invasive plant species of concern growing along Southern Lakes Roadways. However, with the exception of the six large colonies listed below, the level of infestation is much less severe on Southern Lakes roadways than along many other roadways in Yukon – it is possible to drive long sections of these roads without seeing a single sweetclover plant. But this situation could change quickly and irreversibly if control measures are not sustained, to wit four years of the Patrol and Pull program appear to be holding the sweetclover population in check, and in some cases colony densities are even being reduced. The exception is Atlin Road, where some sweetclover colonies expanded this year, despite mowing efforts. This important exception is discussed further below.

Large Colonies: The five large sweetclover colonies mentioned in previous years' reports continue to persist, but a sixth large infestation appeared in 2018 at the new YG HPW gravel pit developed at km 156 SKH. These six 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 new gravel pit at Km 156 South Klondike Highway (new infestation in 2018).

Our observation is that the first four large colonies on the list are being contained by Patrol and Pull mowing efforts, and are not spreading. This affect is seen most dramatically at the intersection of the Tagish Road and the Alaska Highway. Also, the density of plants in those colonies has decreased, which suggests that the seedbanks are perhaps becoming reduced after four years of mowing.

In contrast, the colony between km 16-18.5 on Atlin Road (number 5 in the list above), which was large in 2015 but became progressively smaller in 2016 and 2017 after mowing, exhibited an increase in plant density and overall size in 2018. There may be a number of factors at play here. Perhaps most important, this and other sections of the Atlin road were upgraded sequentially from 2007-2017, and earth moving associated with this work likely exposed and spread existing seeds in the ROW, which promoted their germination. It is also possible that fill material hauled in for the work was contaminated with sweetclover seeds. In these scenarios, the amount of seed exposed or trucked in may simply have been high at km 16-18.5, and at other areas along the Atlin Road where sweetclover colonies have taken hold. The robust growth of sweetclover on the Atlin Road may also in part be the result of favourable weather conditions this year, though we have no data to substantiate this contention.

The new 0.25 ha infestation discovered at the km 156 SKH pit consisted of first-year plants growing on soil waste piles, which originated from soil that was excavated during road upgrade work conducted at the Carcross Cuttuff in 2017 (a few dozen plants were also found to be growing on the active pit face). This contamination of the new pit was an unfortunate and preventable event that YG HPW Transportation Engineering Branch was advised about during the planning phase of the upgrade project. Measures should be taken starting in 2019 to eradicate this infestation, and in subsequent years as new plants germinate from the transported soil. Possible solutions include annual blading, mowing, or spraying, or covering the pile with clean fill. Blading will kill any new, emerging plants, but some of the slopes are too steep to operate equipment on. Hand-mowing alone may be impractical because of the size of the infestation, but a combination of blading and hand-mowing could be employed. The site also is a good candidate for herbicidal treatment, if that is adopted as an acceptable form of control by HPW. These three methods would have to be employed annually for at least 5-10 years to have any chance of exhausting the seedbank. Covering the site with a layer (~0.3 m minimum) of clean fill, will prevent existing seeds from germinating but it will not kill them. Since the buried seeds can remain viable for decades or longer, the pile would have to be marked so that it will never be re-transported and used as fill. And if a cover layer strategy is employed, hand mowing or pulling would still need to be done on the active pit face.

Small and Isolated Colonies: Small sweetclover colonies of <20 plants, as well as single isolated plants, were still encountered on these roadways, but at a slightly lower frequency than in previous years. The small,

isolated colonies are not getting larger, and most appeared to be smaller this year. The persistence of small colonies is best interpreted as the result of well-established, but localized, seed banks, and it is probable that continued mowing and pulling will eventually exhaust these seedbanks and eliminate small colonies. Single plants are probably the result of seed dispersal from existing colonies, vehicle traffic, or snowploughing (see further discussion below).

Evaluation of Previous Hypotheses Regarding Sweetclover Population Dynamics: In the last two reports, we hypothesized that the size of colony and extent of the seedbank 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 should have smaller colonies and seedbanks that were less “deep” (less extensive), because they have not had time to build up from years of seed production, compared to roadways that were upgraded ten or more years ago where seeds have had more time to accumulate.

We now reject the underlying mechanism assumed by the above hypothesis – i.e., that the extent of the seedbank is significantly correlated to the elapsed time since roadwork occurred. A better mechanistic statement is that roadwork simply: 1) exposes bare, nutrient-poor soil on which sweetclover plants can germinate and outcompete other plants, 2) brings existing buried sweetclover seeds to the surface where they can germinate, and 3) potentially introduces new seed via contaminated equipment or hauling in of contaminated fill. Seeds may be introduced from other sources, such as regular vehicle traffic, but roadwork provides the bare ground (seedbed) on which these introduced seeds can germinate.

We also hypothesized in previous reports that sweetclover colonies existed in three population states along Southern Lakes Roadways:

1. Large colonies supported by well-established (“deep”) seedbanks
2. Incipient colonies supported by moderate seedbanks
3. Isolated plants resulting from recent seed dispersal events

As with the first hypothesis, its tenants may be generally true but we have concluded that it is not a very rigorous hypothesis and is not particularly useful from a management standpoint. Instead, we offer the following four observations regarding sweetclover population dynamics:

1. Regardless of colony size (or the elapsed time since roadwork has occurred), a “deep” (extensive) seedbank is indicated when a colony is mowed for multiple years but regrows each subsequent year to a similar size and plant density. Conversely, a less extensive seedbank, or one that is becoming depleted, is indicated when the size or density of the colony is reduced after multiple years of mowing. Furthermore, an extensive seedbank may be the result of a colony producing seeds in-place over many years or the introduction of heavily-contaminated fill material, but the mechanism is irrelevant from a management standpoint. From a prevention standpoint, however, it underscores the importance of not introducing contaminated soil and of eliminating flowering plants so that the seedbank is not allowed to build up.

2. New or incipient colonies may occur as a result of seed dispersal or ground disturbance, with the latter facilitating germination of either existing seeds or newly introduced seeds. In that regard, snow ploughing probably is a major contributor to the distribution and germination of sweetclover because the shoulders of roads are ploughed/scraped down to bare soil each spring. Undoubtedly, this action directly moves/spreads seeds from colonies growing in the shoulders and creates an ideal seedbed for germination the following

summer. It can also remove native plant cover that inhibits the growth of sweetclover. We are not suggesting that shoulders should not be ploughed, but simply point out that it probably is one of the mechanisms that distributes sweetclover and promotes its growth.

3. Sweetclover is a fast growing species adapted to colonizing bare ground of poor nutritional status, such as the shoulders of roads. It is a poor competitor on sites that are already well vegetated or have well-developed organic soils. These aspects of sweetclover biology are consistent with the above two observations and underscore the value of leaving stands of existing vegetation and soils undisturbed when trying to control sweetclover infestations.

4. An important variable in the discussion about seedbank longevity is the number of years that sweetclover seeds can remain viable when buried. Based on the results of the Patrol and Pull program, three years of mowing has had a small, but noticeable, effect reducing plant density in a few colonies (e.g., the corner of Tagish Road and the Alaska Highway), which can be interpreted as a possible reduction of the seedbank, but three years of mowing does not seem to be depleting the seedbank at other colonies (e.g., Atlin Road km 16-18.5). From published studies, sweetclover seeds are known to remain viable after at least 15 years in the soil and may survive over 50 years. It has been well established that seeds of other plant species (including those in the pea family) can remain viable for perhaps centuries or even millennia. This adds credence to the contention that it will take many years of control measures to completely exhaust sweetclover seedbanks and eliminate colonies.

4.2 Yellow Sweetclover

There are 5 yellow sweetclover colonies in the project area: one plant each on the Atlin Road, Tagish Road, 10-Mile Road, South Klondike Highway, and Annie Lake Road. The number has varied from 4 colonies in 2015 and 2016 to seven in 2017. 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 provides a secondary means of tracking the spread of sweetclover and seed sources.

4.3 Oxeye Daisy

In 2018, three oxeye daisy infestations were encountered: two along the BC portion of the South Klondike Highway and one along the Atlin Road. These colonies were encountered in the same locations in 2017, with all plants pulled or mowed. 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 roadways. These were pulled and bagged and no oxeye daisy plants were found at these locations in 2018. From these results, we conclude that Patrol and Pull has been effective in containing larger infestations and eliminating new small colonies.

Oxeye daisy has a high 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 its roots (rhizomes), and can grow into dense, persistent colonies. These colonies outcompete and displace both native and agronomic grass species. The impact is especially damaging to hayfields and pastures because it reduces both crop yield and quality. Mowing is ineffective for

controlling 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 level of infestation in southern Yukon may not warrant spraying, but this may become a prudent action if oxeye daisy starts spreading.

4.4 Spotted Knapweed

In 2015, a small but dense patch of spotted knapweed was encountered and pulled on the Atlin Road near km 12.5. This patch did not regrow in 2016, suggesting effective eradication. However, four flowering plants and ten leaf rosettes (immature plants) were found and pulled in 2016, only 20 m distance from the eradicated patch. In 2017, eleven plants near the flowering stage and many small leaf rosettes were removed in this same general location, and in 2018 twenty flowering plants and 20 leaf rosettes were found. This pattern indicates that there is a viable seedbank in the soil, and that the area should be monitored closely for the next few years, as it is important to ensure that a colony does not get a 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 vigour and diversity of native plants, as well as the quantity and quality of forage crops in agricultural fields (i.e., hay and pasture). 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 not to be effective because it does not kill the plants. Likewise, the complete extrication of every individual plant through hand pulling is not realistic for large infestations.

4.5 Bird vetch

As in 2016, 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 has been battling this and other infestations on his property. Apparently, a previous owner planted the vetch, along with the scentless camomile that was found along this driveway in 2015-2017. The property has changed ownership since 2016 and we tried to contact the new owner in 2018, but the gate to the driveway was closed. It would be prudent for Yukon Government to contact this property owner to discuss the potential spread of bird vetch from their property.

Bird vetch also is a strongly invasive species that is difficult to eradicate once it becomes established, and it can spread quickly and smother other vegetation soon after its first appearance. It has become a very problematic invasive species in interior Alaska and small infestations have been found in Whitehorse and Dawson as well. Consequently, it should be given high priority for monitoring and control.

4.6 Perennial sow thistle

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

1. three on the Tagish Road, including two fairly extensive colonies at Km 5.5 (~5 m²) and Km 19.5 (~50 m²), and one small patch at Km 41.5
2. two small colonies on the Atlin Road at Km 9.5 and Km 10
3. one small colony on the SKH at Km 157.5.

Pulling sow thistle plants through Patrol and Pull at the four small colonies listed above seems to have eradicated them, as no plants were encountered at these locations in 2018. However, the two large colonies on the Tagish Road did regrow in 2018. Once again, these colonies were too large to pull individual plants, but we did mow all flowering tips and young rosettes. Unfortunately, two new small colonies of sow thistle were encountered: one at km 3 (RHS) of the Tagish Road and one at km 18.5 of the Atlin (LHS) Road. The plants at both locations were pulled and bagged. It will be important to control plants in these colonies each year in the future in order to exhaust the entrenched seedbank and prevent further spread. If the two large colonies continue to persist, it may be prudent to conduct a small herbicidal spraying program to eliminate them, as this may be the only way to prevent them from becoming the seed source for a serious outbreak.

4.7 Yellow lucerne

In 2016, two lucerne plants were pulled near km 20 of the Atlin Road. No plants were found in that location in 2017, but one large plant was encountered there in 2018. At this time, yellow lucerne does not represent a large threat 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 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. Mowing or pulling is an effective way to control yellow lucerne.

4.8 Yellow clematis

This non-native, vine-like climbing plant has been observed for many years in the Carcross area, as well as in Whitehorse (see Section 3). It is not strongly invasive, does not appear to be a biological threat, 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.

4.9 Unscented chamomile

In 2015, 2016, and 2017, unscented chamomile was encountered on both sides of the entrance to a private driveway at km 10.5 of the Atlin Road. This is the same driveway where bird vetch was found and discussed above (Section 4.5). Each year, the unscented chamomile was pulled during Patrol and Pull, and this year 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.

4.10 Altai lyme grass

Altai lyme grass populations in 2018 are essentially unchanged from previous years. There are 57 significant colonies along southern portions of the SKH (53 in the vicinity of the BC-Alaska border between Km 24 and 56), and one small, incipient along the Tagish Road. 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, unless it consists of only a few plants. Mowing also is not effective, since it is a grass that will simply regrow. Consequently, none of the usual Patrol and Pull eradication methods could be employed at the extensive colonies along the SKH.

At the small colony along the Tagish Road (km 28, RHS), all plants were pulled and bagged In 2015, 2016, and 2017. This year only 3 plants were found at the colony (these also were pulled and bagged). It is hoped that one or two more years of monitoring and pulling at this location will permanently eliminate the colony.

In all four 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 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 patches of the grass have become well established and compete with rare endemic grass species in this unique boreal dune system. In the course of a few decades, as new dune areas are continually exposed by wind erosion and colonized, Altai lyme grass could take over as the dominant grass, at the expense of rare endemic species. This is a real concern, but so far it has not materialized, and Altai lyme grass is mostly restricted to the road ROW, especially along the South Klondike Highway south of Carcross to the BC-Alaska border. Around Carcross, however, it has spread outside of the ROW and there are some very large patches over 100 m² in size. This may indeed be a situation where it might be prudent to intervene with strong measures, such as herbicidal spraying, in order to stop the spread of an invasive plant that could cause real biological degradation to a unique ecosystem if its expansion suddenly becomes exponential.

5 Overall Situational Assessment and Recommendations

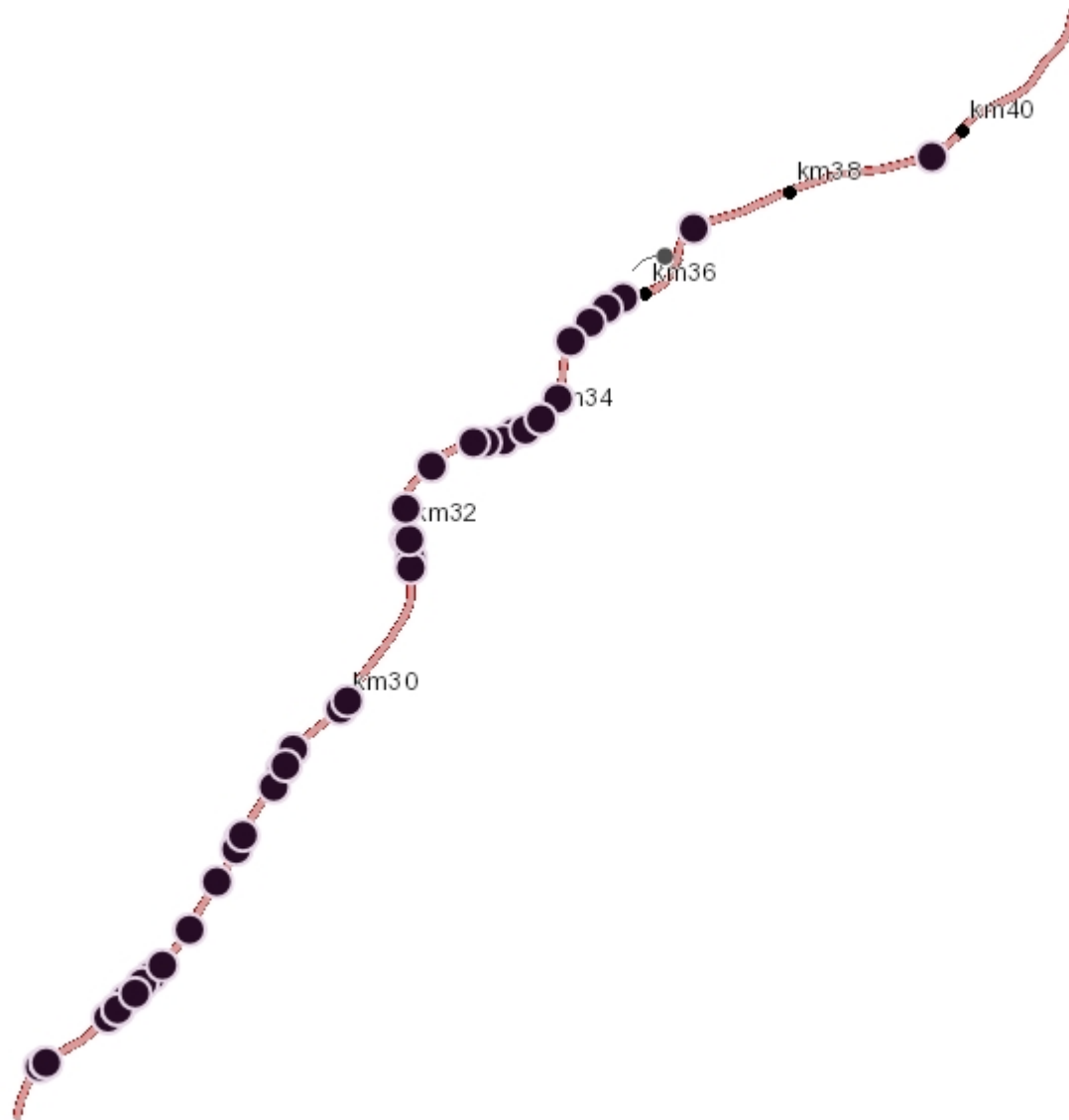
1. Sweetclover continues to be the most prominent invasive plant growing along Southern Lakes roadways, though the level of infestation is light when compared to other Yukon highways. So far, the Patrol and Pull program seems to be effectively containing this species, and there is evidence that the program is eliminating some small colonies and reducing the vigour of other colonies. After three years of mowing, large colonies are being kept in check, and except for those on the Atlin Road, their plant densities appear to be declining.
2. The continued appearance of single-plant colonies of sweetclover means that seeds continue to be distributed along the roadways. In addition to dispersal by highway traffic, it is likely that a key dispersal mechanism is snowploughing, especially blading of shoulders down to bare soil in spring.
3. An important strategy for managing the spread of sweetclover on Southern Lakes roadways is to ensure that road upgrade and maintenance work do not use aggregates transported from borrow pits that are contaminated with sweetclover seeds, or redistribute (e.g. cut and fill) contaminated soil within the road ROW. The use of contaminated fill can create an instant and deep seedbank that spawns colonies that are extremely difficult to eradicate.
4. It is concerning that a large colony of first-year sweetclover plants was found to be growing on the active face and soil waste piles at the new YG HPW aggregate pit developed at km 156 SKH. The waste piles consist of soil transported from the Alaska Highway during road upgrade work performed near the Carcross Corner in 2017. It will be important to control sweetclover at this pit and to avoid spreading seed to other areas via re-transportation of the soil. A combination of blading and hand mowing every summer for the foreseeable future is suggested in order to exhaust the seedbank. Alternatively, herbicidal spraying could be considered as well as covering the pile with clean soil.
5. Atlin Road stands out among the three roadways because it is the only one where sweetclover colonies are expanding, despite mowing efforts, and because new colonies are emerging at a higher rate compared to the SKH or Tagish Road. These two phenomena are probably best ascribed to sequential roadwork that has occurred along the Atlin Road in the last ten years. Roadwork activities likely exposed latent seeds and provided good conditions for germination on bare/disturbed soil.
6. Locations with spotted knapweed, oxeye daisy, bird vetch and sow thistle on the Atlin Road and Tagish Road should be closely monitored because these species will be very problematic if allowed to gain a significant foothold and spread in the Southern Lakes region.
7. It is likely that the one colony of Altai lyme grass on the Tagish road has been eliminated, as only three plants were encountered there this year and they were pulled, complete with roots.
8. It is recommended that YG HPW contact the new landowner at km 10.5 Atlin Road regarding the bird vetch growing on their property. The portion of this infestation growing in the ROW adjacent to their property was mowed again this year, but the main body of the infestation is on the private parcel. Bird vetch is very aggressive and tenacious and will be nearly impossible to eradicate if it spreads, so this is an opportunity to prevent an outbreak.

2018 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 2018 Invasive Plant Survey

S. Klondike Highway km 25-40



Legend

- Highway kilometer post
- 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

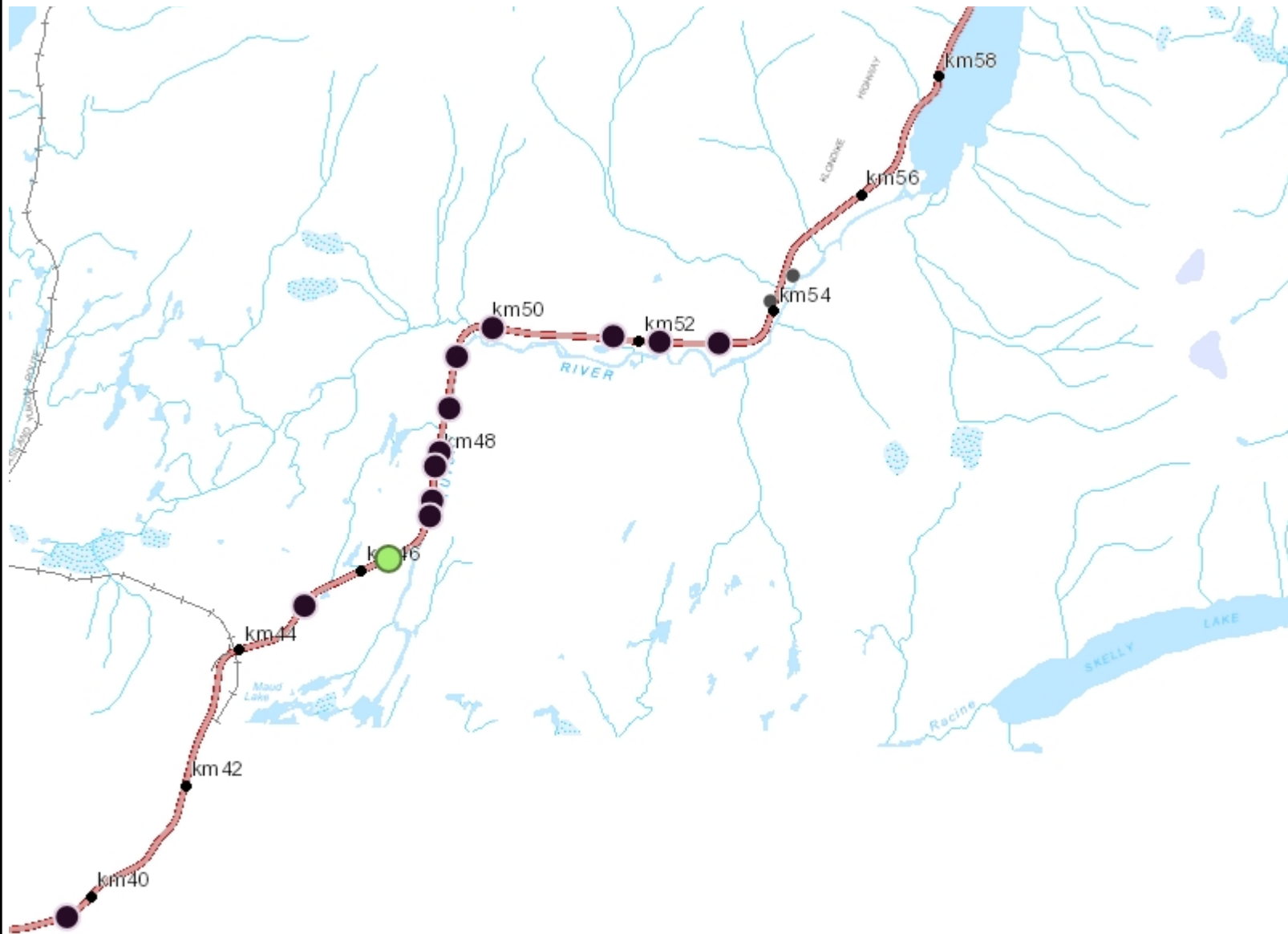
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Date Printed: 17-Aug-2018

Notes

Map 1

Southern Lakes Roadways 2018 Invasive Plant Survey

S. Klondike Highway km 40-58



Legend

- Highway kilometer post
- 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

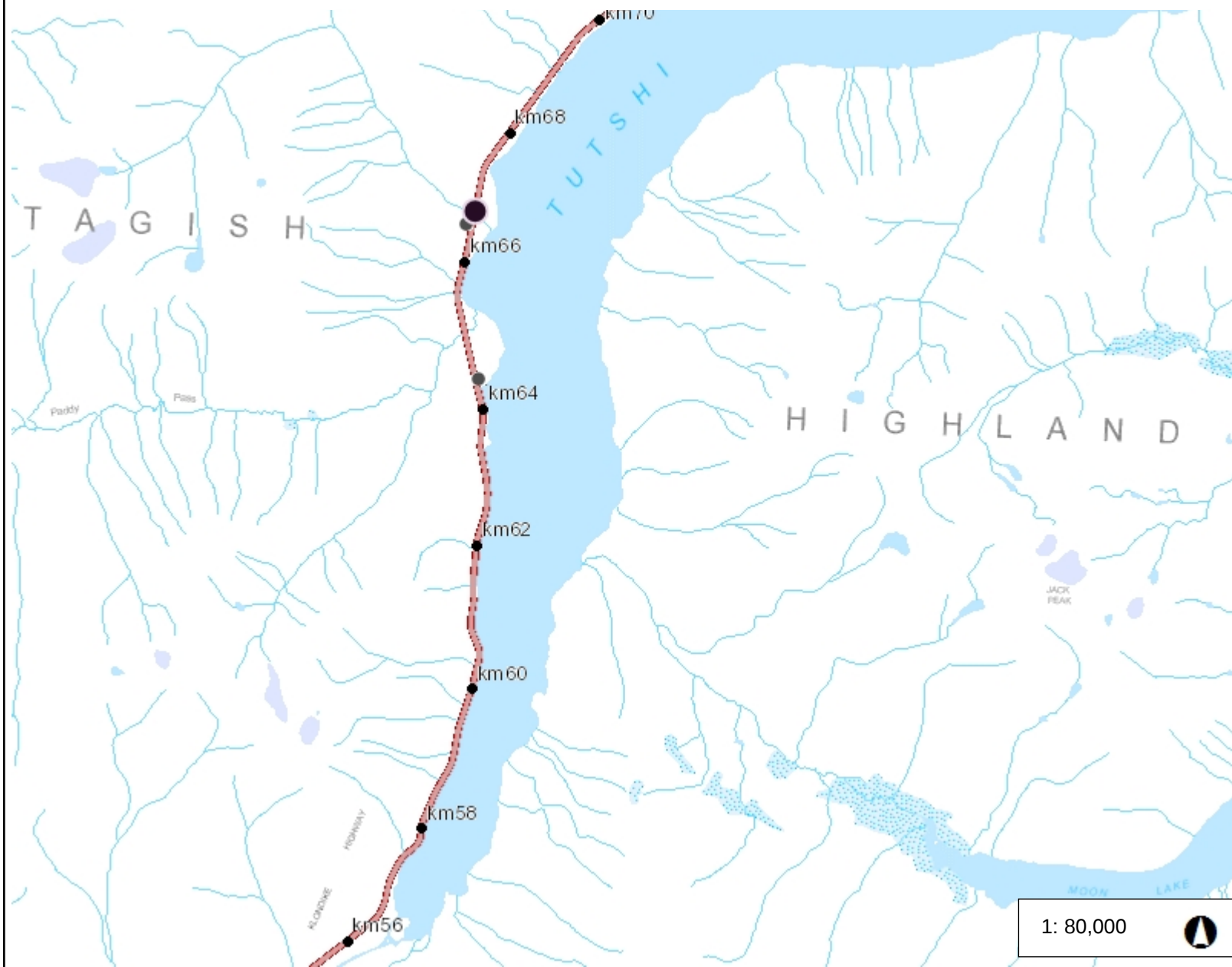
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Date Printed: 17-Aug-2018

Notes

Map 2

Southern Lakes Roadways 2018 Invasive Plant Survey

S. Klondike Highway km 56-70



Legend

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

Notes

Map 3

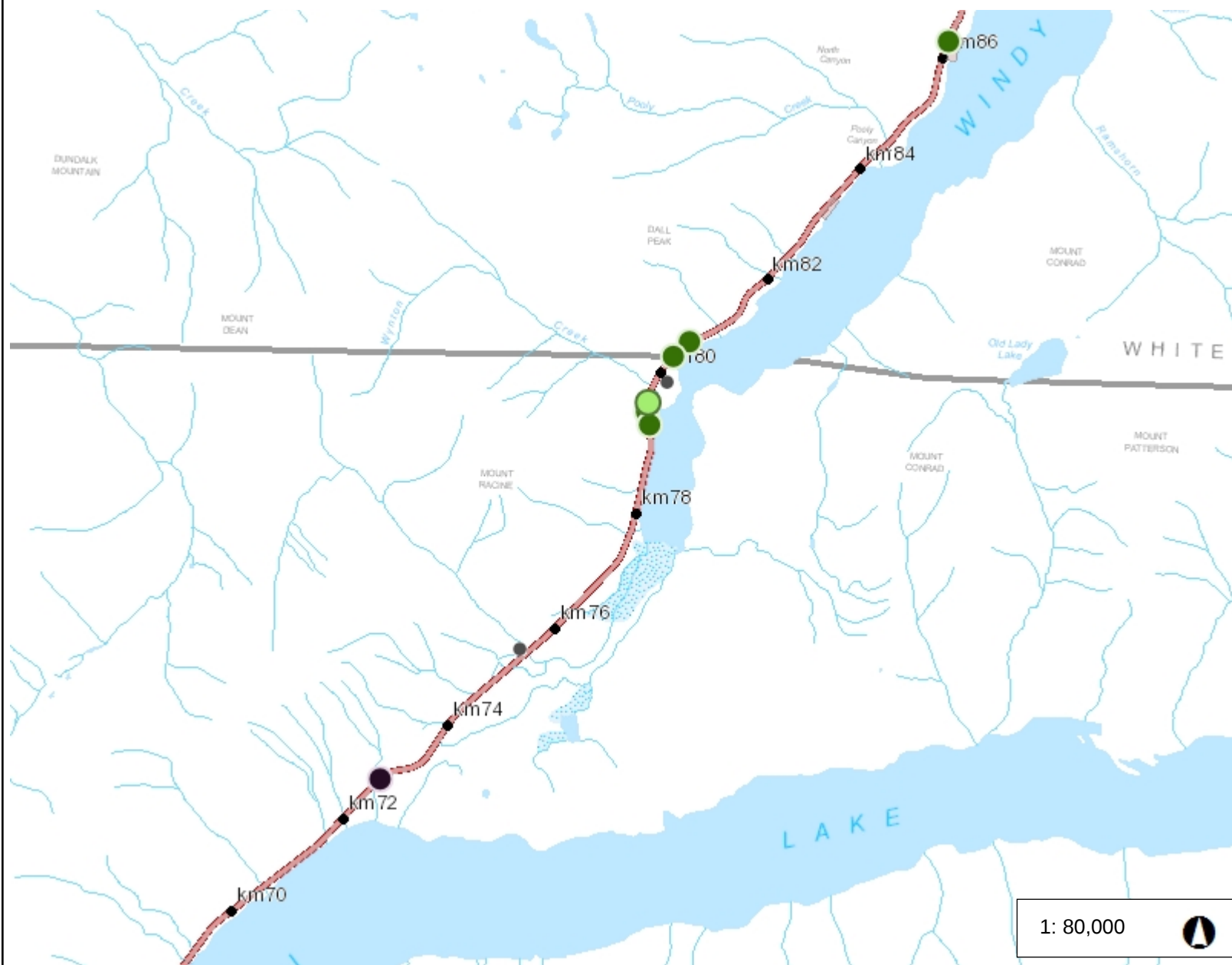
4.1 0 2.03 4.1 Kilometers

Yukon Albers
Produced from: Yukon Lands Viewer

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Southern Lakes Roadways 2018 Invasive Plant Survey

S. Klondike Highway km 70-86



Legend

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

Notes

Map 4

4.1 0 2.03 4.1 Kilometers

Yukon Albers
Produced from: Yukon Lands Viewer

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Southern Lakes Roadways 2018 Invasive Plant Survey

S. Klondike Highway km 86-102



Legend

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

Notes

Map 5

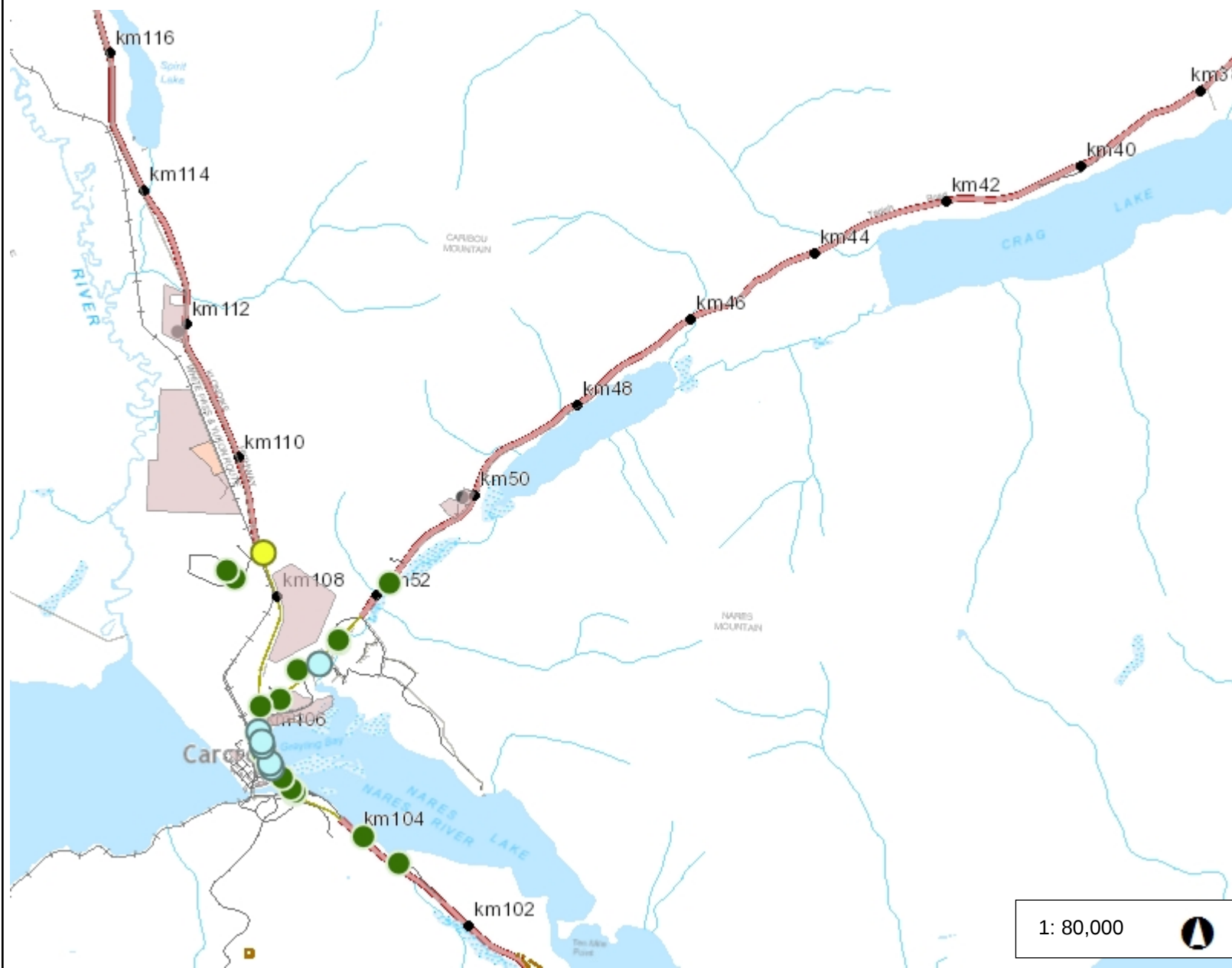
4.1 0 2.03 4.1 Kilometers

Yukon Albers
Produced from: Yukon Lands Viewer

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Southern Lakes Roadways 2018 Invasive Plant Survey

S. Klondike Highway km 102-116 and Tagish Road km 38-55



Legend

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

1: 80,000



Notes

Map 6

4.1 0 2.03 4.1 Kilometers

Yukon Albers
Produced from: Yukon Lands Viewer

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Date Printed: 17-Aug-2018

Southern Lakes Roadways 2018 Invasive Plant Survey

S. Klondike Highway km 116-130



Legend

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

Notes

Map 7

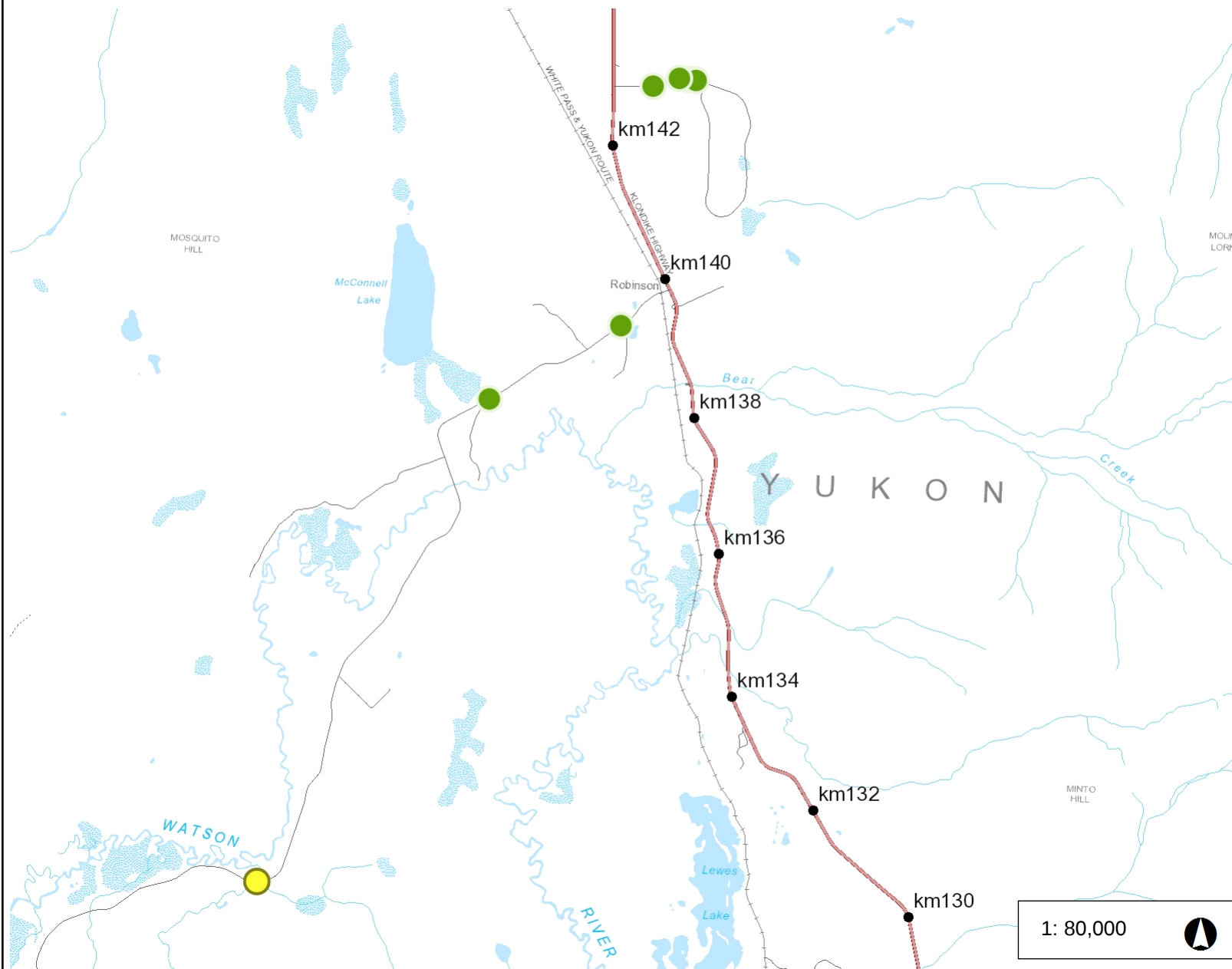
4.1 0 2.03 4.1 Kilometers

Yukon Albers
Produced from: Yukon Lands Viewer

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Date Printed: 17-Aug-2018

Southern Lakes Roadways 2018 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

Notes

Map 8

4.1 0 2.03 4.1 Kilometers

Yukon Albers
Produced from: Yukon Lands Viewer

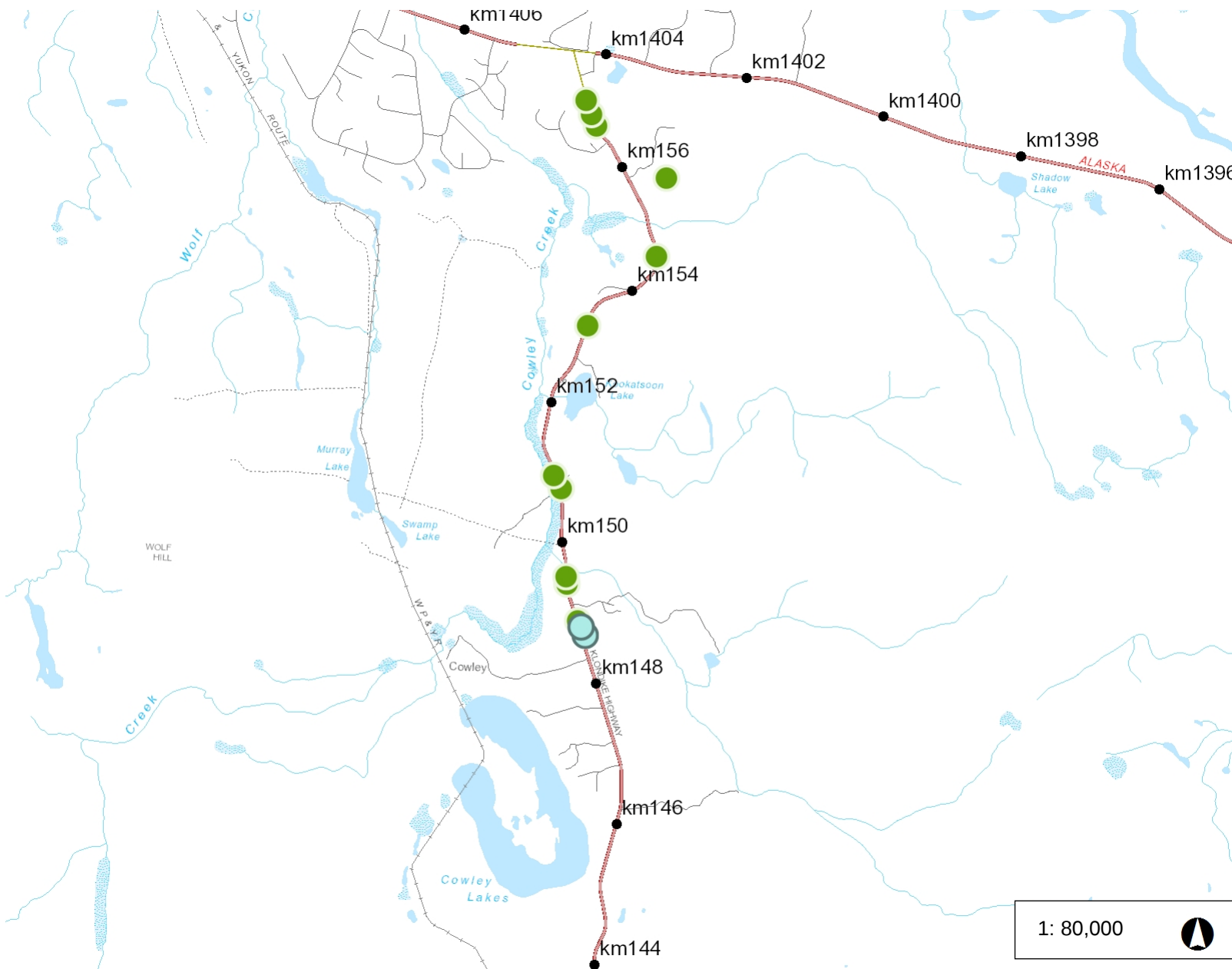
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Date Printed: 10-Sep-2018

1: 80,000



Southern Lakes Roadways 2018 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

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: 10-Sep-2018

Southern Lakes Roadways 2018 Invasive Plant Survey

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



Legend

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

Notes

Map 10

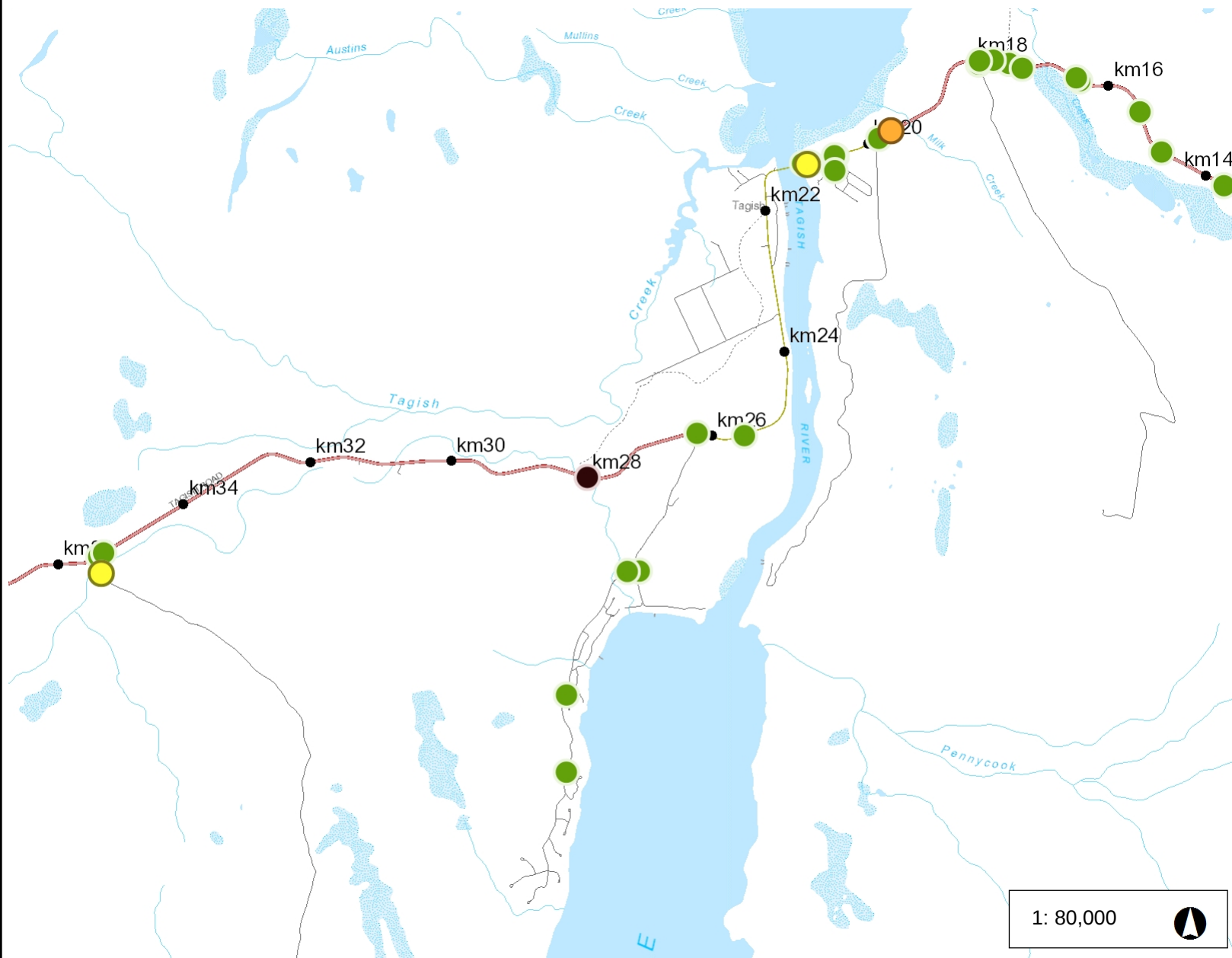
4.1 0 2.03 4.1 Kilometers

Yukon Albers
Produced from: Yukon Lands Viewer

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Date Printed: 17-Aug-2018

Southern Lakes Roadways 2018 Invasive Plant Survey

Tagish Road km 14-37



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

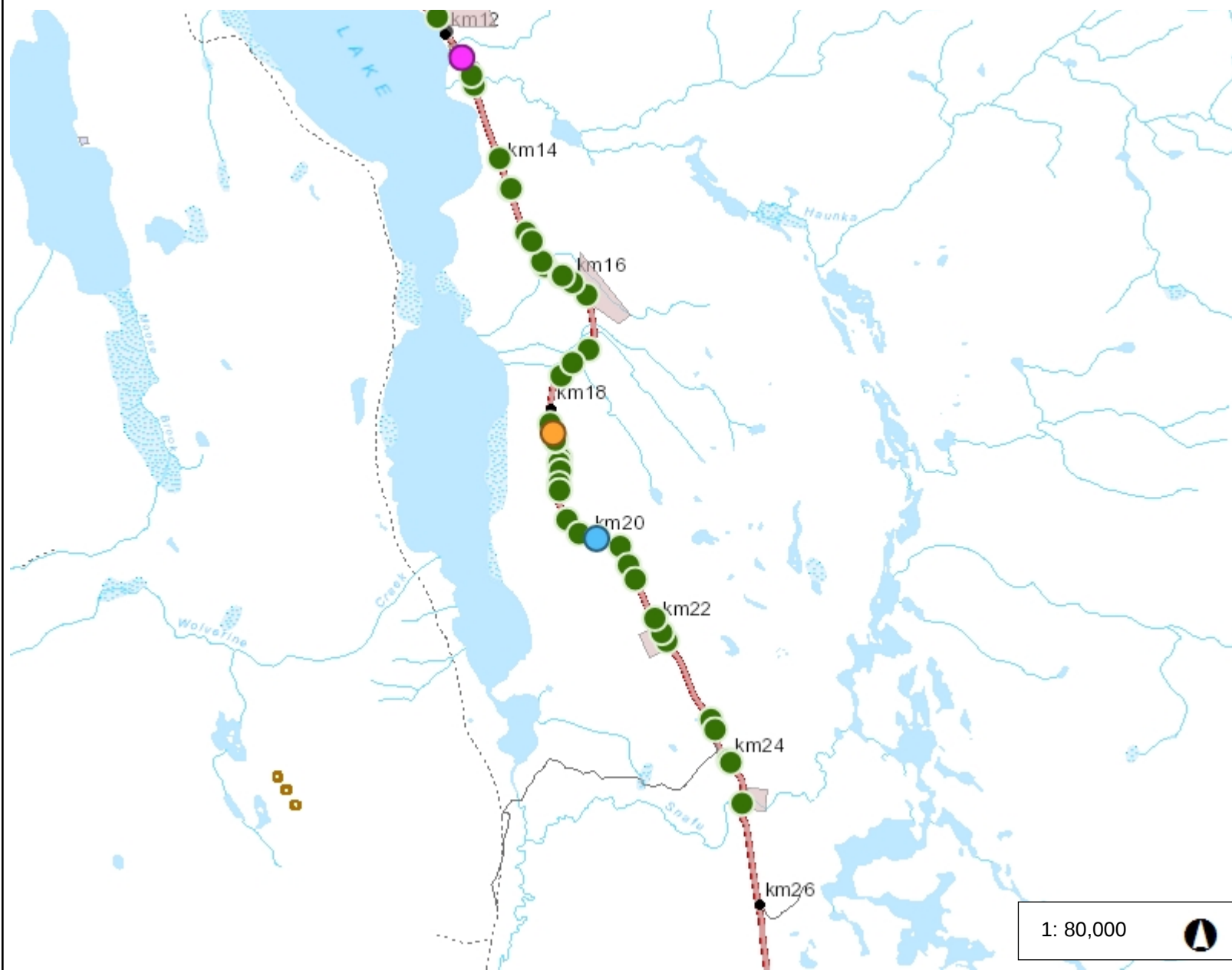
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Date Printed: 10-Sep-2018

Notes

Map 11

Southern Lakes Roadways 2017 Invasive Plant Survey

Atlin Road km 12-26



Legend

- Highway kilometer post
- 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: 17-Aug-2018

Notes

Map 12

Southern Lakes Roadways 2018 Invasive Plant Survey

Atlin Road km 28-41



Legend

- Highway kilometer post
- 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

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Date Printed: 17-Aug-2018

2018 DATA LOGS

Table 2. South Klondike Highway 2018 Invasive Plant Survey

Data collected in WGS 84

Nearest Km	Side of Road	Site ID	Recorded Latitude	GPS Longitude	Mapping Latitude	Mapping Longitude	Species	Notes	Photo File Name
25	LHS	SKH 18-50	59° 38' 7.872" N	-135° 9' 37.926" W	59.63552	-135.16054	altai lyme grass	3 m2	SKH 18-50 DSCF5457.JPG
25	LHS	SKH 18-51	59° 38' 9.312" N	-135° 9' 33.966" W	59.63592	-135.15944	altai lyme grass	2 m2	SKH 18-51 DSCF5458.JPG
25	RHS	SKH 18-52	59° 38' 9.360" N	-135° 9' 33.564" W	59.635933	-135.15932	altai lyme grass	10 m2	SKH 18-52 DSCF5459.JPG
26	LHS	SKH 18-46	*	*	59.65395	-135.12856	altai lyme grass	2 m2	SKH 18-46 DSCF5453.JPG
26	RHS	SKH 18-53			59.64049	-135.14801	altai lyme grass	2 patches total 25 m2	SKH 18-53 DSCF5460.JPG
26	RHS	SKH 18-54	59° 38' 28.764" N	-135° 8' 46.590" W	59.641323	-135.14628	altai lyme grass	6 patches total 75 m2	SKH 18-54 DSCF5461.JPG
26	RHS	SKH 18-55	59° 38' 28.770" N	-135° 8' 46.584" W	59.641325	-135.14627	altai lyme grass	15 m2	SKH 18-55 DSCF5462.JPG
26.5	LHS	SKH 18-49	*	*	59.64236	-135.1447	altai lyme grass	2 patches total 5 m2	SKH 18-49 DSCF5456.JPG
26.5	RHS	SKH 18-57	*	*	59.64572	-135.13818	altai lyme grass	10 m2	SKH 18-57 DSCF5464.JPG
26.5	RHS	SKH 18-58	*	*	59.64925	-135.13332	altai lyme grass	2 patches total 5 m2	SKH 18-58 DSCF5465.JPG
27	LHS	SKH 18-47	59° 38' 40.920" N	-135° 8' 24.390" W	59.6447	-135.14011	altai lyme grass	2 m2	SKH 18-47 DSCF5454.JPG
27	LHS	SKH 18-48	*	*	59.64393	-135.1418	altai lyme grass	2 patches total 3 m2	SKH 18-48 DSCF5455.JPG
27	RHS	SKH 18-56	59° 38' 34.548" N	-135° 8' 35.172" W	59.64293	-135.1431	altai lyme grass	25 m2	SKH 18-56 DSCF5463.JPG
28.5	LHS	SKH 18-45	59° 39' 29.262" N	-135° 7' 28.266" W	59.658128	-135.12452	altai lyme grass	5 m2	SKH 18-45 DSCF5452.JPG
28.5	RHS	SKH 18-59	*	*	59.65714	-135.12515	altai lyme grass	2 patches total 2 m2	SKH 18-59 DSCF5466.JPG
28.5	RHS	SKH 18-60	59° 39' 30.582" N	-135° 7' 26.412" W	59.658495	-135.124	altai lyme grass	3 patches total 5 m2	SKH 18-60 DSCF5467.JPG
29	LHS	SKH 18-44	59° 39' 54.054" N	-135° 7' 1.650" W	59.665015	-135.11713	altai lyme grass	1 m2	SKH 18-44 DSCF5451.JPG
29	RHS	SKH 18-61	59° 39' 47.754" N	-135° 7' 6.804" W	59.663265	-135.11856	altai lyme grass	1 m2	SKH 18-61 DSCF5468.JPG
29	RHS	SKH 18-62	59° 39' 55.278" N	-135° 6' 59.538" W	59.665355	-135.11654	altai lyme grass	3 m2	SKH 18-62 DSCF5469.JPG
29.5	LHS	SKH 18-42	59° 40' 0.960" N	-135° 6' 54.642" W	59.666933	-135.11518	altai lyme grass	5 m2	SKH 18-42 DSCF5449.JPG
29.5	LHS	SKH 18-43	59° 40' 0.984" N	-135° 6' 54.678" W	59.66694	-135.11519	altai lyme grass	2 m2	SKH 18-43 DSCF5450.JPG
30	RHS	SKH 18-63	*	*	59.67099	-135.1066	altai lyme grass	2 m2	SKH 18-63 DSCF5470.JPG
30	RHS	SKH 18-64	59° 40' 18.420" N	-135° 6' 19.140" W	59.671783	-135.10532	altai lyme grass	5 m2	SKH 18-64 DSCF5471.JPG
31.5	LHS	SKH 18-41	*	*	59.68568	-135.09446	altai lyme grass	3 m2	SKH 18-41 DSCF5448.JPG
31.5	RHS	SKH 18-65	*	*	59.68479	-135.09442	altai lyme grass	5 m2	SKH 18-65 DSCF5472.JPG
32	LHS	SKH 18-40	*	*	59.68756	-135.09555	altai lyme grass	2 m2	SKH 18-40 DSCF5447.JPG
32	RHS	SKH 18-66	*	*	59.68749	-135.09492	altai lyme grass	10 m2	SKH 18-66 DSCF5473.JPG
32	RHS	SKH 18-67	59° 41' 25.602" N	-135° 5' 45.030" W	59.690445	-135.09584	altai lyme grass	5 m2	SKH 18-67 DSCF5474.JPG
33	LHS	SKH 18-38	*	*	59.69705	-135.08356	altai lyme grass	2 m2	SKH 18-38 DSCF5445.JPG
33	LHS	SKH 18-39	*	*	59.69461	-135.09124	altai lyme grass	1 m2	SKH 18-39 DSCF5446.JPG
33.5	LHS	SKH 18-35	*	*	59.69816	-135.07595	altai lyme grass	15 m2	SKH 18-35 DSCF5442.JPG
33.5	LHS	SKH 18-36	*	*	59.69736	-135.07795	altai lyme grass	5 m2	SKH 18-36 DSCF5443.JPG
33.5	LHS	SKH 18-37	*	*	59.6971	-135.08131	altai lyme grass	3 m2	SKH 18-37 DSCF5444.JPG

Nearest Km	Side of Road	Site ID	Recorded Latitude	GPS Longitude	Mapping Latitude	Mapping Longitude	Species	Notes	Photo File Name
34	LHS	SKH 18-34	59° 42' 5.652" N	-135° 4' 4.500" W	59.70157	-135.06792	altai lyme grass	1 m2	SKH 18-34 DSCF5441.JPG
34	RHS	SKH 18-68	*	*	59.69847	-135.07381	altai lyme grass	5 m2	SKH 18-68 DSCF5475.JPG
34	RHS	SKH 18-69	59° 41' 58.398" N	-135° 4' 15.462" W	59.699555	-135.07096	altai lyme grass	1 m2	SKH 18-69 DSCF5476.JPG
35	LHS	SKH 18-32	*	*	59.709	-135.06245	altai lyme grass	1 m2	SKH 18-32 DSCF5439.JPG
35	LHS	SKH 18-33	*	*	59.70713	-135.06596	altai lyme grass	2 m2	SKH 18-33 DSCF5440.JPG
35.5	LHS	SKH 18-30	59° 42' 41.310" N	-135° 3' 22.872" W	59.711475	-135.05635	altai lyme grass	10 m2	SKH 18-30 DSCF5437.JPG
35.5	LHS	SKH 18-31	*	*	59.71041	-135.05947	altai lyme grass	10 m2	SKH 18-31 DSCF5438.JPG
37	RHS	SKH 18-70	59° 43' 6.294" N	-135° 2' 36.786" W	59.718415	-135.04355	altai lyme grass	2 patches 1 m2	SKH 18-70 DSCF5477.JPG
39.5	RHS	SKH 18-71	59° 43' 34.260" N	-134° 59' 56.616" W	59.726183	-134.99906	altai lyme grass	3 m2	SKH 18-71 DSCF5478.JPG
45	RHS	SKH 18-72	59° 45' 50.958" N	-134° 56' 46.860" W	59.764155	-134.94635	altai lyme grass	1 m2	SKH 18-72 DSCF5479.JPG
46	RHS	SKH 18-73	*	*	59.770092	-134.92708	oxeye daisy	5 flowering plants and 10 young rosettes	SKH 18-73 DSCF5480.JPG
47	LHS	SKH 18-29	*	*	59.77534	-134.91781	altai lyme grass	2 m2	SKH 18-29 DSCF5436.JPG
47.5	LHS	SKH 18-28	59° 46' 37.866" N	-134° 55' 2.628" W	59.777185	-134.9174	altai lyme grass	1 m2	SKH 18-28 DSCF5435.JPG
48	LHS	SKH 18-26	59° 46' 58.596" N	-134° 54' 57.918" W	59.782943	-134.91609	altai lyme grass	0.5 m2	SKH 18-26 DSCF5433.JPG
48	LHS	SKH 18-27	*	*	59.78126	-134.91701	altai lyme grass	5 m2	SKH 18-27 DSCF5434.JPG
49	RHS	SKH 18-74	*	*	59.78819	-134.91423	altai lyme grass	1 m2	SKH 18-74 DSCF5481.JPG
49.5	LHS	SKH 18-25	59° 47' 39.612" N	-134° 54' 46.476" W	59.794337	-134.91291	altai lyme grass	2 m2	SKH 18-25 DSCF5432.JPG
50	RHS	SKH 18-75	*	*	59.7979	-134.90479	altai lyme grass	2 patches total 13 m2	SKH 18-75 DSCF5482.JPG
52	LHS	SKH 18-24	*	*	59.79747	-134.87644	altai lyme grass	1 m2	SKH 18-24 DSCF5431.JPG
52	RHS	SKH 18-76	*	*	59.79702	-134.86556	altai lyme grass	1 m2	SKH 18-76 DSCF5483.JPG
53	RHS	SKH 18-77	59° 47' 49.614" N	-134° 51' 5.898" W	59.797115	-134.85164	altai lyme grass	0.5 m2	SKH 18-77 DSCF5484.JPG
66.5	RHS	SKH 18-78	*	*	59.90644	-134.7947	altai lyme grass	8 m2	SKH 18-78 DSCF5485.JPG
72.5	RHS	SKH 18-79	*	*	59.94778	-134.73034	altai lyme grass	10 m2	SKH 18-79 DSCF5486.JPG
79	LHS	SKH 18-23	*	*	59.99285	-134.66691	white sweetclover	2 m2	no photo
79	RHS	SKH 18-80	*	*	59.99137	-134.66615	white sweetclover	20 m2 along 100 m	SKH 18-80 DSCF5487.JPG
79.5	LHS	SKH 18-22	*	*	59.99445	-134.66778	white sweetclover	15 m2 along 25 m	SKH 18-22 DSCF5430.JPG
79.5	RHS	SKH 18-81	*	*	59.99561	-134.66748	oxeye daisy	3 flowering plants and 3 leaf rosettes	SKH 18-81 DSCF5488.JPG
80	LHS	SKH 18-21	*	*	60.00144	-134.66163	white sweetclover	3 m2 along 25 m	SKH 18-21 DSCF5429.JPG
80.5	LHS	SKH 18-20	*	*	60.00332	-134.65777	white sweetclover	5 m2 along 25 m	SKH 18-20 DSCF5428.JPG
86	RHS	SKH 18-83	*	*	60.04163	-134.59627	white sweetclover	3 m2	SKH 18-83 DSCF5490.JPG
87.5	RHS	SKH 18-82	*	*	60.0517	-134.58914	altai lyme grass	2 m2	SKH 18-82 DSCF5489.JPG
101.5	RHS	SKH 18-84	*	*	60.13471	-134.61782	white sweetclover	15 plants	SKH 18-84 DSCF5491.JPG
103.5	LHS	SKH 18-19	60° 9' 20.964" N	-134° 40' 10.164" W	60.155823	-134.66949	white sweetclover	3 m2	SKH 18-19 DSCF5427.JPG
104	RHS	SKH 18-85	*	*	60.159	-134.67847	white sweetclover	5 m2	SKH 18-85 DSCF5492.JPG

Nearest Km	Side of Road	Site ID	Recorded Latitude	GPS Longitude	Mapping Latitude	Mapping Longitude	Species	Notes	Photo File Name
104.5	LHS	SKH 18-08	*	*	60.16405	-134.69605	white sweetclover	25 m2	SKH 18-08 DSCF5402.JPG
104.5	RHS	SKH 18-09	*	*	60.16422	-134.69591	white sweetclover	10 small plants	SKH 18-09 DSCF5408.JPG
104.5	RHS	SKH 18-10	*	*	60.16462	-134.69687	white sweetclover	1 m2	SKH 18-10 DSCF5409.JPG
104.5	RHS	SKH 18-11	*	*	60.16595	-134.69918	white sweetclover	10 m2 along 25m	SKH 18-11 DSCF5410.JPG
105	LHS	SKH 18-04	60° 10' 8.244" N	-134° 42' 15.108" W	60.168957	-134.7042	white sweetclover	7 plants	SKH 18-04 DSCF5397.JPG
105	LHS	SKH 18-05	*	*	60.16762	-134.70279	white sweetclover	14 plants	SKH 18-05 DSCF5399.JPG
105	LHS	SKH 18-06	*	*	60.16718	-134.70198	white sweetclover	3 plants	SKH 18-06 DSCF5400.JPG
105	LHS	SKH 18-07	60° 10' 1.692" N	-134° 42' 6.708" W	60.167137	-134.70186	yellow clematis	1 plant	SKH 18-07 DSCF5401.JPG
105	RHS	SKH 18-12	60° 10' 3.666" N	-134° 42' 8.418" W	60.167685	-134.70234	yellow clematis	many plants along 100 m	SKH 18-12 DSCF5411.JPG
105	RHS	SKH 18-13	60° 10' 3.666" N	-134° 42' 8.418" W	60.167685	-134.70234	altai lyme grass	100 m2	SKH 18-13 DSCF5412.JPG
105	RHS	SKH 18-14	60° 10' 4.488" N	-134° 42' 9.450" W	60.167913	-134.70263	white sweetclover	5 plants	SKH 18-14 DSCF5413.JPG
105.5	LHS	SKH 18-03	60° 10' 11.766" N	-134° 42' 17.832" W	60.169935	-134.70495	altai lyme grass	100 m2	SKH 18-03 DSCF5396.JPG
105.5	RHS	SKH 18-15	*	*	60.16976	-134.70435	yellow clematis	3 plants	SKH 18-015 DSCF5414.JPG
105.5	RHS	SKH 18-16	*	*	60.17033	-134.70455	yellow clematis	50 m2 along 100m	SKH 18-16 DSCF5415.JPG
106	LHS	SKH 18-01	60° 10' 17.490" N	-134° 42' 19.080" W	60.171525	-134.7053	white sweetclover	10 plants	SKH 18-01 DSCF5394.JPG
106	LHS	SKH 18-02	60° 10' 17.616" N	-134° 42' 19.584" W	60.17156	-134.70544	yellow clematis	5 m2	SKH 18-02 DSCF5395.JPG
106	LHS	SKH 18-97	60° 10' 16.926" N	-134° 42' 20.442" W	60.171368	-134.70568	white sweetclover	0.5 m2	SKH 18-97 DSCF5684.JPG
108.5	RHS	SKH 18-17	*	*	60.19379	-134.70578	yellow sweetclover	20 m2 along 100 m	SKH 18-17 DSCF5416.JPG
124.5	RHS	SKH 18-18	60° 14' 37.374" N	134° 44' 38.832" W	60.32856	-134.76763	white sweetclover	1 m2 small plants	SKH 18-18 DSCF5418.JPG
148.5	RHS	SKH 18-86	60° 31' 38.136" N	-134° 52' 10.968" W	60.52726	-134.86971	yellow clematis	1 plant	SKH 18-86 DSCF5536.JPG
148.5	RHS	SKH 18-87	*	*	60.52828	-134.87081	yellow clematis	8 plants	SKH 18-87 SCF5537.JPG
149	RHS	SKH 18-88	60° 31' 44.412" N	-134° 52' 18.300" W	60.529003	-134.87175	white sweetclover	4 m2	SKH 18-88 DSCF5538.JPG
149	RHS	SKH 18-89	60° 32' 0.672" N	-134° 52' 29.160" W	60.53352	-134.87477	white sweetclover	6 plants	SKH 18-89 DSCF5539.JPG
149	RHS	SKH 18-90	60° 32' 3.918" N	-134° 52' 30.180" W	60.534422	-134.87505	white sweetclover	1 plant	SKH 18-90 DSCF5540.JPG
151	RHS	SKH 18-91	*	*	60.54529	-134.87711	white sweetclover	2 m2 along 200 m	SKH 18-91 DSCF5541.JPG
151	LHS	SKH 18-98	60° 32' 48.750" N	-134° 52' 44.724" W	60.546875	-134.87909	white sweetclover	4 plants	no photo
153	RHS	SKH 18-96	60° 33' 56.004" N	-134° 52' 19.212" W	60.565557	-134.872	white sweetclover	1 plant	SKH 18-96 DSCF5659.JPG
154.5	LHS	SKH 18-95			60.57442	-134.8554	white sweetclover	1 m2	SKH 18-95 DSCF5545.JPG
155.5	RHS/LHS	SKH 18-92	*	*	60.5903	-134.87166	white sweetclover	20 m2 along 250 m; both side of road	SKH 18-92 DSCF5542.JPG
155.5	RHS	SKH 18-93	60° 35' 30.090" N	-134° 52' 22.836" W	60.591692	-134.87301	white sweetclover	5 m2 along 100 m	SKH 18-93 DSCF5543.JPG
155.5	LHS	SKH 18-94	60° 35' 36.300" N	-134° 52' 28.182" W	60.593417	-134.8745	white sweetclover	8 plants along 50 m	SKH 18-94 DSCF5544.JPG
156	RHS	SKH 18-99	60° 35' 3.006" N	-134° 51' 13.098" W	60.584168	-134.85364	white sweetclover	0.25 ha	SKH-99 DSCF5876.JPG

Nearest Km	Side of Road	Site ID	Recorded Latitude	GPS Longitude	Mapping Latitude	Mapping Longitude	Species	Notes	Photo File Name
1	RHS	Watson Lk Subdivision-01	60° 11' 25.836" N	-134°42' 45.582" W	60.19051	-134.71266	white sweetclover	1 m2 along 50 m	Watson Lk Subdivision-01 DSCF5392.JPG
1	RHS	Watson Lk Subdivision-02	60° 11' 29.178" N	-134° 42' 52.968" W	60.191438	-134.71471	white sweetclover	1 m2 along 10 m	Watson Lk Subdivision-02 DSCF5393.JPG
0	RHS	Robinson Rd-01	*	*	60.47613	-134.85364	white sweetclover	10 plants along 10 m	Robinson Subdiv-01 DSCF5419.JPG
0.5	RHS	Robinson Rd-02	*	*	60.47712	-134.84477	white sweetclover	3 m2 along 25 m	Robinson Subdiv-02 DSCF5420.JPG
0.5	LHS	Robinson Rd-05	*	*	60.47721	-134.84713	white sweetclover	50 m2 along 250 m	Robinson Subdiv-05 DSCF5424.JPG
1	RHS	Robinson Rd-03	*	*	60.47713	-134.84383	white sweetclover	15 plants along 25 m	Robinson Subdiv-03 DSCF5421.JPG
1	LHS	Robinson Rd-04	60° 28' 37.296" N	-134° 50' 34.590" W	60.477027	-134.84294	white sweetclover	25 m2 along 100 m	Robinson Subdiv-04 DSCF5423.JPG
1	LHS	Annie Lk Rd-03	*	*	60.44634	-134.85947	white sweetclover	1 plant	no photo
11	RHS	Annie Lk Rd-01	60° 22' 33.006" N	-134° 56' 42.462" W	60.375835	-134.94513	yellow sweetclover	16 plants	Annie Lk Rd-01 DSCF5425.JPG
3	RHS	Annie Lk Rd-02	*	*	60.43665	-134.89169	white sweetclover	3 plants	Annie Lk Rd-02 DSCF5426.JPG

* empty fields indicate GPS error while recording location; mapped coordinates in subsequent columns were estimated from road kilometre marker, topographic maps and aerial photographs.

Table 3. Tagish Road 2018 Invasive Plant Survey

Data collected in WGS 84

Nearest Km	Side of Road	Site ID	Recorder Latitude	Recorded Longitude	Mapped Latitude	Mapped Longitude	Species	Notes	Photo File Name
0	RHS	Tagish Rd 18-32	60° 20' 21.444" N	133° 59' 5.304" W	60.33929	-133.98481	white sweetclover	3 plants	TR 18-32 DSCF5586.JPG
0	RHS	Tagish Rd 18-33	60° 20' 21.204" N	133° 59' 6.126" W	60.339223	-133.98504	white sweetclover	50 m2 along 250 m	TR 18-33 DSCF5590.JPG
2	RHS	Tagish Rd 18-34	60° 19' 41.256" N	134° 0' 21.366" W	60.328127	-134.00594	white sweetclover	25 m2 along 200 m	TR 18-34 DSCF5591.JPG
2	RHS	Tagish Rd 18-35	60° 19' 36.588" N	134° 0' 31.590" W	60.32683	-134.00878	white sweetclover	1 plant	TR 18-35 DSCF5592.JPG
3	RHS	Tagish Rd 18-36	60° 19' 17.862" N	134° 0' 50.478" W	60.321628	-134.01402	perennial sowthistle	0.25 m2	TR 18-36 DSCF5593.JPG
3	RHS	Tagish Rd 18-37	60° 19' 12.144" N	134° 1' 7.914" W	60.32004	-134.01887	white sweetclover	1 plant	TR 18-37 DSCF5594.JPG
5.5	LHS	Tagish Rd 18-31	60° 19' 53.286" N	134° 3' 18.396" W	60.331468	-134.05511	perennial sowthistle	5 m2	TR 18-31 DSCF5585.JPG
7.5	LHS	Tagish Rd 18-30	60° 19' 59.688" N	134° 5' 12.630" W	60.333247	-134.08684	white sweetclover	10 plants	TR 18-30 DSCF5584.JPG
8	LHS	Tagish Rd 18-29	60° 19' 50.928" N	134° 5' 36.048" W	60.330813	-134.09335	white sweetclover	10 m2	TR 18-29 DSCF5583.JPG
9.5	RHS	Tagish Rd 18-41	60° 19' 14.808" N	134° 5' 52.710" W	60.32078	-134.09798	white sweetclover	1 m2	TR 18-41 DSCF5678.JPG
11	LHS	Tagish Rd 18-28	60° 18' 27.972" N	134° 6' 54.330" W	60.30777	-134.11509	white sweetclover	75 m2	TR 18-28 DSCF5582.JPG
11	RHS	Tagish Rd 18-38	60° 18' 29.586" N	134° 6' 52.854" W	60.308218	-134.11468	white sweetclover	4 plants	TR 18-38 DSCF5595.JPG
11.5	LHS	Tagish Rd 18-27	60° 18' 26.136" N	134° 7' 23.316" W	60.30726	-134.12314	white sweetclover	1 m2	TR 18-27 DSCF5580.JPG
13	LHS	Tagish Rd 18-26	60° 18' 43.818" N	134° 8' 57.372" W	60.312172	-134.14927	white sweetclover	25 m2	TR 18-26 DSCF5579.JPG
13	RHS	Tagish Rd 18-39	60° 18' 43.686" N	134° 8' 53.802" W	60.312135	-134.14828	white sweetclover	10 m2	TR 18-39 DSCF5596.JPG
13.5	LHS	Tagish Rd 18-25	60° 18' 54.384" N	134° 9' 25.800" W	60.315107	-134.15717	white sweetclover	1 m2	TR 18-25 DSCF5577.JPG
14.5	RHS	Tagish Rd 18-40	60° 19' 8.754" N	134° 10' 23.070" W	60.319098	-134.17308	white sweetclover	5 m2	TR 18-40 DSCF5598.JPG
15	RHS	Tagish Rd 18-42	60° 19' 26.562" N	134° 10' 43.488" W	60.324045	-134.17875	white sweetclover	2 m2 along 100 m	TR 18-42 DSCF5679.JPG
16.5	LHS	Tagish Rd 18-24	60° 19' 39.762" N	134° 11' 38.748" W	60.327712	-134.1941	white sweetclover	50 m2 along 100 m	TR 18-24 DSCF5576.JPG
16.5	RHS	Tagish Rd 18-43	60° 19' 41.082" N	134° 11' 41.868" W	60.328078	-134.19496	white sweetclover	50 m2 along 500 m	TR 18-43 DSCF5680.JPG
17	RHS	Tagish Rd 18-44	60° 19' 44.712" N	134° 12' 30.942" W	60.329087	-134.2086	white sweetclover	100 m2 along 500 m	TR 18-44 DSCF5681.JPG
17.5	LHS	Tagish Rd 18-23	60° 19' 46.734" N	134° 12' 42.948" W	60.329648	-134.21193	white sweetclover	100 m2 along 500 m	TR 18-23 DSCF5575.JPG
17.5	RHS	Tagish Rd 18-45	60° 19' 48.012" N	134° 12' 57.324" W	60.330003	-134.21592	white sweetclover	100 m2 along 500 m	TR 18-45 DSCF5682.JPG
18	LHS	Tagish Rd 18-22	60° 19' 46.080" N	134° 13' 10.602" W	60.329467	-134.21961	white sweetclover	5 plants	TR 18-22 DSCF5574.JPG
18	RHS	Tagish Rd 18-46	60° 19' 47.514" N	134° 13' 9.738" W	60.329865	-134.21937	white sweetclover	2 m2	TR 18-46 DSCF5683.JPG
19.5	RHS	Tagish Rd 18-47	60° 19' 15.060" N	134° 14' 28.050" W	60.32085	-134.24113	perennial sowthistle	50 m2	no photo
20	LHS	Tagish Rd 18-21	60° 19' 11.472" N	134° 14' 38.904" W	60.319853	-134.24414	white sweetclover	6 m2	TR 18-21 DSCF5573.JPG
20.5	LHS	Tagish Rd 18-12	60° 19' 2.934" N	134° 15' 16.812" W	60.317482	-134.25467	white sweetclover	50 m2 along 50 m	TR 18-12 DSCF5561.JPG
20.5	RHS	Tagish Rd 18-13	60° 19' 3.138" N	134° 15' 18.384" W	60.317538	-134.25511	white sweetclover	1 m2	TR 18-13 DSCF5563.JPG
21	LHS	Tagish Rd 18-10	60° 18' 58.854" N	134° 15' 42.810" W	60.316348	-134.26189	yellow sweetclover	5 m2	TR 18-10 DSCF5559.JPG
21	LHS	Tagish Rd 18-11	60° 18' 59.448" N	134° 15' 39.972" W	60.316513	-134.2611	white sweetclover	1 plant	TR 18-11 DSCF5560.JPG
21	RHS	Tagish Rd 18-14	60° 18' 59.436" N	134° 15' 42.546" W	60.31651	-134.26182	white sweetclover	1 m2	TR 18-14 DSCF5564.JPG
21	RHS	Tagish Rd 18-15	60° 18' 59.208" N	134° 15' 47.070" W	60.316447	-134.26308	white sweetclover	2 m2	TR 18-15 DSCF5565.JPG

Nearest Km	Side of Road	Site ID	Recorder Latitude	Recorded Longitude	Mapped Latitude	Mapped Longitude	Species	Notes	Photo File Name
25.5	LHS	Tagish Rd 18-09	60° 16' 56.286" N	134° 16' 32.706" W	60.282302	-134.27575	white sweetclover	1 plant	TR 18-09 DSCF5558.JPG
26.5	LHS	Tagish Rd 18-08	60° 16' 56.736" N	134° 17' 15.486" W	60.282427	-134.28764	white sweetclover	3 m2	TR 18-08 DSCF5554.JPG
28	RHS	Tagish Rd 18-16	60° 16' 35.544" N	134° 18' 53.298" W	60.27654	-134.31481	altai lyme grass	3 plants	TR 18-16 DSCF5566.JPG
35.5	LHS	Tagish Rd 18-07	60° 15' 53.442" N	134° 26' 11.886" W	60.264845	-134.43664	white sweetclover	1 m2	TR 18-07 DSCF5553.JPG
35.5	RHS	Tagish Rd 18-17	60° 15' 55.206" N	134° 26' 7.590" W	60.265335	-134.43544	white sweetclover	2 plants	TR 18-17 DSCF5568.JPG
51.5	LHS	Tagish Rd 18-06	60° 11' 26.070" N	134° 40' 26.994" W	60.190575	-134.67417	white sweetclover	1 plant	TR 18-06 DSCF5551.JPG
53	LHS	Tagish Rd 18-02	60° 10' 48.846" N	134° 41' 27.132" W	60.180235	-134.69087	white sweetclover	1 m2	TR 18-02 DSCF5547.JPG
53	LHS	Tagish Rd 18-03	60° 10' 48.846" N	134° 41' 27.132" W	60.180235	-134.69087	yellow clematis	2 m2	TR 18-03 DSCF5548.JPG
53	LHS	Tagish Rd 18-04	60° 10' 48.864" N	134° 41' 27.396" W	60.18024	-134.69094	white sweetclover	2 m2	TR 18-04 DSCF5549.JPG
53	LHS	Tagish Rd 18-05	60° 10' 58.680" N	134° 41' 10.890" W	60.182967	-134.68636	white sweetclover	1 m2	TR 18-05 DSCF5550.JPG
53	RHS	Tagish Rd 18-18	60° 10' 59.820" N	134° 41' 10.968" W	60.183283	-134.68638	white sweetclover	20 plants	TR 18-18 DSCF5569.JPG
53	RHS	Tagish Rd 18-19	60° 10' 45.846" N	134° 41' 46.638" W	60.179402	-134.69629	white sweetclover	30 m2 at HPW maintenace station	TR 18-19 DSCF5570.JPG
53.5	LHS	Tagish Rd 18-01	60° 10' 32.388" N	134° 42' 1.248" W	60.175663	-134.70035	white sweetclover	2 m2	TR 18-01 DSCF5546.JPG
53.5	RHS	Tagish Rd 18-20	60° 10' 28.986" N	134° 42' 18.642" W	60.174718	-134.70518	white sweetclover	20 plants	TR 18-20 DSCF5571.JPG
0.5	LHS	10 MileRd 18-01	60° 15' 45.990" N	134° 26' 9.168" W	60.262775	-134.43588	white sweetclover	1 m2	10 Mile Road 18-01 DSCF5552.JPG
0.5	LHS	10 MileRd 18-02	60° 15' 45.990" N	134° 26' 9.168" W	60.262775	-134.43588	yellow sweetclover	6 plants; same location as 10MileRd-18-01	10 Mile Road 18-01 DSCF5552.JPG
0.5	RHS	ChinookCrRd 18-01	60° 18' 56.448" N	134° 15' 17.766" W	60.31568	-134.25494	white sweetclover	2 plants	Chinook Cr Rd 18-01 DSCF5562.JPG
2	LHS	Reid Rd-01	60° 15' 54.132" N	134° 18' 4.110" W	60.265037	-134.30114	white sweetclover	10 m2	no photo; fire hall lot entrance
0	RHS	Taku-Blvd 18-03	60° 15' 53.808" N	134° 18' 14.880" W	60.264947	-134.30413	white sweetclover	1 m2	Taku Blvd 18-03 DSCF5557.JPG
1.5	RHS	TakuBlvd 18-01	60° 14' 57.546" N	134° 19' 6.504" W	60.249318	-134.31847	white sweetclover	5 plants	Taku Blvd 18-01 DSCF5555.JPG
2	RHS	Taku-Blvd 18-02	60° 14' 22.872" N	134° 19' 4.650" W	60.239687	-134.31796	white sweetclover	2 m2	Taku Blvd 18-02 DSCF5556.JPG

Table 4. Atlin Road 2018 Invasive Plant Survey

Data collected in WGS 84

Nearest Km	Side of Road	Site ID	Recorded Latitude	Recorded Longitude	Mapped Latitude	Mapped Longitude	Species	Notes	Photo File Name
0.5	RHS	Atlin Rd 18-01	60° 19' 34.374" N	134° 0' 5.112" W	60.326215	-134.00142	white sweetclover	25 m2	AR 18-01 DSCF5602.JPG
0.5	LHS	Atlin Rd 18-64	60° 19' 33.492" N	134° 0' 5.460" W	60.32597	-134.001517	white sweetclover	10 plants	AR 18-64 DSCF5677.JPG
1.5	RHS	Atlin Rd 18-02	60° 19' 0.924" N	134° 0' 7.164" W	60.316923	-134.00199	white sweetclover	10 m2	AR 18-02 DSCF5603.JPG
1.5	RHS	Atlin Rd 18-63	60° 19' 7.608" N	134° 0' 6.786" W	60.31878	-134.001885	white sweetclover	1 m2	AR 18-63 DSCF5676.JPG
3	RHS	Atlin Rd 18-03	*	*	60.30431	-133.99962	oxeye daisy	100 m2	AR 18-03 DSCF5604.JPG
4	RHS	Atlin Rd 18-04	60° 17' 49.314" N	133° 59' 6.432" W	60.297032	-133.98512	white sweetclover	2 m2	AR 18-04 DSCF5605.JPG
4	LHS	Atlin Rd 18-62	60° 17' 46.920" N	133° 58' 50.274" W	60.296367	-133.980632	white sweetclover	2 m2	AR 18-62 DSCF5675.JPG
7	LHS	Atlin Rd 18-61	60° 16' 47.874" N	133° 57' 13.416" W	60.279965	-133.953727	white sweetclover	50 m2 (old road alignment)	AR 18-61 DSCF5674.JPG
8	RHS	Atlin Rd 18-05	60° 16' 10.710" N	133° 56' 35.256" W	60.269642	-133.943127	yellow sweetclover	1m2	AR 18-05 DSCF5606.JPG
8.5	RHS	Atlin Rd 18-60	60° 15' 56.850" N	133° 56' 20.400" W	60.265792	-133.939	white sweetclover	5 m2	AR 18-60 DSCF5673.JPG
9.5	RHS	Atlin Rd 18-06	60° 15' 26.088" N	133° 55' 55.938" W	60.257247	-133.932205	white sweetclover	1 plant	AR 18-06 DSCF5607.JPG
10	RHS	Atlin Rd 18-07	60° 15' 8.370" N	133° 55' 42.522" W	60.252325	-133.928478	white sweetclover	1 m2	AR 18-07 DSCF5608.JPG
10	RHS	Atlin Rd 18-08	60° 15' 5.112" N	133° 55' 39.498" W	60.25142	-133.927638	white sweetclover	3 plants	AR 18-08 DSCF5610.JPG
10.5	RHS	Atlin Rd 18-09	60° 14' 59.880" N	133° 55' 30.396" W	60.249967	-133.92511	white sweetclover	2 m2 along 25 m	AR 18-09 DSCF5611.JPG
10.5	RHS	Atlin Rd 18-10	60° 14' 56.424" N	133° 55' 23.838" W	60.249007	-133.923288	bird vetch	5 m2 at driveway	AR 18-10 DSCF5612.JPG
10.5	LHS	Atlin Rd 18-59	60° 15' 1.134" N	133° 55' 32.274" W	60.250315	-133.925632	white sweetclover	5 m2	AR 18-59 DSCF5672.JPG
11	RHS	Atlin Rd 18-11	60° 14' 53.676" N	133° 55' 16.014" W	60.248243	-133.921115	white sweetclover	1 plant	AR 18-11 DSCF5613.JPG
11	RHS	Atlin Rd 18-12	60° 14' 49.578" N	133° 55' 7.302" W	60.247105	-133.918695	white sweetclover	2 m2	AR 18-12&13 DSCF5614.JPG
11	LHS	Atlin Rd 18-13	60° 14' 49.578" N	133° 55' 7.302" W	60.247105	-133.918695	white sweetclover	1 plant	AR 18-12&13 DSCF5614.JPG
12	RHS	Atlin Rd 18-14	60° 14' 7.266" N	133° 54' 6.966" W	60.235352	-133.901935	spottted knapweed	20 flowering plants + 20 new leaf rosettes	AR 18-14 DSCF5615.JPG
12	RHS	Atlin Rd 18-47	60° 14' 25.098" N	133° 54' 29.718" W	60.240305	-133.908255	white sweetclover	1 plant	AR 18-47 DSCF5660.JPG
12.5	LHS	Atlin Rd 18-58	60° 13' 59.472" N	133° 53' 57.870" W	60.233187	-133.899408	white sweetclover	15 plants	AR 18-58 DSCF5671.JPG
13	RHS	Atlin Rd 18-48	60° 13' 55.062" N	133° 53' 55.470" W	60.231962	-133.898742	white sweetclover	12 plants	AR 18-48 DSCF5661.JPG
14	RHS	Atlin Rd 18-15	60° 13' 22.674" N	133° 53' 31.326" W	60.222965	-133.892035	white sweetclover	1 plant	AR 18-15 DSCF5616.JPG
14.5	RHS	Atlin Rd 18-16	60° 13' 9.246" N	133° 53' 21.768" W	60.219235	-133.88938	white sweetclover	2 plants	AR 18-16 DSCF5618.JPG
14.5	LHS	Atlin Rd 18-57	60° 13' 9.312" N	133° 53' 20.454" W	60.219253	-133.889015	white sweetclover	1 plant	AR 18-57 DSCF5670.JPG
15.5	RHS	Atlin Rd 18-17	60° 12' 49.890" N	133° 53' 6.222" W	60.213858	-133.885062	white sweetclover	1 plant	AR 18-17 DSCF5619.JPG
15.5	RHS	Atlin Rd 18-18	60° 12' 34.920" N	133° 52' 48.522" W	60.2097	-133.880145	white sweetclover	5 m2 along 100 m	AR 18-18 DSCF5620.JPG
15.5	LHS	Atlin Rd 18-55	60° 12' 37.134" N	133° 52' 51.480" W	60.210315	-133.880967	white sweetclover	5 m2	AR 18-55 DSCF5668.JPG
15.5	LHS	Atlin Rd 18-56	60° 12' 46.044" N	133° 53' 0.660" W	60.21279	-133.883517	white sweetclover	1 m2	AR 18-56 DSCF5669.JPG
16	RHS	Atlin Rd 18-19	60° 12' 30.906" N	133° 52' 34.284" W	60.208585	-133.87619	white sweetclover	1 m2 along 100 m	AR 18-19 DSCF5621.JPG
16	LHS	Atlin Rd 18-53	60° 12' 28.038" N	133° 52' 23.694" W	60.207788	-133.873248	white sweetclover	9 plants	AR 18-53 DSCF5666.JPG

Nearest Km	Side of Road	Site ID	Recorded Latitude	Recorded Longitude	Mapped Latitude	Mapped Longitude	Species	Notes	Photo File Name
16	LHS	Atlin Rd 18-54	60° 12' 30.930" N	133° 52' 32.682" W	60.208592	-133.875745	white sweetclover	250 m2 along 250 m	AR 18-54 DSCF5667.JPG
16.5	LHS	Atlin Rd 18-52	60° 12' 22.632" N	133° 52' 10.614" W	60.206287	-133.869615	white sweetclover	20 m2 at pit	AR 18-52 DSCF5665.JPG
17	RHS	Atlin Rd 18-20	60° 11' 58.254" N	133° 52' 7.902" W	60.199515	-133.868862	white sweetclover	10 m2 along 50 m	AR 18-20 DSCF5622.JPG
17.5	LHS	Atlin Rd 18-50	60° 11' 46.278" N	133° 52' 31.968" W	60.196188	-133.875547	white sweetclover	0.5 m2	AR 18-50 DSCF5663.JPG
17.5	LHS	Atlin Rd 18-51	60° 11' 52.230" N	133° 52' 22.068" W	60.197842	-133.872797	white sweetclover	1 plant	AR 18-51 DSCF5664.JPG
18	RHS	Atlin Rd 18-21	60° 11' 24.804" N	133° 52' 40.878" W	60.190223	-133.878022	white sweetclover	1 plant	AR 18-21 DSCF5623.JPG
18.5	LHS	Atlin Rd 18-45	60° 11' 17.394" N	133° 52' 35.322" W	60.188165	-133.876478	white sweetclover	40 m2 along 200m	AR 18-45 DSCF5646.JPG
18.5	LHS	Atlin Rd 18-46	60° 11' 17.538" N	133° 52' 35.994" W	60.188205	-133.876665	white sweetclover	40 m2 along 300m	AR 18-46 DSCF5647.JPG
18.5	LHS	Atlin Rd 18-49	60° 11' 20.616" N	133° 52' 37.998" W	60.18906	-133.877222	perennial sowthistle	4 m2	AR 18-49 DSCF5662.JPG
19	RHS	Atlin Rd 18-22	60° 11' 9.462" N	133° 52' 31.182" W	60.185962	-133.875328	white sweetclover	20 m2 along 50 m	AR 18-22 DSCF5624.JPG
19	RHS	Atlin Rd 18-23	*	*	60.18539	-133.87557	white sweetclover	3 plants	no photo
19	RHS	Atlin Rd 18-24	60° 11' 3.816" N	133° 52' 30.918" W	60.184393	-133.875255	white sweetclover	2 plants	AR 18-24 DSCF5625.JPG
19.5	RHS	Atlin Rd 18-25	60° 10' 58.194" N	133° 52' 31.650" W	60.182832	-133.875458	white sweetclover	3 plants	AR 18-25 DSCF5626.JPG
19.5	RHS	Atlin Rd 18-26	60° 10' 42.102" N	133° 52' 23.988" W	60.178362	-133.87333	white sweetclover	1 plant	AR 18-26 DSCF5627.JPG
19.5	LHS	Atlin Rd 18-44	60° 10' 55.116" N	133° 52' 31.170" W	60.181977	-133.875325	white sweetclover	5 plants	AR 18-44 DSCF5645.JPG
20	RHS	Atlin Rd 18-27	60° 10' 36.108" N	133° 52' 12.828" W	60.176697	-133.87023	white sweetclover	1 m2	AR 18-27 DSCF5628.JPG
20	RHS	Atlin Rd 18-28	60° 10' 34.812" N	133° 51' 55.968" W	60.176337	-133.865547	white sweetclover	1 plant	AR 18-28 DSCF5629.JPG
20	RHS	Atlin Rd 18-29	60° 10' 33.996" N	133° 51' 57.150" W	60.17611	-133.865875	yellow lucerne	1 m2	AR 18-29 DSCF5630.JPG
20.5	RHS	Atlin Rd 18-30	60° 10' 30.750" N	133° 51' 35.910" W	60.175208	-133.859975	white sweetclover	5 plants	AR 18-30 DSCF5631.JPG
21	RHS	Atlin Rd 18-31	60° 10' 22.464" N	133° 51' 28.242" W	60.172907	-133.857845	white sweetclover	1 plant	AR 18-31 DSCF5632.JPG
21	RHS	Atlin Rd 18-32	60° 10' 16.194" N	133° 51' 21.900" W	60.171165	-133.856083	white sweetclover	1 plant	AR 18-32 DSCF5633.JPG
22	LHS	Atlin Rd 18-42	60° 9' 52.686" N	133° 50' 57.222" W	60.164635	-133.849228	white sweetclover	1 plant	AR 18-42 DSCF5643.JPG
22	LHS	Atlin Rd 18-43	60° 9' 58.926" N	133° 51' 3.648" W	60.166368	-133.851013	white sweetclover	1 plant	AR 18-43 DSCF5644.JPG
22.5	RHS	Atlin Rd 18-33	60° 9' 48.894" N	133° 50' 52.644" W	60.163582	-133.847957	white sweetclover	20 m2 at old gravel pit	AR 18-33 DSCF5634.JPG
23	RHS	Atlin Rd 18-34	60° 9' 14.364" N	133° 50' 11.646" W	60.15399	-133.836568	white sweetclover	2 plants	AR 18-34 DSCF5635.JPG
23.5	RHS	Atlin Rd 18-35	60° 9' 9.876" N	133° 50' 7.830" W	60.152743	-133.835508	white sweetclover	2 plants	AR 18-35 DSCF5636.JPG
24	RHS	Atlin Rd 18-36	60° 8' 56.424" N	133° 49' 55.080" W	60.149007	-133.831967	white sweetclover	1 plant	AR 18-36 DSCF5637.JPG
24	LHS	Atlin Rd 18-41	60° 8' 55.380" N	133° 49' 53.208" W	60.148717	-133.831447	white sweetclover	0.5 m2	AR 18-41 DSCF5642.JPG
24.5	RHS	Atlin Rd 18-37	60° 8' 37.248" N	133° 49' 42.360" W	60.14368	-133.828433	white sweetclover	3 plants	AR 18-37 DSCF5638.JPG
29.5	LHS	Atlin Rd 18-40	60° 5' 53.364" N	133° 48' 54.390" W	60.098157	-133.815108	white sweetclover	1 plant	AR 18-40 DSCF5641.JPG
31.5	LHS	Atlin Rd 18-39	60° 4' 55.188" N	133° 48' 42.666" W	60.081997	-133.811852	white sweetclover	1 plant	AR 18-39 DSCF5640.JPG
39.5	LHS	Atlin Rd 18-38	60° 1' 3.258" N	133° 47' 45.792" W	60.017572	-133.796053	white sweetclover	0.5 m2	AR 18-38 DSCF5639.JPG

* empty fields indicate GPS error while recording location; mapped coordinates in subsequent columns were estimated from road kilometre marker, topographic maps and aerial photographs.