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Invasive and Exotic Plant Management in Klondike Gold Rush National Historical Park

2022 Summary Report

A Klondike Gold Rush National Historical Park Publication

ON THIS PAGE
An image of a dandelion seedhead along Dyea road with mountains in the background.
(NPS /OLIVIA VARGA)

ON THE COVER
From top, then clockwise: an image of white sweetclover with IPMT intern Olivia Varga pulling plants in background, a close-up of fireweed with a scenic background of spruce trees and lake, a bouquet of butter and eggs held together by a hand.
Top image (STC /REUBEN CASH). Two bottom images (NPS /OLIVIA VARGA).

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2022 Summary Report

A Klondike Gold Rush National Historical Park Publication

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Abstract

Invasive exotic plants management at Klondike Gold Rush National Historical Park (KLGO) is coordinated through the National Park Service (NPS) Alaska Region Invasive Plant Management Team (IPMT) program. During 2019, 2020 and 2021, the IPMT program did not operate at KLGO due to staff vacancies and COVID-19 protection measures, resulting in minimal activity in 2019 and 2020, and low activity in 2021 by park Biological Technicians.

In 2022, the IPMT program returned with two IPMT Student Conservation Association (SCA) interns supervised by the KLGO Biologist. The primary program goal was to update the status of previously identified invasive plant areas of concern through inventory and mapping. Additional goals included control of selected invasive plant sites within KLGO, cooperating with the Skagway Traditional Council (STC) to control invasives at sites outside KLGO, and providing public outreach and education with KLGO Interpretation staff, STC and the Skagway Recreation Center (SRC).

2022 accomplishments included mapping of invasive species at selected NPS building lots in the Skagway town area, Dyea Historic Townsite, portions of the NPS campground, Dyea roads not including the flats, the entirety of the Chilkoot Trail, and the special orange hawkweed site at Dewey Reservoir. In addition, IPMT interns collaborated with STC to remove invasive plant species at sites in Skagway with the highest risk of invasive plant spread. Education and outreach activities included Pullen Creek invasive plant removal and the NPS Junior Ranger Day.

Pullen Creek invasive plant control. From left to right: Skagway summer camp student, KLGO Park Ranger Jolanta Ryan, STC Environmental Dept. staff Colton Belisle, KLGO invasive plants interns Jay Hamill and Olivia Varga, KLGO education intern Kristen Caldwell, and summer camp student - each holding bags from an invasive weed pull. (STC /REUBEN CASH)

Acknowledgments

We would like to thank those that helped contribute to the success of the 2022 IPMT interns at Klondike Gold Rush National Historical Park. Anna O'Brien and C. Elaine Furbish guided the IPMT program and gave support throughout the season. Jen Larsen provided her expertise to assist with GPS, GIS and Junior Ranger Day. Adrian Wakeen helped with plant identifications and survey efforts. Bethany (River) Humphrey completed monitoring, mapping and treatment at the Dewey Reservoir site. Jolanta Ryan and Kristen Caldwell facilitated NPS education outreach. Joel Cusick gave training and assistance with GPS operations. Justin Fulkerson provided taxonomic training and verification. Reuben Cash and Colten Belisle of STC gave continued support to and partnership with NPS KLGO IPMT program to coordinate outreach and education events and for manual control of high priority invasive plants. Johnathan Flood and the archeology technicians were accommodating and flexible in logistics and sharing transportation and data collection materials. The KLGO trail crew tested a prototype invasive plants identification tool for the Chilkoot Trail.

A special thank you to all staff at KLGO; everyone's hard work was appreciated and should be recognized. Our combined efforts and perseverance made it possible to have such a successful season protecting and preserving natural resources at Klondike Gold Rush National Historical Park.

Acronyms

IPMT Invasive Plant Management Team

EDRR Early Detection and Rapid Response

GPS Global Positioning System

GIS Geospatial Information System

KLGO Klondike Gold Rush National Historical Park

NPS National Park Service

SCA Student Conservation Association

SIP Scientists in Parks

STC Skagway Traditional Council

AKDOT&PF Alaska Department of Transportation & Public Facilities

SRC Skagway Recreation Center

WPYR White Pass & Yukon Route

Introduction

Klondike Gold Rush National Historical Park (KLGO) is located in Southeast Alaska at the northern terminus of the Inside Passage. The park is approximately 13,000 acres divided among three separate units located within the Taiya River and Skagway River valleys (Figure 1). These areas are rich in biodiversity, occurring at the ecotone between temperate coastal rainforest and boreal interior forest and encompassing an ecological gradient that includes lowland tidal flats, coastal rainforest, sub-alpine boreal forest, high-alpine meadow, and alpine tundra. The gradient is the result of varying elevation and aspect found within the park, ranging from sea level to about 6,000 feet at the peaks of the coastal mountains.

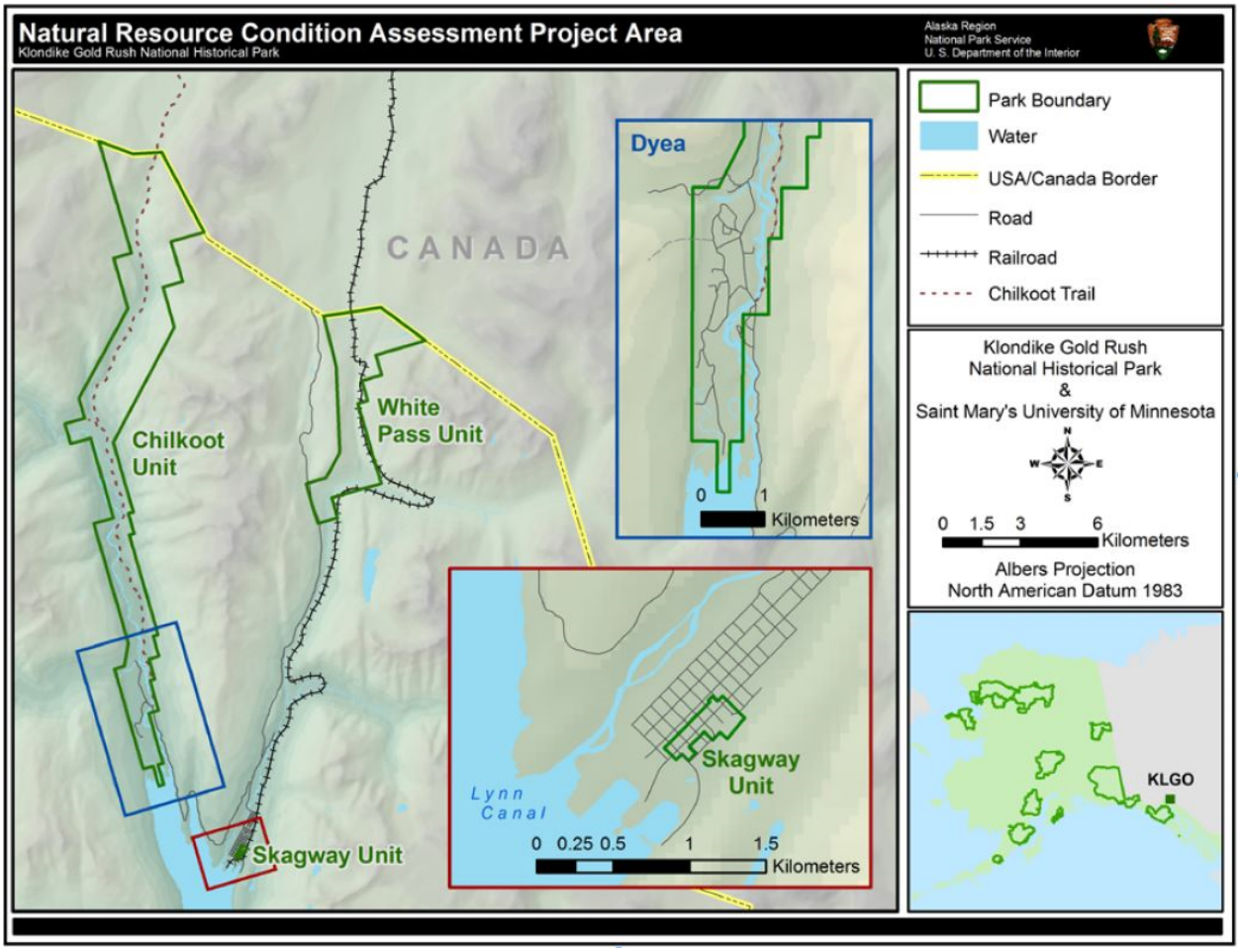

Figure 1. Map: Klondike Gold Rush National Historical Park units. (BERNATZ 2011)

The three KLGO units contain private, municipal, state, and federally owned lands with a variety of management concerns. In addition, each unit has a unique combination of terrain, ecology, visitor use levels, and vectors for plant introduction. Many invasive exotic plant infestations cross land-ownership boundaries within the park, cross outside park boundaries into adjacent lands, or connect to nearby lands via transport corridors, necessitating efforts to monitor and control invasive plants cooperatively with other organizations, such as Skagway Traditional Council.

The Alaska IPMT monitors and controls invasive exotic plants in the National Parks of Alaska. While controlling present populations remains a high priority, the most effective method for controlling invasive plants is to prevent the establishment of invasive species (USDA 2007). The IPMT program combines prevention and control measures to address invasive plants at KLGO.

KLGO parklands are highly vulnerable to the introduction and spread of exotic plant species. The park's variety of habitats that promote biodiversity also provide attractive sites for non-native species.

Humans play a significant role in exotic plant introduction and spread (Hodkinson *et al*. 1997). In general, human activities often create ideal locations for invasive plant colonization, such as disturbed ground or development and maintenance that clears vegetation. Exotic plants are often introduced and spread through garden throw-outs from horticultural stock. Plants may be dispersed both short and long distances when people unintentionally move seeds or other propagules via dispersal agents such as shoes and tires (Hodkinson *et al.* 1997; Wichmann *et al.* 2009).

KLGO is vulnerable to introduction and spread of invasive exotic plants through human activities. Once established in an area, invasive plants may spread through physical (wind, water movement) and biological (animal movement) vectors in addition to human activities. Three primary human activities that encourage introduction and spread of invasive exotic plants in Skagway are: 1) the influx of visitors and workers that produce high levels of foot and vehicle traffic, 2) the local horticultural interest in Skagway of planting invasives as ornamentals in gardens, and 3) private, local, state, and federal maintenance activities to care for infrastructure. Within the park, KLGO transports supplies, equipment, and staff to sites along the Chilkoot Trail via helicopter lifts every spring and fall, and often with additional trips during the summer.

Alaska is in an enviable position compared to the contiguous United States in that relatively few invasive plant species have established in the state. According to data compiled from KLGO IPMT reports 2004 to 2018, there have been a total of 53 invasive exotic species reported in and around the park (Interrante 2021).

KLGO IPMT baseline data, starting in 2004, catalogs the occurrence and spread of invasive species through annual monitoring surveys. When practical, IPMT takes action to control infestations. More specifically, the IMPT program has focused on the strategy of *early detection and rapid response* (EDRR), wherein species are prioritized with a system of triage. This system focuses first on control of small populations of species of high invasiveness, and later on larger populations of low invasiveness rankings (Carlson *et al*. 2008). The IPMT program also promotes community education and outreach to engage others to prevent introduction and reduce the spread of invasive plants.

Goals

Invasive plants management at Klondike Gold Rush National Historical Park (KLGO) is coordinated through the National Park Service (NPS) Alaska Region Invasive Plant Management Team (IPMT) with additional support from in-park staff. During 2019, 2020 and 2021, the IPMT program did not operate at KLGO due to staff vacancies and COVID-19 protection measures. During those years, KLGO seasonal Biological Technicians maintained a special orange hawkweed control site at the Dewey Reservoir. In addition, a Biological Technician performed a program review, researched information for a Chilkoot Trail field booklet, and accomplished reduced site-specific survey and control efforts in 2021 (Interrante 2021).

The primary goal for management of invasive exotic plants at KLGO in 2022 was to update the status of previously identified invasive plant areas of concern through IPMT inventory and mapping.

The second goal was to control invasive plants at selected sites within KLGO, and by cooperating with Skagway Traditional Council (STC) to control invasive plants at high-risk sites outside KLGO. Preventive measures, such as boot brushes and a Chilkoot Trail invasive plants identification booklet, were also considered a part of control efforts.

The third goal was to provide public outreach and education working with KLGO Interpretation staff, STC, and the Skagway Recreation Center (SRC) summer school camp.

Methods

The IPMT program provided hands-on training and field and office protocols for invasive exotic plants data collection, data management, and control (IPMT; O'Brien 2022a, 2022b). IPMT and KLGO managers used recommendations from past annual reports, existing data in the Alaska Exotic Plants Information Clearing House (AKEPIC), seasonal phenology, and timing of available labor to prioritize the treatment of species and infestations, select equipment, and choose appropriate control methods. Education and outreach projects were developed with the KLGO Interpretation staff, STC and SRC summer camp program.

Defining Work Areas

To facilitate planning inventory and control efforts, fieldwork was organized by geographic location, park unit, cooperators, and treatment.

Table 1. Work, geographic, and inventory areas for IPMT at KLGO, 2022.

Work Area	Geographic Area	Park Unit and other status	Inventory name	Fieldwork & Considerations
Skagway Town	lower Skagway River valley	Skagway Historic District unit, other sites through STC	Skagway town area	inventory & map on federally owned land; remove white sweetclover and reed canarygrass from sites arranged by STC
Skagway Town	lower Skagway River valley	Skagway recreation area	Dewey Reservoir	monitor and control orange hawkweed at Dewey Reservoir site
Skagway Town	Skagway Town Area	state road right-of-way	lower Klondike Highway	inventory small section of lower Klondike Highway roadside and Liarsville Road turnoff
White Pass	upper Skagway River valley	federal land near White Pass unit	Laughton Glacier trail	inventory & map Laughton Glacier Trail and remove orange hawkweed if found
Dyea Town	lower Taiya River delta	Dyea and Chilkoot Trail unit	Dyea NPS town area	inventory & map Dyea high visitation areas (excluding the flats) including roads, trailheads, trails, NPS campground; remove exotic vegetation from False Front installation site; upgrade boot brushes at trailheads.
Dyea Town	lower Taiya River valley	state road right-of-way	Dyea Road (state)	map & control white sweetclover along right-of-way near Dyea
Chilkoot Trail	Taiya River valley up to pass	Dyea and Chilkoot Trail unit	Chilkoot Trail	inventory & map Chilkoot Trail, including campgrounds, ranger stations and spur trails; control small isolated infestations

The workplan for NPS IPMT interns when working independently without cooperators, was to focus primarily on federally owned or managed lands. In Skagway town area, the interns would collect inventory and abundance data at KLGO historical or operational lots. In addition, IPMT interns and a SIP intern would continue past efforts to control orange hawkweed at the Dewey Reservoir site. Efforts in Dyea would focus on surveying and mapping the Dyea Historic Townsite, tracking the

spread of invasive plants, and monitoring the effects of ongoing construction work and commercial use on park lands. IPMT interns would also survey and remove high priority species along the Dyea Road in the Taiya River valley. Along the Chilkoot Trail, invasive species would be inventoried and some manual control conducted, with special attention given to the area around Sheep Camp, where major efforts to remove reed canarygrass began in 2015.

Work conducted in collaboration with STC had no set areas of interest, operations would be completed on an as-needed basis defined by the growth and appearance of high priority species, particularly reed canarygrass and white sweetclover. These areas would be selected by STC, and manually controlled by STC staff and the KLGO IPMT interns. STC would make arrangements with the Municipality of Skagway, the Alaska Department of Transportation (AKDOT&PF) and private landowners.

Prioritization of Species to Control

Effort to control established invasive plants within KLGO was prioritized by three factors—the geographic location, the extent of infestation, and a state-wide invasiveness ranking system. The Invasiveness Ranking System for Non-Native Plants of Alaska assigns invasive potential on a scale from 0 to 100 based on four factors for each species: potential ecological impacts, biological attributes and dispersal ability, distribution, and feasibility of control (Carlson et al. 2008). KLGO prioritized treatment of species with a high invasiveness rank (70-80 or above) that had a relatively small local extent, with species reported from only 1 or 2 locations given top priority. Species with a low invasiveness rank (49 or less) with a larger local extent were considered lowest priority for control activity. According to these guidelines, the highest priority species for control during the 2022 season was orange hawkweed (rank 79) with verified occurrence at only 1 location. Next in priority were white sweetclover (rank 81) and reed canarygrass (rank 83). Both are moderately widespread but had been responding well to control efforts prior to 2019, when staff vacancies and COVID-19 measures interrupted treatments.

These three species were also high priority to STC for the preservation of traditional Tribal cultural and subsistence resources. In order to honor the values of the Council, as well as prevent the spread of these species into park boundaries, all efforts to mitigate infestations in collaboration with STC took highest priority among the workload of the IPMT interns.

Tools for Identification and Data Collection

The primary field guides referenced for plant identification are listed below and fully referenced in Literature Cited:

Identification of Non-Native Plants in Alaska (Flagstad *et al.* 2017)
Plants of the Pacific Northwest Coast (Pojar and Mackinnon, 1994)
Flora of Alaska and Neighboring Territories (Hulten, 1968)
A Field Guide to Alaska Grasses (Skinner *et al.* 2012)
How to Identify Grasses and Grasslike Plants (Harrington 1977)

The official KLGO herbarium collection was also used to confirm identification, as well as the KLGO Natural Resources field exotic pressed plant collection started in 2010.

Condition status and spatial data of invasive plant infestations were collected using GPS: a Trimble GeoExplorer 6000 GeoXH® datalogger and an external Trimble Tornado L1® GNSS antenna receiver. GPS data were differentially corrected to the nearest base station using PathFinder Office.

Control Methods

Control measures were limited to non-chemical treatments such as invasive plant pulling (attempting to remove the whole plant including underground parts) clipping plants at ground level, removing seed heads, and tarping to prevent photosynthesis.

Given the historical and cultural significance of many areas within KLGO, the removal of vegetation was often limited to above-substrate clipping to ensure that no archeological resources in the soil were disturbed during the process. Tools such as hand trowels, Hori-Hori knives, and pruners were used which minimized the potential to unearth or damage any archeological resources. In areas cleared of archeological resource concern, the removal process could include unearthing the whole plant, with particular attention to the underground structures for invasive plants that can regenerate from roots, rhizomes or other tissues left in the soil.

In some situations, clipping only the fruiting bodies of the plant to prevent seed dispersal was the best option. This method was used in areas of potential cultural resource disturbance or in areas where groundcover was dense. For example, reed canarygrass was abundant along Pullen Creek in Skagway where seedhead clipping is ongoing and continues to be effective (STC 2022).

Opaque plastic tarps were used at the orange hawkweed site at Dewey Reservoir. Plastic tarps anchored to the ground had been used since 2016 at that site. Tarps were also deployed at Sheep Camp campground in past years to help control reed canarygrass and tall buttercup.

Removed plants from all sites were bagged on site and transported to the Skagway city incinerator to be burned. This method minimized the potential for inadvertent spread while transporting and disposing of invasive plants.

Personnel

The personnel dedicated to the KLGO invasive exotic plants program were the NPS AK Region IPMT program Student Conservation Association (SCA) interns, Jay Hamill and Olivia Varga. They were the lead KLGO staff for the program, dedicating most of their time to monitoring, control and educational outreach. Working as a pair in most efforts, the SCA interns surveyed and managed small-scale manual control tasks - often trading off the responsibilities of identifying plants and conducting manual control with collecting data using the Trimble GPS. Scientists in Parks (SIP) intern, Bethany (River) Humphrey, completed orange hawkweed monitoring, control and mapping. The interns were assisted as needed by Biological Technician Adrian Wakeen (plant identification expertise), Biological Technician Jen Larsen (GPS mapping expertise and education outreach experience), and biologist C. Elaine Furbish.

IPMT intern Jay Hamill using Trimble GPS with external antenna at Saintly Hill along the Chilkoot trail. (NPS /OLIVIA VARGA)

Results

KLGO invasive exotic plant activities began in mid-May and ended in late October, 2022. The IPMT interns devoted almost all of their work time between May and August to invasive plants inventory, control and outreach. The SIP intern completed monitoring and control from August to September at the high-priority Dewey Reservoir orange hawkweed site.

Summary of accomplishments by goal

The KLGO invasive exotic plants program accomplished all goals for 2022. The primary goal was to update the status of previously identified invasive plant areas of concern through inventory and mapping. The second goal was to control selected invasive plant sites within KLGO, and by cooperating with STC, to control invasive plant sites outside KLGO. The third goal was to provide public outreach and education with KLGO Interpretation staff, STC and the SRC summer school camp.

Goals 1 and 2 - invasive plants inventory, mapping and control.

The IPMT interns collected inventory & mapping data on all identifiable invasive plants in the search areas described for Skagway, Dyea, Chilkoot Trail, and White Pass work areas (Table 1). At selected sites, they also performed manual removal of particular invasive species. Working with STC, they contributed to manual removal of identified invasive species of concern. In total, 8.656 acres were inventoried or received manual treatments (Table 2), and over 1,500 pounds of invasive vegetation were removed (STC 2022).

Table 2. IMPT inventoried and treated acres, 2022.

IPMT activity	within KLGO acres	outside KLGO acres	Sum of acres
Inventory	8.493	--	8.493
Manual Treatment	0.028	0.135	0.163
Total	8.521	0.135	8.656

The status of the three highest priority invasive species was established: orange hawkweed, white sweetclover and reed canarygrass. Control efforts substantially reduced their coverage and potential for spread.

Boot brushes at trailheads in and around KLGO were evaluated. A Chilkoot Trail invasive plants identification booklet was completed and printed.

Detailed descriptions of invasive plant status, control measures and prevention measures follow this summary section.

Goal 3 - education outreach.

Successful collaboration with STC and SRC resulted in two educational summer camp days and weed pulls for students. Educational outreach efforts and activities at KLGO Junior Ranger Day proved popular, where IPMT interns interacted with over 100 curious visitors. Adults and children were provided with information about invasive plants and how to reduce their spread.

Figure 2. Junior Ranger Day, IPMT intern Jay Hamill talks to visitors about invasive plants as child colors informational coloring sheet about invasive plants. (NPS /OLIVIA VARGA)

Details of invasive plants management activities

Overall, 34 invasive species were documented, including 2 subspecies (Appendix A). The 21 most-noticed invasive plants (including 1 subspecies) and locations where found are presented in Table 3.

The inventory area with the highest variety of easily noticed invasive species was the Dyea NPS town area with 16 species/subspecies (Table 1). The Skagway town area followed with 8 species, and the Dyea Road (state) right-of-way near Dyea had 7 species. The Chilkoot Trail, from the trailhead to Chilkoot Pass, had 6 species.

The Chilkoot Trail and the Laughton Glacier Trail were completely inventoried. Within other areas, only identified sites were examined.

Table 3. Most-noticed invasive plants and their presence in inventory areas, 2022.

Common name	*Scientific name*	Skagway town area	Dewey Reservoir	lower Klondike Hwy	Laughton Glacier trail	Dyea NPS town area	Dyea Road (state)	Chilkoot Trail
Annual bluegrass	*Poa annua*					X		X
Big chickweed	*Cerastium fontanum*	X				X		X
Creeping buttercup	*Ranunculus repens*	X						
Common chickweed	*Stellaria media*					X		X
Common dandelion	*Taraxacum officinale*	X	X	X	X	X	X	X
Common eyebright	*Euphrasia nemorosa*					X		
Common plantain	*Plantago major*				X	X		
Sheep sorrel	*Rumex acetosella*					X		
European mountain ash	*Sorbus aucuparia*	X						
Kentucky bluegrass	*Poa pratensis*					X		
Orange hawkweed	*Hieracium aurantiacum*		X					
Oxeye Daisy	*Leucanthemum vulgare*				X	X	X	
Quack grass	*Elymus repens*					X		
Red clover	*Trifolium pratense*	X				X	X	
Reed canarygrass	*Phalaris arundinacea*							X
Siberian pea shrub	*Caragana arborescens*	X						
Spreading bluegrass	*Poa pratensis ssp. irrigata*					X		
Tall buttercup	*Ranunculus acris*		X			X	X	
Timothy grass	*Phleum pratense*					X	X	
White clover	*Trifolium repens*	X	X	X	X	X	X	X
White sweetclover	*Melilotus albus*	X		X		X	X	

Skagway Town Area

The town of Skagway had a variety of invasive plants, most prevalent in disturbed areas but with others planted as ornamental groundcover. Invasive plants found on selected federally owned lands associated with KLGO were inventoried and mapped, with some highly invasive species receiving control effort. STC coordinated invasive plant activities on non-federal lands. The KLGO IPMT interns assisted STC staff and volunteers by adding person-power to their control activities. By combining effort, STC and KLGO accomplished control of larger infestation sites than would have been feasible working separately.

NPS Moore Homestead and Peniel Dormitory

Both the Moore Homestead located on 5th Avenue, and the Peniel Mission Dormitory located on 6th Avenue, had invasive vegetation consistent with those present in the rest of Skagway. The species included big chickweed, common dandelion, European mountain ash, creeping buttercup, white clover, and red clover. Along the 6th Avenue street-facing boardwalk of the Peniel lot, a row of Siberian pea shrub was planted as ornamental hedging; this is of particular concern as this species has an invasiveness rank of 74 and is notably one of the few instances of Siberian tree shrub on park lands in Skagway.

12th Avenue and Broadway White Sweetclover Infestation

Over the course of three days, the KLGO IPMT interns joined a team of 6 volunteers coordinated by STC to remove over 300 pounds of white sweetclover that were pulled from an empty lot located on 12th Avenue and Broadway.

Figure 3. Before and after manual control at the 12th Avenue white sweetclover patch in Skagway town area. (NPS /OLIVIA VARGA)

NPS 14th Street Duplex

The park employee housing Duplex lot on 14th and Main St. had invasive vegetation commonly associated with residential areas of Skagway, such as white clover and common dandelion. Additionally, 6 European mountain ash trees (rank 59) were planted on the property. This species ranks at the edge of moderately invasive (rank 60-69). European mountain ash trees are widespread

ornamental plantings that are popular food for birds that disperse seeds throughout the area, which fosters spread through the urban Skagway town area.

Dewey Reservoir - orange hawkweed

Orange hawkweed was found for the first time in 2015 at the Dewey Reservoir by IPMT staff (Appendix B). An intense joint control effort by KLGO, STC and the Municipality of Skagway was designed to prevent orange hawkweed from becoming established in Skagway. Orange hawkweed has a high invasiveness ranking of 79. It spread rapidly once established in Haines and Juneau, where it quickly reached a difficult to manage stage.

In 2016, opaque tarp treatment began. The tarping has been replaced multiple times since 2017 and has been relatively effective in controlling spread. However, occasional plants have sprouted near the tarps, making continuous monitoring and immediate control essential (Interrante 2021).

During 2019 and 2020, control measures were restricted to one activity: maintaining the tarp. In 2021, the tarps were replaced and the site was visited weekly from mid-May to mid-September. Rosettes and flowering plants were removed as soon as they were identified (Interrante et al. 2021).

In 2022, weekly visits by the IPMT interns were scheduled to monitor the site. Several invasive plants were seen in the area: white clover, European mountain ash, common dandelion, common plantain, and an abundance of tall buttercup. However, the control effort concentrated only on orange hawkweed.

When flowering heads appeared, the site was visited twice per week. Beginning May 25, rosettes were observed growing an estimated 1 meter from the larger tarp. On July 1, flower heads confirmed identification of orange hawkweed growing up to about 10 meters from the same tarp. A total of 18

Figure 4. Orange hawkweed control at Dewey Reservoir.
Left: orange hawkweed rosette near tarp (NPS /JAY HAMMIL)
Right: orange hawkweed inflorescence within 10 meters of tarp (NPS /OLIVIA VARGA).

rosettes and 7 flowering heads were removed from the site that day. Every subsequent visit in July and early August included a large survey radius, but no new growth was observed.

After mid-August, the KLGO SIP intern made weekly trips to the site until mid-September to monitor for new growth. No new growth of orange hawkweed was confirmed, but some rosettes that had characteristics that may have indicated orange hawkweed were removed.

As the summer progressed, tarps had become frayed and in need of replacement. On September 19, both tarps were removed without replacement on the recommendation of the Alaska Region IPMT coordinator. No orange hawkweed was observed growing in areas underneath the tarps. Beneath the small tarp was mostly bare. Beneath the large tarp were substantial moss patches with scattered big chickweed and white clover.

Figure 5. Tarped areas at Lower Dewey reservoir after removal of tarps in September 2022 (NPS /C E FURBISH)

<u>lower Klondike Highway</u>

A small section of Klondike Highway was surveyed from the Skagway River bridge to the Hamilton quarry, approximately 3 miles. Overall, the number of invasive species and the extent of infestation were found to be largely congruent with previous years, except white sweetclover was more abundant. The roadsides and the quarry had scattered, densely populated patches of white sweetclover with large swaths of first year growth, indicating an established population that was spreading.

A large, dense patch of white sweetclover at the Liarsville Road turnoff was identified as a high-priority control area by STC. KLGO IPMT interns joined forces with STC staff and volunteers to remove all of the white sweetclover.

Figure 6a. Liarsville Road turnoff white sweetclover patch BEFORE manual control by IPMT interns and STC technicians and volunteers (STC /REUBEN CASH)

Figure 6b. Liarsville Road turnoff white sweetclover patch AFTER manual control by IPMT interns and STC technicians and volunteers (STC /REUBEN CASH)

White Pass Area

Laughton Glacier trail

A popular hiking destination approximately 1 mile east of the KLGO White Pass unit, Laughton Glacier trail is accessed via the White Pass and Yukon Route Railroad. The trail is about 3.5 miles long. The first 2 miles border the upper Skagway River to a US Forest Service cabin. The trail then leaves the riverside and turns south toward the glacier.

Orange hawkweed reports on Laughton Glacier trail were received in 2015 and 2018. Based on past IPMT surveys, only one patch of orange hawkweed is known elsewhere in the greater Skagway area: the Dewey Reservoir site that has been intensively controlled to prevent spread and achieve elimination. A second orange hawkweed site would greatly impact the current management strategy whih depends on a single infestation site. Laughton Glacier trail was checked for orange hawkweed from 2015 to 2018, no orange hawkweed was found. Two native plants of interest were found during that time period: a hawkweed with white flowers (*Hieracium albiflorum*) and an agoseris with look-alike orange flowers (*Agoseris aurantiaca)* (Interrante 2021).

Figure 7. A look-alike native flower compared to orange hawkweed.
Left: orange agoseris inflorescence (iNATURALIST jeffreykarafa CC-BY-NC)
Right: orange hawkweed inflorescence (iNATURALIST treepublican CC-BY-NC)

No monitoring was done at Laughton Glacier trail from 2019 to 2021. In August 2022, a crew of 4 KLGO Natural Resources staff surveyed the Laughton Glacier trail. The 2 IPMT interns were joined by Biological Technician Adrian Wakeen who provided advanced plant identification skills, and Biological Technician Jen Larsen, who was familiar with the site and surveyed for other biota.

The majority of invasive species found at Laughton Glacier in 2022 were concentrated at the large clearing around the train stop. White clover and common dandelion accounted for most of the ground cover, common sheep sorrel and common plantain were also present. These infestations appeared to be contained to the areas of high disturbance around the train stop. No orange hawkweed was seen. The native hawkweed with white flowers was found (*Hieracium albiflorum* or *Pilosella albiflora*).

Dyea Town Area

Dyea Road

Dyea Road is the only road into the Dyea area, it experiences heavy traffic during the summer tourist season. The section of Dyea Road from the turn at Taiya Point to West Creek was surveyed. For most of this section, the road runs adjacent to the Taiya River, after crossing the Taiya River bridge, it passes through the Dyea woodlands.

The road is mostly unpaved, with gravel road shoulders and mowed shrubby edges throughout, providing the type of ground disturbance that fosters invasive plants. Along this stretch of road, 3 predominant invasive species were observed: oxeye daisy, white sweetclover, and timothy grass. All white sweetclover found along the road was documented using IPMT methods and manually pulled. Timothy grass and oxeye daisy were pulled when possible, but in dense populations seedheads were clipped and removed.

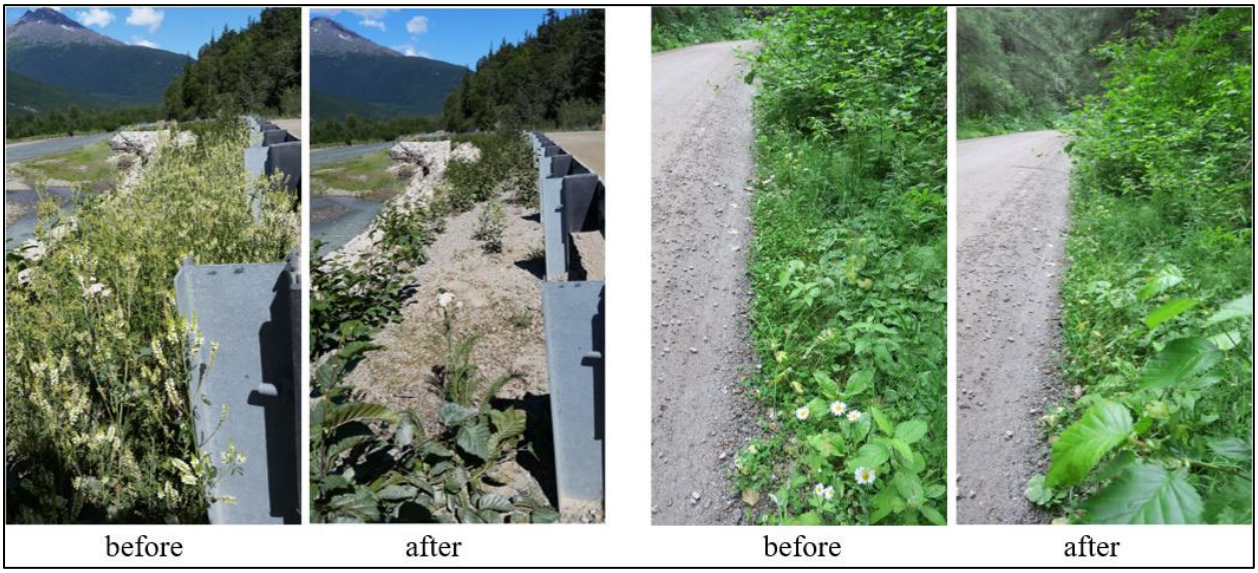

Figure 8. Manual control of invasive plants along Dyea Road.
Left panel: white sweetclover before and after manual control (NPS /OLIVIA VARGA)
Right panel: oxeye daisy before and after manual control (NPS /OLIVIA VARGA)

Dyea Historic Townsite

The Dyea Historic Townsite trail grid (Appendix C) was thoroughly inventoried for invasive exotic plants. Due to the cultural significance of the site and its exposure to high visitation, the trail grid was surveyed at a more detailed level than the standard IPMT protocol described. An example of the detail level for one side of one section of trail is shown in Appendix D. Data collected indicated the trail grid and associated disused service roads are prone to invasive plant encroachment. Species documented for the first time in the townsite during the 2022 season are common eyebright, annual bluegrass, Kentucky bluegrass, and spreading bluegrass. Other species recorded were white clover, tall buttercup, sheep sorrel, common dandelion, common chickweed, and big chickweed.

False Front Relocation in Dyea Historic Townsite

Accelerating erosion along the Taiya River cut bank on the north side of the historic townsite trail grid required the relocation of the False Front, a valued and popular gold rush artefact (Appendix C). The False Front was moved to a protected location near the entrance to the trail grid at Scow and 2nd Streets. In preparation for the relocation, the IPMT interns worked alongside archeologist Jonathan Flood to remove invasive vegetation between the trail and the new location. This preemptive measure would reduce the spread of invasive plants during and after the relocation. Complete removal of roots was not possible due to archeological considerations and time constraints. The site was monitored several times after the initial excavation and installment of the False Front on site, with new growth of annual bluegrass removed as it began resprouting.

Figure 9. Area between trail and False Front relocation site cleared of invasive plants, with KLGO maintenance team installing the artefact. (NPS)

Chilkoot Arrival Parking Lot Construction

The first stage of construction of a new parking and visitor services area for the Chilkoot Trail trailhead near the Taiya River Bridge was completed in July 2022. This project caused major ground reworking disturbance in the area. The non-parking or pedestrian travel areas of the site were seeded with an Alaska native grass to temporarily stabilize the ground pending later revegetation with native plants. This area was monitored for invasive plants in July and early August. Common dandelion was observed growing in the grass-seeded areas along the Dyea road. With plant identification assistance from Biological Technician Adrian Wakeen, quackgrass, Kentucky bluegrass and spreading bluegrass were found bordering the parking lot near the south shoulder of the Taiya River bridge.

NPS Campground Dyea

The NPS campground area in Dyea is susceptible to invasive plant introduction and spread due to ground disturbance from campers and their vehicles, and NPS staff vehicles and equipment.

A casual survey of the campground found small infestations of common dandelion, common plantain, sheep sorrel, tall buttercup, and white clover. Invasive plants were concentrated around NPS staff cabins, the parking lot, and along the road to each campsite. There were other infestations located along the perimeters of each campsite and invading nearby native vegetation.

White sweetclover was found for the first time in the NPS campground in 2022 and was immediately manually removed and documented using the IMPT procedures. Four patches were recorded: one at campsite 6, one at the large picnic pavilion, and two along the road into the campgrounds.

Dyea boot brush stations

Boot brush stations are an effective way to mitigate the spread of invasive plant species as well as educate visitors. KLGO has boot brush stations at the trailheads for the Chilkoot Trail and Lost Lake Trail. Each station consists of a post structure topped with an informative sign, and one boot brush mounted below.

The Lost Lake trail boot brush station was in good condition. This site receives only light visitation during a typical year. The sign was dirty in early summer, but a maintenance volunteer group cleaned it mid-summer. The Chilkoot Trail boot brush station was in disrepair. This site receives heavy visitation, including commercially guided hiking groups. The sign was dirty, and the boot brush was falling apart.

The IPMT program provided two new post & boot brush mounts to KLGO. However, their design was not the same as the existing stations. A modification to adapt the new boot brushes to the existing posts was investigated but could not be executed. No attempt was made to clean the Chilkoot Trail sign, since a functioning boot brush was not present.

Chilkoot Trail

The Chilkoot Trail is a fundamental cultural and natural resource of KLGO. In 2022, the trail was inventoried and mapped from the trailhead in Dyea to roughly 2 miles north of Sheep Camp campground using the IPMT protocol. The trail from that point to the summit was visually surveyed by Biological Technician Adrian Wakeen.

<u>Chilkoot Trail Invasive Plants field booklet</u>

A booklet was designed to be an identification tool for KLGO staff working on the Chilkoot Trail. The booklet was based on critical evaluation of invasiveness risk, identification research and preliminary layout done by a KLGO Biological Technician in 2021 (Interrante 2021). A contractor was retained in 2022 to generate selected illustrations and create final layout for printing, and an NPS Alaska Region Natural Resources Advisory Council small grant funded printing of the booklet.

The waterproof booklet was designed to fit into an NPS uniform cargo pants pocket. It presents the 16 invasive plants known to occur or found close to the trailhead that have the highest risk of causing environmental damage through uncontrolled spread on the Chilkoot Trail. Crucial identification characteristics with abundant photographs and graphics are given for each invasive plant and for native plants that could be easily confused with the invasive plant. The booklets will be distributed among KLGO staff and partners to increase invasive plants monitoring and control efforts.

Figure 10. Chilkoot Trail booklet invasive plants identification tool, with sheep sorrel pages. (NPS)

Trailhead to Finnegan's Point

Finnegan's Point campground is located about 5 miles from the trailhead. Inventory and manual control for this section of trail was conducted across several trips. The spur trail to the river used by commercial hike & float tours was also included in this section.

From the trailhead over Saintly Hill only a few common dandelions were found and manually removed. Where the trail flattens after Saintly Hill, dandelions became more frequent and abundant, and partial removal was accomplished. Annual bluegrass was scattered abundantly between the Beaver Pond and Finnegan's Point, but only dense patches of it were documented using IPMT procedures due to the volume and erratic distribution pattern. For the same reason and because removal of this species at this location might cause soil disturbance with archeological consequences, no manual control of annual bluegrass was performed.

Big chickweed was abundant along the trail edges between Saintly Hill and Finnegan's Point. Chickweed was manually removed whenever observed. It was not seen beyond the immediate edge of the trail, approximately 15 centimeters.

The spur trail to the river had an abundant infestation of annual bluegrass, and occasional instances of common dandelion and big chickweed. Invasive plants were inventoried and mapped on the spur trail, but due to the volume of infestation and time constraints, no control measures were attempted.

Finnegans Point to Canyon City

Invasive plants along the stretch of trail between Finnegans Point to Canyon City were concentrated within the couple of miles after Finnegans point and consisted of predominantly annual bluegrass, common chickweed and Kentucky bluegrass. Annual bluegrass periodically appeared along the 3 mile stretch between the campgrounds but was most dense within the first mile past Finnegans point campground. Dense forest canopy was noted between these campgrounds, which likely contributed to low abundance of invasive plants on this stretch of the trail.

Canyon City Campground and Canyon City Loop

The Canyon City campground and surrounding structures had a very low abundance of invasive plant species. Annual bluegrass and common dandelion were found and mapped. The approximately 1-mile Canyon City loop trail through historic Canyon City had a high abundance and diversity of invasive plant species including Timothy grass, Kentucky bluegrass, spreading bluegrass, annual bluegrass, and common dandelion.

Figure 11. IPMT intern Olivia Varga and Biological Technician Adrian Wakeen identify invasive grasses at Canyon City on the Chilkoot Trail. (NPS /C E FURBISH)

Canyon City to Sheep Camp Campground

Between Canyon City and Sheep Camp Ranger Station, invasive plants occurred as scattered, low-density patches. Annual bluegrass was the most abundant species, followed by Kentucky bluegrass, common chickweed, white clover and common dandelion. Pleasant Camp, roughly 1 mile south of the Sheep Camp Ranger Station, was relatively free of invasive plants with one patch of Timothy grass and several patches of annual bluegrass and common dandelion. The annual bluegrass growth form had shallow roots, allowing hand removal from this section of trail.

Sheep Camp Ranger Station had the highest density of invasive species and the densest distribution of them on this section of trail. The cleared field around the helipad was largely composed of common dandelion, annual bluegrass, Kentucky bluegrass and common chickweed. The helipad is routinely used by KLGO for transporting building materials, supplies, and personnel. Between the Ranger Station and Sheep Camp campground, annual bluegrass is matted along and within the path. Kentucky bluegrass and common chickweed were also recorded along the trail leading up to campground.

Figure 12. IPMT intern Olivia Varga and Biological Technician Adrian Wakeen manually removing annual bluegrass along Chilkoot trail. (NPS /C E FURBISH)

Sheep Camp Campground

Sheep Camp campground had the highest density of annual bluegrass found on the trail. It is present all throughout campground trails, tent pads, and structures. At the time of survey, numerous streams were active within the campground due to an August 2021 flood event. Annual bluegrass was found on the edges of all streams examined. Common chickweed bordered the trails throughout the campground. Tall buttercup and white clover were found sporadically within the campground.

The areas surroundings the warming structures were all highly disturbed with multiple invasive species. Most notably, reed canarygrass (rank 83) was found here, this was the only site along the trail where it was present. This highly invasive plant received special attention in past years to eradicate it before it could spread out of control. Those efforts were effective, after 2018 the site moved out of active control and into surveillance monitoring. However, due to staffing shortages and COVID-19 prevention measures, no monitoring was done 2019, 2020 or 2021. In 2022 two small patches of reed canarygrass were found along the southern side of the largest open air warming shelter. The seed heads were removed, but this plant will easily sprout from roots.

IPMT intern Olivia Varga recording data while mapping on the Chilkoot Trail. (NPS /C E FURBISH)

Sheep Camp Campground to Chilkoot Pass

The trail from Sheep Camp campground to a place roughly 2 miles north was surveyed using GPS. The area roughly 2 miles north was being called “the flats” by trail rangers, however it was probably the area known as "Long Hill" in the past. Annual bluegrass densely covered much of the trail despite the rocky terrain. Common dandelion was also present along this stretch of trail, however native dandelions were also observed. Common chickweed was dense near the campground, but diminished as the trail ascended in elevation and becomes rocky.

The rest of the trail north to the Chilkoot Pass was visually surveyed. Timothy grass was seen along some sections of trail, and dispersed patches of annual bluegrass found all the way to the summit.

Education and Outreach

Effective invasive exotic plant management must engage the community to increase awareness of and spread knowledge about invasive plants to the public. Most invasive plants are spread unknowingly by people who do not understand the impact of invasive plants on the environment. By providing the tools to think about the problems associated with invasive plants, we can empower participants to make knowledgeable choices about preventing the spread of invasive plants.

Children are particularly eager to learn about their environment, especially through outdoor activities. During the 2022 season, the IPMT interns worked in collaboration with other entities on multiple outreach and education projects.

Skagway Recreation Center Summer Camp

SRC holds two summer camp days for students each year: one for 1st through 3rd graders and one for 4th through 6th graders. The KLGO Education Specialist coordinated KLGO staff participation in SRC events through collaboration with STC and SRC. The IPMT interns developed a short informative talk to launch the summer camp days. Afterward, the STC environmental coordinator oversaw a reed canarygrass removal at Pullen Creek.

Other activities included planting native thimbleberry (*Rubus parviflorus*) seedlings, an invasive plant bingo game, invasive plant coloring sheets, a population simulation tag game about the impact of reed canarygrass on river health, and pressing and taping identified plants onto cards for students to take home. Take-home information and identification sheets were distributed to students.

Figure 13. Pullen Creek summer camp invasive plant activity day.
Left: Reuben Cash (STC) shows a native pea plant to summer camp students. (NPS)
Right: Jolanta Ryan (KLGO) and IPMT intern Olivia Varga hold bags and assist students removing invasive reed canarygrass at Pullen Creek. (NPS)

The Pullen Creek summer camp days provided a wide scope of direct interaction and hands-on activities with invasive plants, both of which are crucial components in engaging younger age

groups. Such activities are effective in conveying the negative impacts of invasive plants on local ecosystems.

Junior Ranger Day

Junior Ranger Day is an annual event hosted every July at KLGO. Local and visiting families to the park are invited to participate in a wide variety of activities hosted by different park programs, such as natural resources, archeology, museum collections, etc. The IPMT interns hosted two tables dedicated to tangible, informational take-home activities.

The first table was dedicated to creating bookmarks using a variety of previously pressed invasive plants and colorful bookmark templates with information about invasive species on the back. Participants selected their pressed plant, which was identified and described by an intern. Clear tape was used to seal the pressed plants to the template. The second table was set up with informational invasive plant coloring sheets and supplies, and an invasive plants card matching game.

Figure 13. Junior Ranger Day bookmarks made from pressed invasive plants with information on backside. (NPS /OLIVIA VARGA)

IPMT Interns Discussion and Recommendations

The Invasive Plant Management Team interns at Klondike Gold Rush National Historical Park offer these observations, opinions, and recommendations for future invasive exotic plant management.

The highly ranked invasive species in Skagway and Dyea should remain the highest priority for effective containment. Also, high priority would be continuing the multi-year projects that the team oversaw for the 2022 season. Monitoring and surveying efforts should focus on high traffic areas, and frequent re-checking of the areas should occur across a season. The focus in these areas should be on containment of new or highly ranked invasive plant species.

The need to map preexisting populations or low ranked invasives would not be a high priority, however, they should be described in field surveys or notes. Continued education and outreach with the local community and park visitors should remain a priority. Educational activities to increase awareness about the presence, impacts, and ways to report and contain invasive plant species, should remain a priority.

Existing invasive ornamentals on historic NPS property

Many properties in Skagway have established invasive plant populations which were planted as ornamentals. On some NPS properties, particular invasive plants may hold historical significance. The Moore Homestead and Peniel House have established populations of European mountain ash and Siberian pea shrub, which are ranked at 59 and 74 respectively in the AKEPIC invasiveness ranking system. While it is recommended that such plants be removed whenever possible, the IPMT interns recognize the historical significance of some ornamental plants in Skagway. These plants should be closely monitored to ensure new growth is controlled and seedlings are pulled. Additionally, when plants start to die, deteriorate, or become a hazard, we recommend that such plants be removed and replaced with a species native to Skagway. Monitoring and continued communication with maintenance staff about the state of these plants is crucial to successful monitoring and containment of the plants and historical preservation of the park.

Continuing Projects

<u>Orange Hawkweed monitoring</u>

Since 2015, control efforts to eradicate orange hawkweed at the Dewey Reservoir has been a high priority for IPMT staff. The manageable size of the infestation and high invasiveness rank (79) indicate that this plant should remain a high priority project until eradicated. The small rosettes area seen in 2022 was recommended to be tarped in spring of 2023 by the Alaska Region IPMT coordinator. In addition, frequent monitoring and manual control focused on complete removal of above and below-ground tissues of orange hawkweed should be continued.

<u>Collaboration with Skagway Traditional Council</u>

Collaboration with Skagway Traditional Council (STC) should remain of the upmost priority for future IPMT staff. Combining mitigation efforts and personnel proved to be very effective in locating and removing white sweetclover and reed canarygrass during the 2022 season. The KLGO biologist instructed the 2022 IPMT interns to make STC cooperative control projects high priority. When

contacted by STC about invasive plant removals or education programs, IPMT interns had the flexibility to adjust their schedules for these collaborative efforts. Collaboration with STC helps ensure the control and monitoring of the invasive plants in Skagway and KLGO.

Education and Outreach

As one of the main objectives for the IPMT program, education and outreach was a high priority activity. During the season, the IPMT interns participated in the SRC summer day-camp education programs on invasive plants, as well as the KLGO Junior Ranger Day. Events like these are important to begin education and awareness of invasive plant species, the environment, and the public's place in it, across all ages, but especially for younger audiences. Efforts to continue collaborating and participating in education and outreach events are vital to continued support for the IPMT program, and to inform the local community and park visitors about invasive plants.

The White Pass Unit

Laughton Glacier trail is near the White Pass unit of KLGO. It is a relatively high-traffic destination accessed by the railroad. The high frequency of hikers and frequent maintenance on the railroad serves as an effective way for invasive species to travel into this remote area. The White Pass unit of the park has not been a high priority for IPMT staff, due to transport logistics and time needed to travel to and effectively survey these areas. Despite the challenges the White Pass unit presents, we recommend that trailheads such as Laughton and Denver Glacier are monitored in order to keep any occurrences of high priority invasive species from becoming established.

Fireweed (native plant) near Laughton Glacier. (NPS /JEN LARSEN)

Surveys in this area of the park should occur later in the season if possible. The high elevation of these trails means that plants blooms times are later in the season than areas near sea-level in Skagway and Dyea.

Suggested Projects

Herbarium

In past years, the herbarium has been noted to be a useful tool for interns to view specimens in order to establish a familiarity with the local vegetation, and to recognize and distinguish invasive and native plants from one another. During the 2022 season, the KLGO herbarium was not accessed nor added to by the IPMT interns, however, it is recognized that the herbarium would prove especially useful at the beginning of the season. Additionally, as new invasive plants are documented in Skagway each year, it would be valuable for interns to collect plant specimens to be added to the collections.

Boot Brushes

Boot brushes are an effective way to mitigate the spread of invasive plant species as well as educate visitors. Within KLGO, the boot brush currently located at the Chilkoot Trail trailhead was broken, while the boot brush at Lost Lake trailhead was in good condition. Consistently cleaning the surfaces of the interpretation signs and replacing weathered boot brushes would ensure that boot brushes are noticed and utilized by visitors. The combination informational sign and boot brush display at the head of the Chilkoot Trail should be monitored frequently to ensure it is clean and visible, and the attached boot brush is intact and functional.

Working with partners to install and maintain boot brushes on trails outside of KLGO would contribute to reducing the spread of invasive plants within KLGO. In the Skagway Municipal trail system, the Dewey Lake and Yakutania Point boot brushes are significantly weathered. In the Tongass National Forest areas accessed by railroad, Laughton Glacier and Denver Glacier trailheads did not have boot brushes or educational signs.

ArcMap

Learning how to create maps and utilize ArcMap to input, interpret and visualize recently collected data would be of great value to the interns involved with monitoring invasive plant populations. Additionally, the maps would serve as a visual tool for future IPMT interns and KLGO staff in finding and effectively treating plant populations, especially in remote places and along the Chilkoot Trail. It is recommended that during the 2023 season IPMT staff take online GIS training and utilize those skills to create maps which utilize data they have collected on invasive plants within KLGO.

Standardized Polygons

Standardized polygons are an effective tool in collecting data each year in an already mapped and surveyed area. These are especially helpful in buildings, parking lots and anywhere with definitive borders. During the 2022 season limited data was collected utilizing standard polygons mainly because only a several exist for KLGO. One additional standard polygon for the NPS maintenance building was created and data was collected and added to the existing standardized polygon for Jeff Smiths Parlor. For 2023, we recommend the IPMT staff create standardized polygons for NPS property in Skagway such as the 14th street Duplex and the Moore Homestead. Additionally standardized polygons should be made in Dyea at the newly constructed Chilkoot Arrival parking lot, NPS campground, Lost Lake trailhead and Slide Cemetery.

IPMT intern Olivia Varga uses GPS equipment to map Chilkoot Trail. (NPS /C E FURBISH)

Skagway

Documentation and manual control of species of high priority should be the focus of IPMT interns in the town of Skagway. In previous years, landowners were alerted when invasive plant were present on their property either as ornamentals or random lawn occurrences. We recommend informing landowners of invasive plants occurrences be added to future IPMT activities. This had previously been done through formal letters sent to landowners offering to have IPMT come and remove the species, which appeared to have been effective in select instances in previous years. If this is to continue, it would be valuable to include additional information about the impacts and effects of invasive species.

Dyea

The heavily trafficked Dyea Road should be monitored closely for invasive plants as it is the only road between the town of Skagway and the Dyea Historic Townsite and the Chilkoot Trail. Walking the road in sections multiple times throughout the season is a recommended way to monitor invasive

plant occurrences, but, in previous years, biking the road has proven an effective means of spotting high-ranking invasive plants.

The Historic Townsite should continue to be monitored for high priority invasive species. If found, invasive species should be manually removed as soon as possible. Mapping species of low invasive rank should not be a priority during 2023 as this was done in 2022. Monitoring the populations by visual and phenotypical indications, rather than mapping, and noting this for future work would allow most time and effort to be spent on high priority species and manual control.

Monitoring of the heavily trafficked attractions in Dyea such as Slide Cemetery and the NPS campground, and Lost Lake trailhead to a lesser extent, should be done regularly to ensure no high priority species are present.

The newly constructed Chilkoot Arrival parking lot is a highly disturbed area it's location along a busy roadside makes it extremely suspectable to invasive plants. The parking lot should be continually monitored over the 2023 season, with control efforts for all invasive species. Species with low invasiveness ranking should be included, because the area of disturbed soil is ripe for invasive establishment and has the potential to become a source for spreading invasives to the rest of Dyea and the Chilkoot Trail.

Chilkoot Trail

The abundance of invasive species throughout the Canyon City loop trail is of high concern because of its proximity to an area of the Chilkoot Trail which is largely uninhabited by invasive plant species.

Monitoring and controlling reed canarygrass at Sheep Camp campground should remain a high priority for IPMT on the Chilkoot Trail. Sheep Camp campground has the only documented populations of tall buttercup and reed canarygrass on the Chilkoot Trail. Controlling these populations should remain a high priority as both species are highly capable of spreading along the trail and establishing large populations. North of Sheep Camp, the invasive common dandelion and a native dandelion both occur, so during future years definitive distinctions should be made before mapping or documenting dandelion populations up to the pass.

It is recommended that the trail be hiked and monitored at least twice and ideally three times during each season because of the ecological diversity of the trail and varying bloom times of plants. In order to make multiple surveys valuable, the trail should be surveyed at the beginning of the season and at least once more in late June or July to ensure no invasive plant occurrences are missed because of the breadth of phenology. It is also recommended that all invasive plant occurrences along the trail be pulled to keep populations of even low priority invasives at a minimum or ideally non-existent.

Education and outreach

Previous IPMT interns have conducted educational talks and walk-throughs of Skagway for visitors, emphasizing and giving educational information on invasive plants. Previous displays about invasive plants have been set up in the Skagway Public Library and different park service buildings and it is recommended that both outreach opportunities are explored and implemented as a part of the IPMT

program to reach a wider audience of park visitors and local community members. Educating the park staff, especially trail crew and maintenance staff, about how invasive plants can be spread, as well as what to look for and how to identify species, would be a valuable way to potentially help identify and alert IPMT of invasive plant occurrences in the backcountry, as well as help to mitigate accidental spread of invasives from contaminated equipment.

Broadway native plant garden

Located on Broadway and 6th Street there is a native plant garden which once contained informational signs and manicured lush native vegetation. Due to the personnel shortage over the last four years this native plant garden has become overgrown and the painted and laminated informational signs have faded and in some cases are non-existent. Revamping these garden beds and signage would be a valuable service to the beautification of the park in additionally an opportunity to spread information and awareness about invasive species. It is recommended that communication and collaboration between IPMT interns as well as the interpretation and maintenance staff is facilitated to ensure that signage is easily decipherable and to assist with manicuring and upkeep of the plants. Additionally, since the revegetation project will be starting during the 2023 season there will be opportunity for new plant specimens and seeds left over from the revegetation project to planted or used as replacement for current plants in raised beds.

Phenology

With the change in climate, most plants are beginning to flower and seed earlier in the season each year. It is imperative to get out and complete certain projects as early as possible in order to prevent the plants from going to seed and dispersing to new locations. This is particularly important for species such as oxeye daisy, reed canarygrass and white sweetclover because once developed and the seeds are dropped, these seedbanks are viable for many years.

IPMT intern Jay Hamill prepares to attack sweet white clover. (STC /REUBEN CASH)

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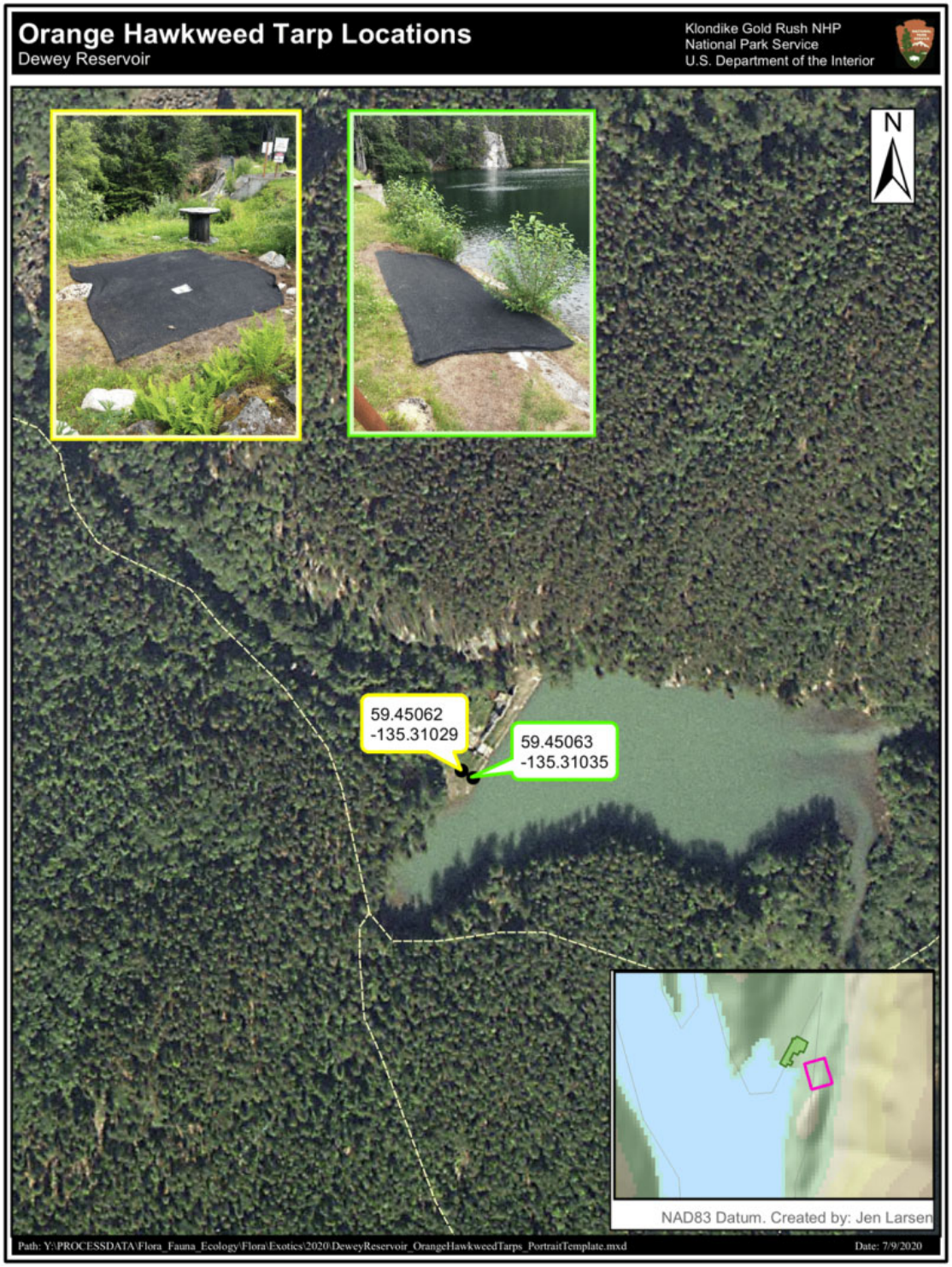
Appendix A - Plant Names

List of invasive exotic plant species recorded in 2022.

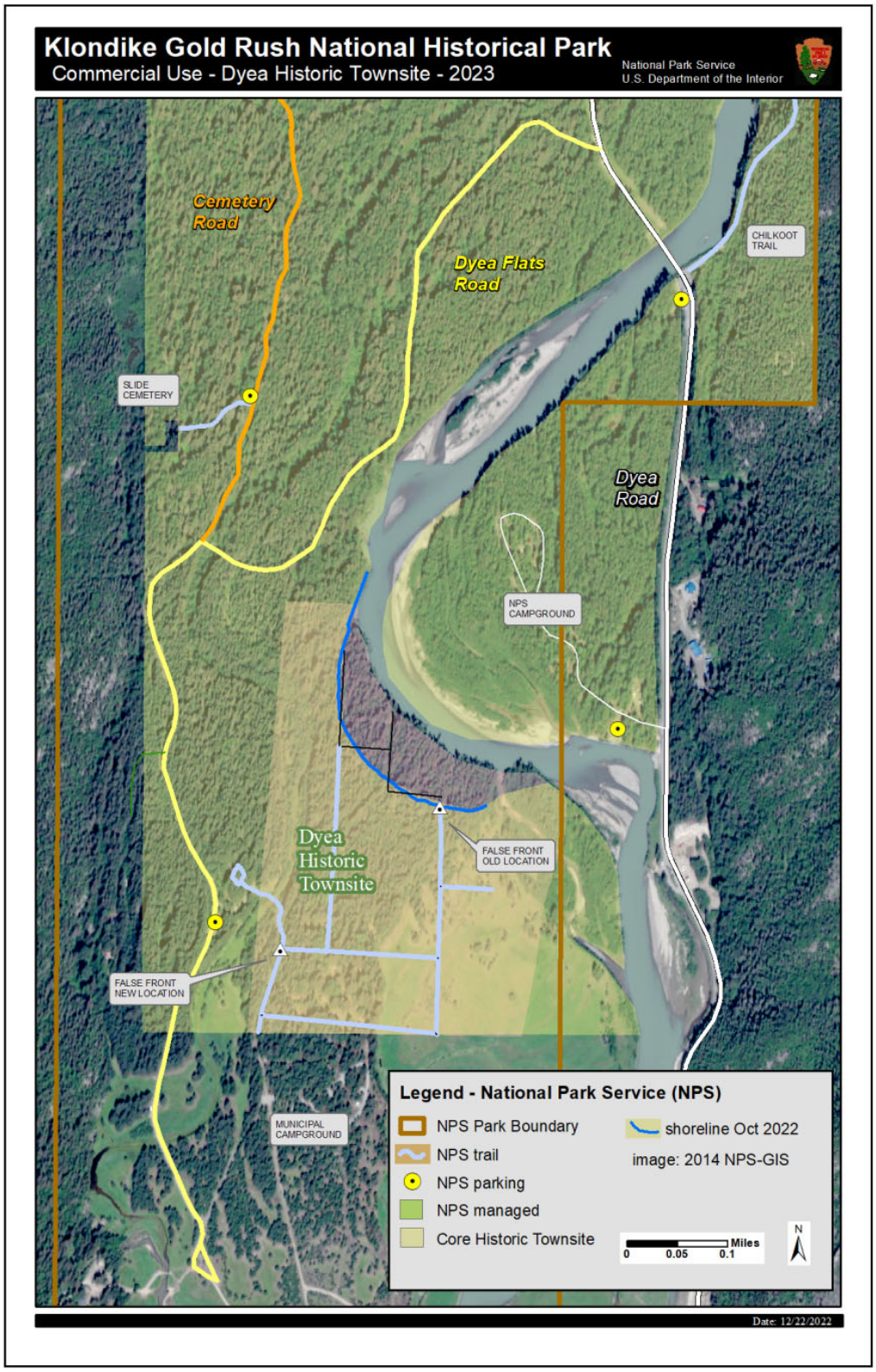
Scientific name	Common Name	Inventory	Manual Treatments
Alchemilla mollis	Lady's mantle	X	
Bromus inermis	Smooth brome	X	
Capsella bursa-pastoris	Shepherd's purse	X	
Caragana arborescens	Siberian peashrub	(X)	
Cerastium fontanum	Big chickweed	X	X
Cerastium tomentosum	Snow in summer	X	
Elymus repens	Quack grass	X	
Euphrasia nemorosa	Common eyebright	X	
Hieracium aurantiacum	Orange hawkweed	X	X
Leucanthemum vulgare	Oxeye daisy	(X)	
Linaria vulgaris	Butter and eggs	X	
Matricaria discoidea	Pineapple weed	X	
Melilotus albus	White sweetclover	X	X
Melilotus officinalis	Yellow sweetclover	(X)	X
Phalaris arundinacea	Reed canarygrass	X	
Phleum pratense	Timothy grass	X	
Plantago major	Common plantain	X	
Poa annua	Annual bluegrass	X	X
Poa pratensis	Kentucky bluegrass	X	
Poa pratensis ssp. irrigata	Spreading bluegrass	(X)	
Polygonum aviculare	Prostrate knotweed	X	
Ranunculus acris	Tall buttercup	X	
Ranunculus repens	Creeping buttercup	X	
Rosa rugosa	Rugosa rose	X	
Rumex acetosella	Sheep sorrel	X	X
Rumex crispus	Curly dock	X	
Senecio sylvaticus	Woodland ragwort	X	
Sorbus aucuparia	European mountain ash	X	
Stellaria media	Common chickweed	X	
Tanacetum vulgare	Common tansey	X	
Taraxacum officinale ssp. officinale	Common dandelion	X	X
Trifolium hybridum	Alsike clover	X	
Trifolium pratense	Red clover	X	
Trifolium repens	White clover	X	X

(X) = not contained in inventory records, but documented elsewhere

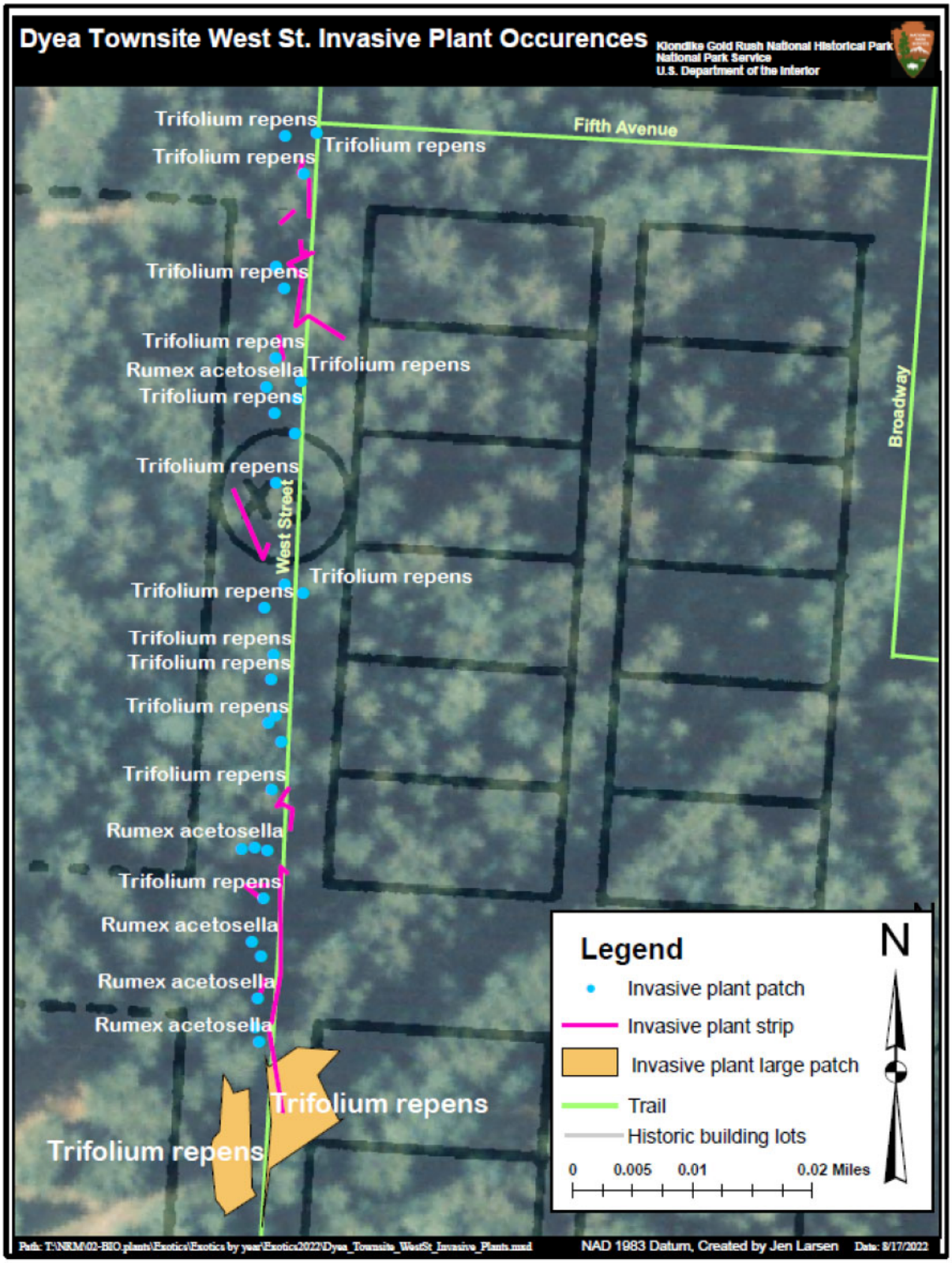
Appendix B - Orange Hawkweed Site



Appendix C - Dyea Area Map



Appendix D - Dyea Historic Townsite Trail Grid



The Department of the Interior protects and manages the nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its special responsibilities to American Indians, Alaska Natives, and affiliated Island Communities.

NPS XXXXXX, Month Year (The Fort Collins Support Office will fill out this line for you)