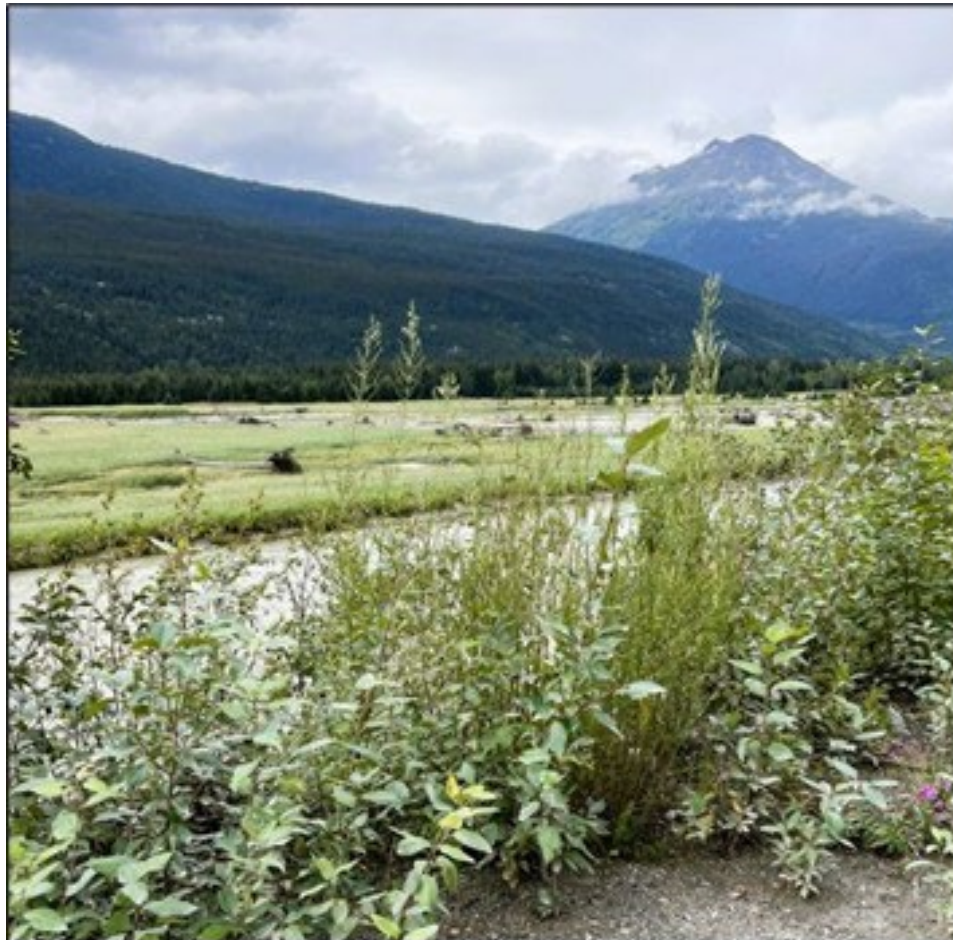




Invasive Exotic Plant Management in Klondike Gold Rush National Historical Park

2023 Summary Report

A Klondike Gold Rush National Historical Park Publication



**ON THIS PAGE**

KLGO invasive plants removal intern crew at Chilkoot Arrival visitor services. Left to right: Isabella Yallapragada, Adrian DeLong, Annika Christensen, and Gale Vantrease; not pictured: crew leader, biological technician Lynn Rhodes (NPS)

ON THE COVER

White sweet clover on Dyea Road shoulder, looming over the banks of the Taiya River (NPS //Lynn Rhodes)

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2023 Summary Report

A Klondike Gold Rush National Historical Park Publication

Lynn Rhodes¹ and C. E. Furbish²

¹Biological Science Technician
Klondike Gold Rush National Historical Park
P.O. Box 517
Skagway, Alaska 99840

²Biologist
Klondike Gold Rush National Historical Park
P.O. Box 517
Skagway, Alaska 99840

February 2024

Klondike Gold Rush National Historical Park (KLGO) produces reports about natural resource and management subjects to document the status of park natural resources, monitoring projects and resource studies. These reports may not meet the rigorous standards of a National Park Service Natural Resource Stewardship report or a peer-reviewed scientific journal. However, they document natural resources condition information intended for all interested audiences, managers, professionals, and the public.

These KLGO reports receive the appropriate level of peer review to ensure that the information is accurate and presented in a professional manner. This report received peer review by at least one subject-matter expert or management specialist who was not directly involved in the collection, analysis, or reporting of the data.

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List of Acronyms

ARO - NPS Alaska Region Office

AGOL - ArcGIS On Line

AKDOT - Alaska Department of Transportation and Public Facilities

AKEPIC - Alaska Exotic Plants Information Clearinghouse

CVIP - Conservation Volunteer International Program

EDRR - Early Detection and Rapid Response

GIS - Geospatial Information System

GPS - Global Positioning System

IPMT - Invasive Plant Management Team

KLGO - Klondike Gold Rush National Historical Park

NPS - National Park Service

NRM - Natural Resource Management

RAD - Resist-Accept-Direct management paradigm

SRC - Skagway Recreation Center

STC- Skagway Traditional Council

Abstract

Management of invasive exotic plants at KLGO is accomplished through park projects, the NPS Alaska Region Invasive Plant Management Team program, and through cooperative activities with community organizations and people. The IPMT program separately compiles and reports spatial and quantitative data for Alaska parks, including KLGO IPMT data and sometimes other data contributed by KLGO. Emphasis is on monitoring and control, but educational outreach and native seed collection are also important parts of successful invasive plants management. This report documents KLGO operations, including IPMT information, for 2023. It includes a description of strategy and goals, selection and prioritization of species and sites, summaries of actions accomplished, and detailed discussion and recommendations for future actions.

Acknowledgements

The authors express thanks and appreciation to all who contributed to the 2023 invasive plants management efforts at KLGO and the greater Skagway area. Anna O'Brien coordinated the Alaska Region IPMT program, without which most work would not have been accomplished. A number of NRM interns contributed critical parts to bring the whole of invasives plant management together for KLGO in 2023: Lexi Zolenski, Isabella Yallapragada, Julianna Tenebaum, Annika Christensen and Jeff Bodendorf. Interns from the KLGO interpretation program volunteered to help with specific events: Adrian DeLong and Gale Vantrese. Thanks also to Gale for offering Lingit indigenous plants knowledge.

Biological-GIS technician Jen Larsen gave essential bio-technical support and helped with spatial data technical issues. Special thanks to trail crew member Cat Stewart for coordinating an adult volunteer group workday for invasive plant control, and to the trail crew who helped with that event: Josh Colosky, Ian Hayes and Ken Graham. Trail Center ranger Kari Rain helped with an outreach event for adults and children. Johanna Evans coordinated the SRC Summer Day Camp program that generously included KLGO presentation of an educational youth outreach event.

This year's accomplishments were a collaboration on the part of many, KLGO staff and many others, we recognize and value all who contributed to its success.

Introduction

Klondike Gold Rush National Historical Park (KLGO) is located in Southeast Alaska at the northern terminus of the USA-Canada fjord system known as the “Inside Passage.” The park is approximately 13,000 acres distributed among three separate units (Figure 1) within the Skagway Borough valleys of the Taiya River (Chilkoot Unit) and Skagway River (Skagway and White Pass Units).

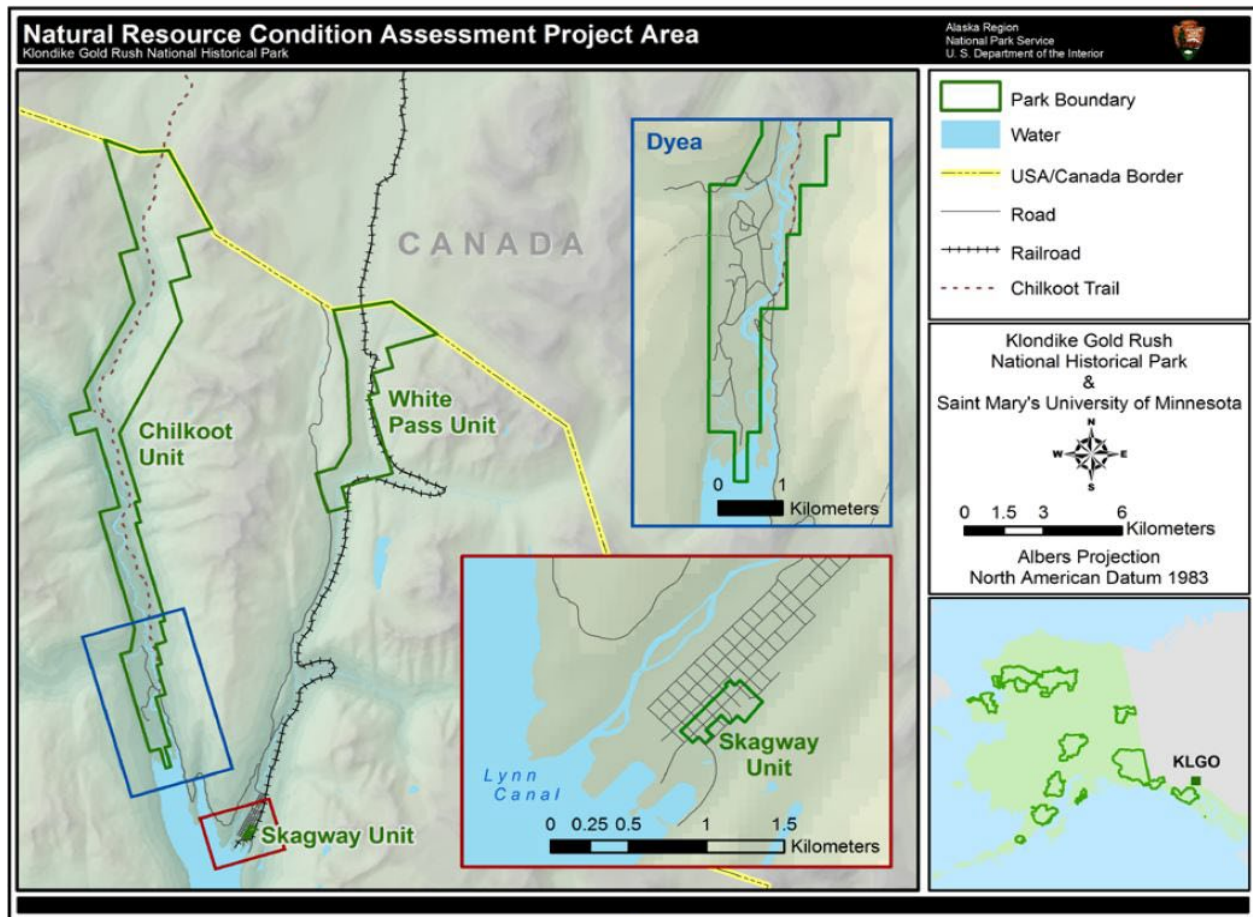


Figure 1. KLGO park units and general vicinity map (Bernatz et al. 2011)

The Skagway valleys are rich in biodiversity along an ecological gradient from lowland tidal flats, coastal rainforest, sub-alpine forest, high-alpine meadow, to alpine tundra (Pojar and Mackinnon 1994). The short, steep valleys form an ecotone where coastal and interior ecosystems mix to create a patchwork of landcover habitats (Flagstad and Boucher 2015) and foster high biodiversity of flora and fauna (Bernatz et al. 2010). The Skagway area is unique in the Inside Passage rainforest and fjord system as the only place where coastal temperate rainforest abuts an interior boreal/sub-boreal forest ecoregion - all other mainland rainforest areas in southeast Alaska are separated from interior forested ecoregions by rocky, low-vegetation mountain/icefield ecoregions (Demarchi 2011).

Though rich in biodiversity, KLGO is vulnerable to the introduction and spread of invasive and exotic plant species. While birds and other wildlife that pass through Skagway are vectors for invasive species, KLGO is particularly at risk for introduction and spread of exotic plants from a tourism-based economy with high human activity. During the warm months, over 10,000 new visitors per day, arriving via cruise ships, planes, other vessels, and road vehicles, may unintentionally transport exotic plants throughout the area. Construction and maintenance activities create disturbed or cleared areas susceptible to invasive plants. There is also strong local horticultural interest in Skagway, the self-proclaimed “Garden City of Alaska,” for businesses, public properties, and residents to create attractive gardens and planters, which may include invasive ornamental plants.

Invasive plant management at KLGO is accomplished through within-park projects and as part of the NPS Alaska Region Invasive Plant Management Team (IPMT) program. The IPMT provides support to all Alaska NPS units to inventory, map, monitor and control invasive exotic plants through standardized methods that apply to all parks. KLGO often desires additional data at higher resolution (smaller spatial discrimination) than the IPMT standards. KLGO resources, maintenance and/or educational projects may include invasive plant control efforts outside the IPMT program.

KLGO also engages in joint efforts with local, state, federal and tribal government entities, as well as local civic organizations, groups and private property owners. Both within and surrounding the KLGO administrative boundary, property is a patchwork of different owners and managers. KLGO must work cooperatively with stakeholders to accomplish effective invasive plant management within the park and the larger community.

Strategy and Goals

Invasive exotic plant management at KLGO follows the early detection and rapid response (EDRR) strategy for federal land management agencies, formalized in 2016 (USDOI 2016) and updated in 2019 (Reaser et al. 2019). The strategy emphasizes the efficiency and effectiveness of prioritizing control efforts on the most highly invasive species with potential for habitat alteration or replacement when they are first detected. In Alaska, EDRR is anchored in the state-wide invasiveness ranking system for invasive exotic plants developed by state and federal experts (Carlson et al. 2008). Updates to invasive plant distributions and concerns from federal and state agencies are reported through the Alaska Exotic Plants Information Clearinghouse (AKEPIC) maintained by the Alaska Center for Conservation Science, at the University of Alaska, Anchorage.

Now and into the future, management of invasive exotic plants at KLGO will also include the Resist-Accept-Direct (RAD) strategic framework (Schuurman et al. 2022) for management response to the effects of rapid global climate change. As local environmental changes increase in speed and severity, an additional evaluation of anticipated plant adaptation and habitat transformation should be overlaid upon the EDRR. Examples include immediate considerations such as invasive plants that heretofore could not survive the Skagway winter being able to thrive in warming climatic conditions, and longer term considerations such as plant assemblages that will likely shift to higher elevations and may eventually run out of appropriate habitat.

Year 2023 goals were developed by considering the highest risk species and sites at KLGO and within the general Skagway area.

Primary goal: monitor and control -- to track and manage particular invasive plants at particular sites:

- control the highest priority EDRR invasive plants at all known existing sites,
- control lower priority EDRR invasive plants at selected sites with added non-EDRR considerations, such as popular visitation areas or culturally sensitive landscapes, and
- survey for selected invasive plants not problematic in our area, but identified as high potential invaders through EDRR and RAD.

Note: a general inventory survey and mapping for all invasive exotic species at most sites within KLGO was completed in 2022. Therefore, the primary goal for 2023 concentrated on control activities for selected species and/or sites.

Secondary goal: education and outreach -- to foster prevention and independent action to reduce invasive plant introduction and spread through public outreach and education:

- participate in KLGO or community educational events for school-age children,
- offer adults educational materials and events, and arrange control activities for adult volunteers,
- provide KLGO commercial tour guides with information and tools, and
- provide park visitors and staff with information and boot brush stations at key foot traffic locations.

Tertiary goal: collect native plant seeds -- to support repair of invasive plant infestation sites post-treatment and resist introduction of invasive plants on cleared ground. Native plant restoration is often

needed to prevent invasive plant colonization at newly disturbed bare ground or after invasive plant control removes all vegetation at a site. Restoration projects at KLGO are largely planned and executed outside the IPMT program, but the IPMT program at times may offer support for native seed collection, processing and propagation for restoration projects.

For all above, KLGO works with cooperators and partners as much as possible.



Footpath between Dyea NPS campground to Chilkoot Arrival visitor services (NPS)

Methods

In this section, common plant names are given in paragraphs; common and scientific names are given in tables. See Appendix A for common and scientific names of all plants mentioned in this report.

Selection and prioritization of invasive species and sites of concern was the first step for invasive plants management in 2023. Logistical considerations included personnel and transport availability, and possibilities for cooperative activities. Education and outreach events were largely dependent upon coordination outside the resources division of KLGO. Seeds of native plants identified for restoration at KLGO facilities were collected by NRM staff.

Workplan Development

Geographic areas and recent data

Locations of interest were developed based on the results of extensive invasive plant surveys conducted in 2022 (Varga and Hamill 2023) and ongoing multi-year control efforts. Sites were grouped by geographic area to facilitate implementation of planning, monitoring, control, and reporting. Geographic areas for 2023 were Skagway Valley, Dyea, Chilkoot Trail, and General. Sites within geographic areas, specific places within the sites, 2022 survey and ongoing multi-year control status are presented in Table 1.

Table 1. 2023 geographic areas and sites, 2022 survey, and ongoing control efforts.

Geographic Area	Site	Specific Place(s)	2022 Survey Result	Ongoing Multi-year Control Effort
Skagway Valley	Lower Dewey Reservoir	banks of reservoir near dam (MOS joint effort)	5 invasives noted, not full inventory	orange hawkweed (<i>Hieracium aurantiacum</i>)
Skagway Valley	town area	KLGO lots, (other areas STC joint effort)	8 invasives noted on KLGO property	white sweetclover (<i>Melilotus albus</i>)
Dyea	Dyea Road in Taiya valley	roadside shoulders and ditches	7 invasives noted, mutiple locations	white sweetclover (<i>Melilotus albus</i>)
Dyea	Historic Townsite	trail edges and low meadows	16 invasives inventoried	no
Dyea	NPS Campground and Footpath	campground + footpath to Chilkoot Arrival	6 invasives noted	no
Dyea	Chilkoot Arrival Visitor Services	parking lot edges, bare ground from construction	site under construction	initiated in 2023 for all invasives
Chilkoot Trail	Sheep Camp Campground	picnic shelter, warming cabin, trails and tent sites	6 invasives noted, concentrated at buildings	reed canarygrass (<i>Phalaris arundinacea</i>)
Chilkoot Trail	Sheep Camp Ranger Station	helipad, trails and near all structures	at least 6 invasives noted at high density	no
General	all roads and easily accessed public areas	(joint control efforts at places selected by STC)	33 invasives inventoried	white sweetclover (<i>Melilotus albus</i>)

Species Alaska invasiveness rank, EDRR and RAD

The Invasiveness Ranking System of Non-Native Plants of Alaska (Carlson et al. 2008) was used to evaluate known invasive plants in KLGO and the Skagway Borough. The ranking system 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.

Following EDRR methodology, KLGO gave highest priority to species with invasiveness rankings 70-80 or above in combination with a small spatial presence in Skagway. Species with lower invasiveness rankings (49 or less) and with larger local extent were considered lower priority for control activity. Four species were identified and prioritized through EDRR methods.

Following the RAD framework, KLGO attempted to identify and strategize management of new invasive plant concerns anticipated from climate change warming in Skagway. Bird vetch was presented as a species of high concern for Alaska at the May 2023 IPMT training session in Anchorage. It has periodically been found at two sites in Skagway in the past 2 decades, but apparently failed to thrive or spread (AKEPIC 2023). Bird vetch can be confused with the native beach pea, widespread along roads and beaches in Skagway. Based on the premise that the previously low-priority bird vetch could become more able to thrive and may have spread without being detected, KLGO assessed *RESISTANCE* as the best strategy for this species and made a general survey for its presence a high priority.

Table 2 presents the 5 invasive exotic species with associated information and their 2023 priority.

Table 2. High invasiveness rank species, locations, and 2023 priority.

Invasive Plant (scientific name)	AK Invasiveness Rank	Skagway Valley Locations (plus Nahku Bay)	Taiya Valley Locations	2023 Priority (type of activity)
orange hawkweed (<i>Hieracium aurantiacum</i>)	79	only one, on the banks of Dewey reservoir near the dam	none	highest (control)
reed canarygrass (<i>Phalaris arundinacea</i>)	83	probably only one, at Pullen Creek near Pullen Pond	probably only one, on Chilkoot Trail at Sheep Camp campground	highest (control)
white sweetclover (<i>Melilotus albus</i>)	81	scattered in townsite, Liarsville, Klondike Hwy south of Black Lake; not in Nahku Bay	scattered along Dyea Road and in NPS Campground	high (control)
common dandelion (<i>Taraxacum officinale</i>)	58	widespread, pervasive in townsite + along roads, including Nahku Bay	widespread along roads and trails, and in meadows	low (control, on NPS property in Dyea)
bird vetch (<i>Vicia cracca</i>)	73	in the past, 2 sites east of Spring Street, between 9 th and 10 th Avenues.	not recorded, but could be confused with widespread beach pea	high (survey)

Additional considerations

Sites with multiple invasive species with varying invasiveness rankings, but with additional local considerations, were added as lower priority locations. Four (4) KLGO high visitation sites and one KLGO staff support site were identified as places for control effort to eliminate or reduce all invasive plants:

Dyea NPS campground

Chilkoot Arrival services area

Dyea Historic Townsite

Sheep Camp campground

Sheep Camp ranger station

All of these sites have the potential to be an introduction point for new invasive plants, and currently act as source areas for spread of already established invasive plants. With the exception of the Sheep Camp ranger station (a staff support area) the sites are also visitor experience nodes where the cultural landscape should demonstrate the historic setting as it is changed by natural processes, and provide a visitor experience of native plants and wildflowers rather than the same “weeds” visitors see at home.

A number of logistical constraints were known and accounted for when planning the invasive plants management program at KLGO in 2023. The Chilkoot Trail would be closed until August due to ongoing repairs from flooding in autumn 2022, access to the Sheep Camp area would be limited to helicopter travel during that time. Vehicles needed to access the Dyea area would not be regularly available. The IPMT intern would not be at the park until the end of May, and a biological technician to work with the intern would not start until early July.

Opportunities were also included in the season workplan. A visit to KLGO in August was planned for an IPMT program certified herbicide applicator, primarily to treat reed canarygrass at Sheep Camp, but to include other priority plants and/or sites if practical. Cooperative work events were planned with STC to remove white sweetclover from various Skagway sites. The KLGO maintenance division offered a CVIP group for a day of invasive plants control in Dyea.

Table 3 summarizes the monitoring and control workplan sites and activities planned for the 2023 KLGO invasive exotic plants management program.

Table 3. Summary of 2023 monitoring and control workplan for invasive plants.

Geographic Area	Site	Invasive Plant (<i>scientific name</i>)	Activity and Timing (control by NRM staff unless otherwise indicated)	Priority
Skagway Valley	Lower Dewey Reservoir	orange hawkweed (<i>Hieracium aurantiacum</i>)	monitor and manual control weekly, mid April to mid October	highest
Skagway Valley	town area	white sweetclover (<i>Melilotus albus</i>)	assist STC, manual control patches along roads and lots June - August	highest
Dyea	Dyea Road in Taiya valley	white sweetclover (<i>Melilotus albus</i>)	manual control July-August	high
Dyea	Historic Townsite	common dandelion (<i>Taraxacum officinale</i>)	manual control - June	lower
Dyea	NPS Campground and Footpath	common dandelion (<i>Taraxacum officinale</i>) others if apparent	manual control with CVIP, June	lower
Dyea	Chilkoot Arrival Visitor Services and road shoulder	all apparent invasive plants	manual control dandelion with CVIP, June all plants, July	lower
Chilkoot Trail	Sheep Camp Campground	reed canarygrass (<i>Phalaris arundinacea</i>)	manual control - June herbicide, IPMT staff - August	highest
Chilkoot Trail	Sheep Camp Campground	other invasive plants	manual control - June herbicide, IPMT staff - August	lower
Chilkoot Trail	Sheep Camp Ranger Station	selected invasive plants	herbicide, IPMT staff - August	lower
General	lower elevation human use areas of both valleys	bird vetch (<i>Vicia cracca</i>)	survey for presence, roads and easily accessed public areas	high

Data Collection and Processing

The IPMT protocols include standard methods to survey/inventory, map, and collect data on invasive species occurrence. IPMT and KLGO each provided a Samsung Active2 tablet, IPMT loaded both with applications configured for field data collection and reporting to the Alaska region AGOL data portal. KLGO provided a Leica GG04 antenna to increase the accuracy of GPS data. The IPMT program provided 1 week of intensive training, quality review and correction of IPMT AGOL data, and consolidation of quantitative information, including NPS reporting required by the Government Performance and Results Act. The IPMT procedures are thoroughly described in the 2023 Field Protocol and Office Protocol (O'Brien 2023a, 2023b).

Most survey, monitoring and control activities were documented using the IPMT procedures and AGOL. When the equipment was not available, traditional field mapping and data collection were performed, when possible with digitization for spatial extent using the ARO and KLGO established GIS data sets.

Plant identification was done in the field with verification in the office, using a variety of identification aids:

IPMT presentation: Non-Native Plants of Alaska TAXONOMY WORKSHOP (Fulkerson 2023)

Identification of Non-native Plants in Alaska (Flagstad et al. 2019)
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 Glasslike Plants (Harrington 1977)
Invasive Plants on the Chilkoot Trail, Field Identification Tool (KLGO 2022)

At KLGO sites where additional information beyond the IPMT protocols was desired, data were collected and compiled through traditional methods. For regular, repetitive site visits, a log was kept of visits with description of findings. For sites where invasive plant spatial information was desired at a more discriminating level than the IPMT protocols, siteplan maps with categorized points or polygons for the plants of interest were produced.

Control Methods

Manual control measures are the preferred method of reducing or eliminating invasive exotic species at KLGO sites. However, where manual methods have not proven effective, cannot be employed, or do not exist for an invasive species, herbicide treatment is a viable option. Although there is not a single preset time period for proving ineffectiveness of a manual method, 2 to 3 years without discernable progress is typical. With discernable improvement, or at sites where herbicide treatment is problematic, a longer time period may be reasonable. An example is the orange hawkweed site at Lower Dewey reservoir, where tarping followed by weekly visits to monitor and control have nearly eliminated the population.

Extensive areas of archeological sensitivity occur at KLGO, manual control that requires removal of below-ground parts cannot be employed in those areas. Some invasive plants do not have an effective manual control method for our locale. For example, plants that cannot be physically removed from the ground (reed canarygrass, orange hawkweed, bird vetch) without a high probability of leaving behind rhizome fragments that sprout, often making the infestation worse. Clear plastic insolation soil heating to kill below-ground tissues is not effective at KLGO due to latitude, weather and/or forest cover.

Manual control methods employed at KLGO include:

- removal of inflorescence to prevent spread by seed or fruit,
- removal of above-ground parts by clipping at ground level, to reduce vigor (energy stored in roots),
- tarping to prevent photosynthesis, for very small infestations,
- removal of whole plant with taproots or non-fragmenting root/rhizome systems.
- removal of whole plant with fragmenting root/rhizome systems, only with careful extraction of isolated plants under moist soil conditions and with weekly monitoring.

Whenever plants or plant parts were removed, plants were bagged and disposed at a municipal waste facility for composting or incineration.

Herbicide treatments are acceptable if good-faith effort to control without herbicide can be demonstrated or manual control methods are not available, such as in zero ground disturbance areas. A number of locations at

KLGO have been effectively treated with herbicide in past years, such as reed canarygrass at Sheep Camp campground.

Education & Outreach

Invasive exotic plant management includes outreach to children and adults, visitors and residents, and park staff and KLGO commercial use permit holders.

Activities scheduled for summer 2023 included KLGO and STC sponsored field trips, targeted for children, through the Skagway Recreation Summer Camp program. Children's activities are a big part of the mid-summer KLGO Junior Ranger Day event, which also attracts adults, both visitors and residents.

Boot brushes with informative signs placed at trailheads or other congested areas reduce the spread of invasive plants and educate users about the impacts of invasive plants. The broken Chilkoot Trail trailhead boot brush station was scheduled for repair in June.

Presentations to KLGO staff and KLGO commercial use permit holders in April or May include information to communicate the general risks of highly invasive exotic plants and ways to reduce introduction and spread.

Native Seed Collection

In 2023, the highest priority site for native plant restoration was the Chilkoot Arrival services area. The facility expanded from a small informal parking and existing service area in 2022 with construction of a large new parking lot and pedestrian service area. Preparations for native plant restoration of bare disturbed ground were made in 2022, including a strategy for native plantings and seed collection for native plants. Funding, staffing and management issues postponed the planned restoration effort, but collection of additional native plant seeds in 2023 was identified as important to be prepared for future restoration activity. Field collection of seeds, processing, and storage treatments followed methods based on KLGO or southeast Alaska recommendations. (Bodendorf and Furbish 2023)

Results

In this section, common plant names are given in paragraphs; common and scientific names are given in tables. See Appendix A for common and scientific names of all plants mentioned in this report.

Logistical developments in early June affected KLGO invasive plant management personnel and operations. The IPMT internship was reduced to one month. KLGO participation was cancelled for potential cooperative activities with STC, particularly for white sweetclover control in the Skagway valley. Additional staffing shortages at KLGO curtailed some education and outreach activities.

Other NRM interns stepped up to assist with invasive plants management. Two successive National Council for Preservation Education interns monitored the orange hawkweed site, and one took on GPS mapping for the IPMT program. Two successive Scientists in Parks interns assisted with invasive removal and documentation. The late season NRM biological technician arranged activities, organized information, and drafted documentation. Also, 2 interns from the KLGO interpretation division assisted with manual control in Dyea.

The Chilkoot Trail closure was extended to the end of the season, causing the eventual cancellation of an ARO IPMT staff visit to KLGO for herbicide treatment of reed canarygrass and other invasive plants at Sheep Camp.

Summary of Results

The IPMT program compiles spatial extent and control effort data for overall quantitative results for KLGO. The final IPMT information was not available for this report. Results presented here are a combination of IPMT information submitted by KLGO and KLGO-generated supplementary information.

Table 4 summarizes the control activities for 2023 by site and species. Information is presented for timing, number of people (effort), treatment, amount of plant material, and percentage of identified plants removed.

Following the table, narrative descriptions of invasive plants control, survey, and mapping activities are presented by geographic location and site.

Table 4. Results of 2023 invasive plant control activities.

Geographic Area	Site (when) <# of people>	Invasive Plant(s) (scientific name)	Treatment	Volume of Plant Material	Percent Identified Plants Treated
Skagway Valley	Lower Dewey reservoir (late April to August) <1-2>	orange hawkweed (<i>Hieracium aurantiacum</i>)	whole plant removed with careful extraction of rhizomes	16 plants or sprouts	100%
Dyea	Dyea Road in Taiya valley (July-August) <2-3>	white sweetclover (<i>Melilotus albus</i>)	pulled with partial root	approx. 3 cubic yard	75%
Dyea	Historic Townsite, forested terrace (mid June) <1>	common dandelion (<i>Taraxacum officinale</i>)	clipped at ground level	approx 1 cubic yard	100%
Dyea	Historic Townsite, low meadow (mid June) <1>	common dandelion (<i>Taraxacum officinale</i>)	whole plant with taproot removed	approx. 2 cubic yards	70%
Dyea	NPS Campground and footpath (late June) <12>	common dandelion (<i>Taraxacum officinale</i>) others if apparent	whole plant with taproot/roots removed	approx. 5 cubic yards	100%
Dyea	Chilkoot Arrival visitor services and road shoulder (late June) <12>	common dandelion (<i>Taraxacum officinale</i>)	whole plant with taproot removed	approx. 15 cubic yards	80%
Dyea	Chilkoot Arrival visitor services and road shoulder (early July) <5> (mid August) <3>	ball mustard* sheep sorrel* common plantain* white clover* creeping buttercup* tall buttercup*	whole plant with root if possible	approx. 3 cubic yards	100% July 50% August
Chilkoot Trail	Sheep Camp Campground (late June) <2>	reed canarygrass (<i>Phalaris arundinacea</i>)	inflorescence removed, then clipped at ground	10 patches of approx. 1-3 meters each	100%
		quackgrass (<i>Elymus repens</i>)	pulled with root	1 patch	100%
		common dandelion (<i>Taraxacum officinale</i>)	removed with taproot	3 patches	50%
		tall buttercup (<i>Ranunculus acris</i>)	inflorescence removed	scattered along trails	100%
	Sheep Camp Campground TOTAL			approx 2 cubic yards	

* ball mustard (*Neslia paniculata*), sheep sorrel (*Rumex acetosella*), common plantain (*Plantago major*), white clover (*Trifolium repens*), creeping buttercup (*Ranunculus repens*), tall buttercup (*Ranunculus acris*)

Skagway Valley

Lower Dewey Reservoir

Orange hawkweed was found by IPMT staff for the first time in 2015 at the Lower Dewey Reservoir (Appendix B). An intense joint control effort by KLGO, the Skagway Traditional Council and the Municipality of Skagway was implemented to prevent orange hawkweed from becoming established in Skagway. It spread rapidly once established in the neighboring cities of Haines and Juneau, where it quickly reached a difficult to control stage. (Interrante 2021a)

In 2016, opaque tarp treatment was initiated and has been reasonably effective in controlling spread. However, plants occasionally sprouted near the tarps, making continuous monitoring and immediate control essential. (Interrante 2021a)

During 2019 and 2020, staff shortages and COVID-19 measures restricted control efforts to one activity: a few visits to maintain the tarps. In 2021, the tarps were replaced and the site was also 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, the site was visited weekly by the IPMT interns. Orange hawkweed was found about 10 meters from the tarp locations and removed in June. Every subsequent visit through mid-September included a large survey radius, but no new growth was observed. No sign of orange hawkweed was found near the tarps, nor under the tarps at the end of the season. Tarps were not replaced on the recommendation of the Alaska Region IPMT coordinator. In addition, reports of a possible infestation at Laughton Glacier trail were investigated and found to be native species, so the lower Dewey reservoir remains the only known site of orange hawkweed in Skagway. (Varga and Hamill 2023)

In 2023, intensive monitoring and control continued with weekly visits from late April to early October. No hawkweed was found in or near the formerly tarped area. However, orange hawkweed was identified and removed downslope from previous plant locations. Removal included careful excavation of roots and rhizomes from moist soil to avoid leaving fragments in the ground. In addition, some suspected white clover and white sweetclover were removed from the site in June. The site was mapped in July to collect spatial data for IPMT reporting, which included data for plant removals.

Field identification of orange hawkweed was problematic in 2022 and 2023, especially for early sprouts and small rosettes. A set of mounted pressed plants was created in 2023 to aid field identification, a few plants were allowed to flower before removal for the collection. The set contains orange hawkweed plants at all stages of development, including tiny sprouts, and early sprouts of other plants easily misidentified as orange hawkweed.



Figure 2. Intern Annika Christensen displays an excavated orange hawkweed rosette with rhizome, at Lower Dewey Reservoir (NPS //Annika Christensen)



Figure 2. Left: orange hawkweed and look-alike plants at incremental development stages; Right: orange hawkweed rhizome with small sprouts (NPS)

Dyea

Four sites within the Dyea work area received attention in 2023: Dyea Road shoulders along the Taiya River, Historic Townsite, NPS Campground and footpath, Chilkoot Arrival visitor services.

Dyea Road in Taiya Valley

The state-maintained Dyea Road is the only road access to the Dyea area. It experiences heavy traffic during the summer tourist season. The mostly gravel-surfaced road has paved areas in Dyea on the level ground of the river delta approaching the Taiya River bridge and to West Creek. The road has mowed gravel shoulders and shrubby edges throughout, providing the type of ground disturbance that fosters invasive plants.

In 2023, the Dyea Road from the turn into the Taiya valley, near Taiya Point Road, to the Taiya River bridge was surveyed and treated for white sweetclover. The roadside was scanned for white sweetclover whenever NRM staff associated with invasive plants control traveled the road, and obvious plants were removed by pulling with roots. When white sweetclover was flowering, special trips were made to survey by car at slow speeds and by foot in areas where plants had been seen earlier. All white sweet clover found along the road was removed including roots. A dense infestation near the pull-off across from Kalen's road was noted as needing additional treatment. The locations were mapped and documented into the IPMT data set, and marked on a KLGO GIS map (Appendix C).



Figure 4. Mapping white sweetclover on Dyea roadside (NPS //Lynn Rhodes)



Figure 5. White sweetclover in bloom in roadside ditch (NPS //Lynn Rhodes)

Dyea Historic Townsite

The Dyea Historic Townsite has a system of hardened trails following the layout of selected gold rush streets from the historic boom town period. The entire townsite area is culturally sensitive. The portion on a forested terrace has substrate intact from the gold rush which is archeologically important. The part in a low meadow, scoured by river channel movement post-gold rush, no longer possesses archeological potential, but has cultural setting and landscape significance.

The townsite was thoroughly inventoried for invasive exotic plants in 2022. Sixteen (16) invasive species were documented established on the edges of trails and a former access road. A number of those species are ground-hugging plants that can form mats, such as white clover and annual bluegrass.

In June 2023, the IPMT intern treated common dandelion in the townsite using manual control methods. In the forested terrace, all dandelion inflorescences were removed; then as time allowed plants were clipped at ground level and removed. In the low meadow, the trail grid with a roughly 10-meter buffer on each side of

the trail was treated. About 70% of dandelion plants were dug out including taproot, and removed. The trail grids and associated control data were later mapped and added to the IPMT data set.

Dyea NPS Campground and Footpath

The NPS campground in Dyea is susceptible to invasive plant introduction and spread from campers and their vehicles. Also, NPS staff vehicles, equipment, maintenance operations, and campground visitor support activities may spread invasive plants.

In 2021, the footpath was surveyed for invasive exotic plants in late August to mid September. Preliminary data showed 4 invasive and 4 potentially invasive graminoids (grasses or grass-like plants) and 3 invasive broadleaf plants: common dandelion, white clover and European mountain ash. Of particular note were the number of small saplings of mountain ash. The survey was done late in the growing season, when many forbs (non-grass herbaceous plants) would have been hard to detect. Additional field work in spring-summer, species identification work, and data analysis are needed to complete the survey. (Interrante 2021b).

A brief non-exhaustive survey for invasive forbs in the campground in 2022 found infestations of common dandelion, common plantain, sheep sorrel, tall buttercup, and white clover. Invasive plants were concentrated around NPS staff cabins, parking areas, along the road to each campsite. Also, white sweetclover was found for the first time in the NPS campground, immediately removed, and documented using the IPMT procedures. (Varga 2023)

In 2023, common dandelion was targeted for complete removal from the campground and the footpath to Chilkoot Arrival visitor services. Other easily identified invasive plants were included where apparent. In late June, a CVIP group of 10 volunteers with 2-3 KLGO staff spent part of a day treating the campsite and footpath. Invasive plants were dug up, including dandelion with taproots, eliminating 100% of dandelions detected in the campground, no dandelions were found on the footpath. The area was later mapped and documented into the IPMT data set.

Chilkoot Arrival Visitor Services

This service area was greatly expanded in 2022. The construction left disturbed edges, and produced large bare areas that were seeded with a non-aggressive native grass to stabilize the soil and reduce potential for invasive plant colonization. Preparations were made for native plant restoration, which would further decrease the likelihood of invasive plants becoming established, but the full revegetation strategy could not be implemented in late 2022 nor in 2023.

A siteplan with detailed invasive plant locations was created in mid June for KLGO documentation and planning (Appendix D). Plant identifications associated with the siteplan, particularly grasses, should be verified.

In late June, the CVIP group of 10 volunteers and 2-3 KLGO staff spent most of a day removing all common dandelion plants, including taproot, from the site and nearby road shoulder.



Figure 6. CVIP volunteers remove common dandelion from roadside ditch (NPS)

In early July, a group of 4 KLGO interns and the NRM biological technician removed all identified invasive plants including roots if possible, predominantly ball mustard and sheep sorrel. The area was later mapped with invasive plant control data for IPMT.



Figure 7. Intern Annika Christensen mapping IPMT data at Chilkoot Arrival (NPS)

Chilkoot Trail

The historic Chilkoot Trail is a fundamental cultural and natural resource of KLGO. Most of the trail was closed in 2023 due to flood damage. However, access to Sheep Camp by helicopter was arranged in late June to conduct a partial survey and prioritized manual control of invasive plants at the campground.

Sheep Camp Campground

The Sheep Camp campground experiences high visitor use from permitted trail hikers and high KLGO staff activity during normal trail operations. The campground requires frequent maintenance to maintain the campground structures and trails. COVID-19 measures followed by flood damage resulted in abnormally low trail use from 2020 to 2023, with either zero or very reduced numbers of recreational hikers. A number of invasive plants occur in the Sheep Camp area (campground and ranger station), but reed canarygrass was the highest priority for urgent control.

Reed canarygrass was first detected at Sheep Camp in 2011. It was treated by removing plants including roots/rhizomes, followed by various opaque membranes over several years. In 2015, these treatments were determined to be insufficient, whereupon reed canarygrass was treated with herbicide followed by revegetation with a mixture of 5 native Alaska grasses. Herbicide follow-up treatment in 2016 was canceled due to heavy rain, but was successfully applied in 2017. (Interrante 2021a)

In 2018, no reed canarygrass plants were detected and the site moved from active control into surveillance monitoring. The monitoring was intended to consist of annual checks and immediate treatment for any emergent plants from seeds or rhizome fragments remaining in the ground. However, there was no monitoring in 2019, 2020 or 2021 due to staffing shortages, COVID-19 restrictions, and trail closures (Interrante 2021a). In 2022, two small patches of reed canary grass were found along the southern side of the large open air shelter constructed in 2018. Seed heads were removed, but no further treatment was applied. (Varga 2023)

In late June 2023, 10 small patches of reed canarygrass were found, primarily in the disturbed area around the shelter constructed in 2018. Preliminary control of the patches consisted of inflorescence removal followed by above ground tissue removal, and included spot marking for herbicide treatment scheduled for later that summer. Unfortunately, the herbicide treatment was cancelled due to trail closure extension and logistical problems.

Other invasive species treated in the campground in 2023 were quackgrass (1 small patch, above ground parts removed), tall buttercup and some chickweed (inflorescences removed) and common dandelion (about 50% of apparent plants dug out with taproot). Roughly 2 cubic yards of plant material was removed and compressed for helicopter transport, followed by incineration. IPMT mapping technology was not available, traditional site maps were prepared to document the locations of plants and treated areas (Appendix E).



Figure 8. Sheep Camp campground reed canarygrass - Left: Biotech Lynn Rhodes removes seedheads prior to above-ground parts, Right: small auricles help identify reed canarygrass (NPS)



Figure 9. Sheep Camp campground tall buttercup - Left: seeds with tapered, hooked ends, Right: Biologist Elaine Furbish removes yellow buttercup flowers (NPS)

General

A brief but broad survey for bird vetch was performed by the IPMT intern in June 2023. Bird vetch was identified during IPMT training as a high priority invasive plant for the state of Alaska in 2023. The survey included the Skagway town area, along Dyea Road and into the Dyea town area. Bird vetch was listed as detected in each area, but specific locations and voucher specimens for identification were not obtained. The site of previous records for bird vetch near Pullen Creek was not targeted. Additional invasive plants were noted, but some identifications should be verified.

A common Skagway area native plant, beach pea, can easily be mistaken for bird vetch. A useful identification tool was created post-survey to facilitate future surveys by highlighting crucial identification characteristics of the two species (Appendix F). The brief bird vetch survey was not included in IPMT mapping and data.



Figure 10. Intern Julianna Tenebaum surveying for invasive plants (NPS)

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 unaware of the impact invasive plants have 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.

Skagway Recreation Center Summer Day Camp

The SRC organizes summer day camp events for grade school children. The IPMT intern created a Dyea Flats afternoon event for invasives species in mid June. The event included a lesson plan, multiple activities, boot brush demonstration, coloring pages and invasive plants recipes. The central activity focused on dandelion flower head removal to prevent seed spread, coupled with snacks made with dandelion as an ingredient.



Figure 11. Summer Day Camp students invasive plants scavenger hunt (NPS)

Boot Brush at Chilkoot Trailhead

Boot brush stations are an effective way to reduce the spread of invasive exotic plants and inform users about the impacts of invasive plants. 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, with one boot brush mounted below. In 2022, the Chilkoot Trail station brush had fallen apart and a replacement did not match the station, making the boot cleaning part of the station inoperable for that season.

In 2023, a new brush of the same model was obtained, but mounting brackets did not line up when installation was attempted in June. In August, a free-standing brush was placed on the ground at the station. Although it was moved about slightly as it was used, it was not removed. A second free-standing brush was placed at the sign a few weeks later. Within minutes, both brushes were being used by a commercial hiking group as they approached the trailhead.



Figure 12. Two free-standing boot brushes at Chilkoot Trail trailhead (NPS)

Bloom Garden Maintenance

A native wildflower garden for visitors is located in small KLGO lot on Broadway St. in the Skagway Historic District. The garden area has park benches and raised beds of native plants with informative signs. In 2023, the raised beds and surrounding lawn were heavily infested with invasive plants and the signs were degraded. The IPMT intern pulled most invasive plants out of the flower beds and some invasives from the lawn. New educational signs were produced and installed on the raised beds.

Fall Festival Outreach Event

The KLGO Interpretation division produces or participates in summer and autumn community outreach events every year. In 2023, the summer KLGO Junior Ranger Day event, which usually includes invasive plants education and activities, was cancelled due to staffing shortages. However, KLGO participated in the Fall Festival event hosted by the city of Skagway. An NRM intern and a Trail Center ranger worked

together to create a table of information and activities for the KLGO visitor center open house during the festival. Crafts and handouts for both adults and children communicated the difference between native plants and invasive plants and why they matter.



Figure 13. Intern Jeff Bodendorf and Ranger Kari Rain at Fall Festival (NPS)

CVIP at Chilkoot Arrival visitor services and NPS Campground

The Conservation Volunteer International Program attracts adult volunteers interested in learning about natural and cultural resources at public protected areas and contributing their labor to help preserve those areas. A CVIP group of about 10 volunteers was coordinated by the KLGO maintenance trail crew for June 2023, with a day of invasive vegetation control scheduled with NRM staff.

Control of common dandelion in the vicinity of the NPS campground and Chilkoot Arrival was planned for the CVIP group. The IPMT intern prepared an educational presentation and supervised the plant removal activity while providing information about the site, the plants and the park.

Native Seed Collection

As the Chilkoot Arrival visitor services was being constructed in 2022, a strategy to quickly restore the site with native vegetation was developed. Native plants with desired characteristics were identified, a list of species best suited to propagation using seed was compiled, and seeds were collected, processed and stored for 8 species.

In 2023, the seed list was updated, including additional research on methods for seed collection, processing and propagation. Seeds were collected, processed and stored for 6 species, with focus on 3 species needing replenishment after being used for preliminary revegetation of small portions of the site: fireweed, beach pea and silverweed. Table 5 lists the native plants collected in 2022 and 2023 (Bodendorf and Furbish 2023).

Table 5. Native plant seed collected for Dyea restoration, 2022 and 2023.

common name	scientific name	2022	2023
angelica	<i>Angelica lucida</i>	X	
beach pea	<i>Lathyrus japonicus</i>	X	X
beachhead iris	<i>Iris setosa</i>		X
fireweed	<i>Chamerion angustifolia</i>	X	
Nootka lupine	<i>Lupinus nootkatensis</i>	X	
rock harlequin	<i>Corydalis sempervirens</i> (aka <i>Capnoides sempervirens</i>)	X	
shooting star	<i>Dodecatheon pulchellum</i>		X
silverweed	<i>Potentilla anserina</i> (aka <i>Argentina egedii</i>)	X	X
western columbine	<i>Aquilegia formosa</i>	X	X
yarrow	<i>Achiella millefolium</i>		X



Figure 14. NRM interns collecting fireweed seed in Dyea (NPS)

Discussion and Recommendations

The EDRR and RAD strategy for setting goals and identifying priority species and sites was effective and proved resilient to the unusually high need to adjust operations to changes in personnel and logistics as the 2023 season progressed.

All of the control treatment sites from 2023 should continue to receive control attention in 2024, with similar priorities. Two additions should be made if possible. The Sheep Camp ranger station is a location with high density of invasive plants that is acting as a the introduction point and source area for spread for the Sheep Camp campground and nearby sections of Chilkoot Trail. The river spur trail off the Chilkoot Trail is the introduction point and source area for spread of invasive plants for the lower Chilkoot Trail. Both are discussed in detail below.

The survey priority for 2023 was a general survey for bird vetch. The resulting information can be considered the first stage in that effort. An additional survey work to pinpoint and verify the 2023 data (see results) should be done in 2024. Also, consider including additional species if identified in the IPMT training as potentially rapid-spreading and highly invasive for the KLGO vicinity.

Cooperation with partners in 2023 was unfortunately very limited. Re-establishing collaboration with STC and MOS is top priority for long-term effective invasive plants control in and around KLGO. Combining mitigation efforts and personnel has proved to be very effective in the past, especially for motivating community response for difficult control situations.

Orange Hawkweed at Dewey Reservoir

Remnant seeds or rhizome fragments in the soil continue to occasionally sprout away from the tarped area of the original infestation. The direction is down a slope to a creek, and will soon reach a steep area difficult to access. Recommended for 2024: spot treat all new sprouts with herbicide to eliminate the last reproductive potential at the site before it becomes inaccessible. Herbicide use will require coordination with the Municipality of Skagway. Also, consider planting native species in the formerly tarped areas which are being colonized by chickweed. Finally, white sweetclover may be present and would be very high priority to prevent spread into the Lower Dewey Lake and wetlands system. Add search and removal for white sweetclover to the weekly orange hawkweed site visits. Intensive monitoring of this site should continue for several years after the year when there is no detection of orange hawkweed, white sweetclover or other highly invasive plants.

Skagway Town Area Invasive Plants Control

The KLGO properties in Skagway should receive invasive plant control appropriate for the lot taking into account cultural setting and practicality of effective control. However, regular annual surveys are needed to detect high invasiveness species and immediately remove them.

Other invasive plants control in the Skagway town vicinity depends upon cooperative efforts with STC and MOS. In past years, the 3-way relationship allowed very effective control of difficult invasive plant situations, such as the introduction of white sweetclover at the airstrip. General agreements are needed for KLGO staff to engage in cooperative activities. However, the IMPT intern can participate in cooperative events organized by STC or MOS on public property under the Student Conservation Association agreement.

Dyea Road

All white sweetclover detected along the Dyea Road in the Taiya Valley (same area described for 2023) should be removed, ideally prior to flowering, and pulled with roots. Extra attention should be given to the dense infestation near the pull-off across from Kalen's Road, and to the NPS campground where some plants were found in 2022.

Dyea Historic Townsite

At minimum, preventing more spread within the townsite should receive attention, with inflorescences and/or above ground tissues removed in the forested terrace, and any effective manual control used in the low meadow. When possible, herbicide treatment of all invasives in the forested terrace is needed.

If at some point the townsite can be mostly cleared of invasive plants, installation of a boot brush station in the entrance area near the footbridge should be considered. In addition, prevention options should be examined for the road/trail connection to the MOS campground, and for commercial guided bike tours.

The Townsite entrance area includes an interpretive kiosk, toilet, trash bins, and small side trail to archeological interpretation sites. When possible, it should receive enough attention to reduce the invasive plant load to a lower level that can be held with annual control activity.

Dyea NPS Campground and Footpath

This area is constantly exposed to new introductions of invasive exotic plants. There are multiple infestations, with some hard to identify species (mostly grasses) or hard to easily control species (such as low, mat forming species).

Control activity in the past few years has been two-pronged: low-level control by removal of easily detected and controlled species, such as common dandelion, when staff or volunteer workgroups can be arranged; and quick surveys for noticeable high-invasiveness species with immediate removal, such as white sweetclover. Opportunities to educate and engage campers have been limited due to the absence of a campground host.

To facilitate efforts to control invasives at the campground, NRM and IPMT interns could pre-map locations and species appropriate for manual control that could then be used whenever staff or volunteer events can be arranged. If a campground host or visitor services staff are available, small educational control activities could be offered to campers. Later, additional control not appropriate for unskilled workers, especially herbicide application, should be arranged to bring the invasives presence in the campground down to a low-maintenance condition.

When possible, the footpath survey should be completed and used to target control on the footpath, which will require skilled staff for all but a few easily identified species. A boot brush station should be considered at the intersection of the accessible campground forest trail loop and the rustic footpath toward Chilkoot Arrival. Later, when Chilkoot Arrival development of the footpath intersection with the accessible pedestrian area at the parking lot is complete, and boot brush station should be considered for foot traffic going toward the campground.

Chilkoot Arrival Visitor Services

The recently constructed and still being developed Chilkoot Arrival visitor services site includes highly disturbed areas. The location along a busy roadside makes it extremely susceptible to invasive plants. Plans

to quickly install native plants, which would increase the site's resistance to invasive exotic plants, have been postponed and are hampered by unsettled management of the large areas within the AK state road right of way.

The area should be continually monitored 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.

River Spur Trail-Chilkoot Trail

The river spur trail off the Chilkoot Trail is the introduction point and source area for spread of invasive plants for the lower Chilkoot Trail. The spur trail intersects the Chilkoot Trail at about 1.6 miles from the trailhead, and leads to a raft landing on the Taiya River. The spur trail has likely been acting as a source area for invasive spread, but at a relatively low level as only KLGO staff would periodically walk in from the river on the spur and then on to the Chilkoot Trail.

A special situation developed in 2023 due to the Chilkoot Trail being impassible at a washed out bridge not far from the intersection with the spur trail. Commercial Use Authorization guided hiking groups normally travel from the Chilkoot Trail trailhead to the spur trail, and then on the spur trail to the river - thus any potential spread of invasives picked up along the spur trail was in a direction away from the Chilkoot Trail.

In 2023, the direction of commercial travel on the spur trail was reversed, with daily multiple groups traveling from the river to the spur trail-Chilkoot Trail intersection, then up the Chilkoot Trail to the beaver pond or beyond - increasing potential for invasive spread into new trail areas.

Recommended for 2024: review 2022 and earlier survey data for the spur trail, add an inventory survey (identification of all invasive species) for additional data if needed. Also review information for the Chilkoot Trail from the spur trail-Chilkoot Trail intersection north to Hosford's sawmill or Finnegan's Point. Consider herbicide control action to reduce/remove invasive species on the spur trail as soon as practicable for KLGO staff, this will require coordination with MOS.

Also, when commercial guided tours return to their normal route, placement of discrete boot brushes near the spur trail-Chilkoot Trail intersection for KLGO staff or anybody traveling from the river to the Trail should reduce spread invasives on the Chilkoot Trail. If invasive plants along the spur trail are brought under control, the boot brushes could be moved to near the raft landing on the east shore of the Taiya River, with KLGO staff and raft guides meeting guided hikers encouraged to clean boots on the west landing before they leave.

Sheep Camp Ranger Station

The Sheep Camp ranger station is a location with high density of invasive plants that is acting as a the introduction point and source area for invasive spread to Sheep Camp campground and nearby sections of Chilkoot Trail. The helipad, ranger cabin, outbuildings, and connecting trails are heavily infested with invasive exotic plants.

River channel movements in 2022 undercut outbuildings and side channel erosion isolated the helipad and is approaching the cabin. Manual control methods would not be efficient, herbicide control would be

complicated. In 2024, if herbicide treatment is arranged for the campground area, evaluation of the ranger station area should be included, perhaps even with some treatment if possible.

In the meantime, placement of discrete boot brushes near the intersection of the ranger station trail with the Chilkoot Trail for staff to use as they leave should help reduce new spread from the ranger station. Once invasives at the campground and nearby Chilkoot Trail sections have been brought under control, use of boot brushes as KLGO staff leave the ranger station will be the prime tool for preventing invasive exotic plants on the Chilkoot Trail and Sheep Camp campground.

Sheep Camp Campground

A number of invasive plants have established at the campground and nearby sections of the Chilkoot Trail. Control herbicide treatment of reed canarygrass is urgent to prevent a breakout spread of this highly invasive plant that had been successfully controlled and reached the surveillance monitoring stage in 2018.

Herbicide treatment of other invasive exotic plants can be included when herbicide treatment is applied for reed canarygrass. Careful herbicide application may be complicated if unstable flow channels within the campground become active in summer 2024. The reed canarygrass locations are mostly on raised ground near structures, but a few patches may be wet depending upon recent weather. Channels may be flowing on campground trails and at tent pad sites.

A single control visit per summer is unlikely to be fully successful for campground invasives control. Engaging hike-through campers and VRP trail rangers to accomplish small, easy, frequent manual control efforts could be the key to effective control in the long run, and includes interpretation opportunity. For example, trail rangers or educational signs in shelters could guide campers to pick easily identified tall buttercup and common dandelion flowers when they are in bloom and dispose of them in a provided container.

Education Outreach

All types of education and outreach interactions with the community, park visitors and park staff are key to consistent management of invasive exotic plants. Joint activities with partners STC and MOS are more effective than isolated efforts.

Hosting events is 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. Whenever possible, KLGO should engage in activities that focus on children, such as the Skagway Summer Camp and Junior Ranger Day. Also, KLGO should continue to message adults through park visitor center or field interpretation pamphlets, campground hosts, commercial tour guides, and volunteer group events.

Boot brush stations that combine bushes with informative signs at popular pedestrian trails are a proven education and preventative measure. The boot brush station at Chilkoot Trail trailhead has been tested with a new type of brush that allows multiple brushes to be installed. Since the trailhead is often where casual or guided groups embark on hikes, having multiple brushes will facilitate boot brush by speeding up the process for the group.

Native Seed Collection

Collection of local native plant seeds at KLGO will often be needed at a low volume level, rather than large quantities. The IPMT program will sometimes offer assistance with larger volume seed collection and processing. In 2023, IPMT made arrangement with the AK Plant Materials Center to process NPS collected seed, with a possibility for propagation and return to the park. When KLGO resolves management and scope of native plant restoration of key areas, such as Chilkoot Arrival visitor services, Dyea Historic Townsite, and the Sheep Camp area, assistance with seed collection, processing, and/or propagation through IPMT may be valuable support.



Skagway Summer Camp students (SRC)

BIBLIOGRAPHY

- AKEPIC (Alaska Exotic Plant Information Clearinghouse). 2023. AKEPIC web portal database (<https://akepic.accs.axds.co>). Alaska Center for Conservation Science, University of Alaska, Anchorage. Accessed June 2023.
- Bernatz, G. C., A. G. Robertson, and B. W. Drazkowski. 2010. Klondike Gold Rush National Historical Park: Natural resource condition assessment. Natural Resource Report NPS/NRPC/WRD/NRR—2010/288. National Park Service, Fort Collins, Colorado.
- Bodendorf, J. and C. E. Furbish. 2023. Native Plant Propagation for Dyea Restoration. Klondike Gold Rush National Historical Park. Unpublished Report. Skagway, Alaska.
- Burton, D. 2017. Invasive and exotic plant management in Klondike Gold Rush National Historical Park: 2017 Summary Report. Natural Resource Report NPS/KLGO/NRR—2017/1343. National Park Service, Fort Collins, Colorado.
- Carlson, M. L., I. V. Lapina, M. Shephard, J. S. Conn, R. Densmore, P. Spencer, J. Heys, J. Riley, and J. Nielsen. 2008. *Invasiveness Ranking System for Non-Native Plants of Alaska*. USDA Forest Service, R10, R10-TP-143.
- Demarchi, D. A., 2011. An introduction to the Ecoregions of British Columbia, Third Edition. Ministry Information Section, Ministry of Environment, Victoria, British Columbia.
- Flagstad, L., H. Cortes-Burns, and C. Greenstein. 2019. Identification of Non-native Plants in Alaska. Alaska Natural Heritage Program, University of Alaska Anchorage. 226 pp.
- Flagstad I. and T. Boucher. 2015. Klondike Gold Rush National Historical Park, Landcover Classes and Plant Associations. Natural Resource Report NPS/KLGO/NRR—2015/917. National Park Service, Fort Collins, Colorado.
- Fulkerson, J. 2023. Non-Native Plants of Alaska TAXONOMY WORKSHOP. UAA Alaska Natural Heritage Program presentation at IPMT May 2023 training, Anchorage, Alaska.
- Interrante, A. 2021a. Invasive Plant Management Team Program Summary 2004-2018. Klondike Gold Rush National Historical Park. Unpublished Report, Skagway, Alaska.
- Interrante, A. 2021b. NPS campground footpath survey for invasive plants - protocol and field data. Klondike Gold Rush National Historical Park, Skagway, Alaska.
- Interrante, A., C. E. Furbish, and J. R. H. Larsen. 2021. Dewey Reservoir Orange Hawkweed control project, 2020-2021. Klondike Gold Rush National Historical Park. Unpublished Report, Skagway, Alaska.
- KLGO (Klondike Gold Rush National Historical Park). 2022. Invasive Plants on the Chilkoot Trail, Field Identification Tool, 2022. Unpublished booklet. Klondike Gold Rush National Historical Park, Skagway, Alaska.

- O'Brien, A. 2023a. Alaska Invasive Plant Management Team: 2023 Field Protocol. National Park Service, Unpublished Report. Anchorage, Alaska.
- O'Brien, A. 2023b. Alaska Invasive Plant Management Team: 2023 Office Protocol. National Park Service, Unpublished Report. Anchorage, Alaska
- Pojar, J. and A. MacKinnon. 1994. Plants of the Pacific Northwest Coast. Lone Line Publishing, Vancouver, British Columbia.
- Reaser, J.K., S.W. Burgiel, J. Kirkey, et al. 2020. The early detection of and rapid response (EDRR) to invasive species: a conceptual framework and federal capacities assessment. *Biol Invasions* 22, 1–19 (2020). <https://doi.org/10.1007/s10530-019-02156-w>
- Schuurman, G. W., D. N. Cole, A. E. Cravens, et al. 2022. Navigating Ecological Transformation: Resist–Accept–Direct as a Path to a New Resource Management Paradigm, *BioScience*, Volume 72, Issue 1, January 2022, Pages 16–29, <https://doi.org/10.1093/biosci/biab067>
- USDA (U.S. Department of Agriculture). 2007a. Meeting the challenge: invasive plants in Pacific Northwest ecosystems. U.S. Department of Agriculture. Forest Service Pacific Northwest Research Station, General Technician Report PNW-GTR-694.
- USDA (U.S. Department of Agriculture). 2007b. Orange Hawkweed, revised. prepared by Forest Service, Alaska Region. R10-TP-129.
- USDOI (U.S. Department of the Interior). 2016. Safeguarding America's lands and waters from invasive species: A national framework for early detection and rapid response, Washington D.C., 55p.
- Varga, O.J. and J. Hamill. 2023. Invasive and Exotic Plant Management in Klondike Gold Rush National Historical Park: 2022 Summary Report. Klondike Gold Rush National Historical Park, Skagway, Alaska

Appendix A - Plant Species Common and Scientific Names

EXOTIC INVASIVES

Common name (sort)	Scientific name	Scientific name (sort)	Common name
annual bluegrass	<i>Poa annua</i>	<i>Cerastium fontanum</i>	mouse-ear chickweed
bird vetch	<i>Vicia cracca</i>	<i>Elymus repens</i>	quackgrass
ball mustard	<i>Neslia paniculata</i>	<i>Hieracium aurantiacum</i>	orange hawkweed
common chickweed	<i>Stellaria media</i>	<i>Melilotus albus</i>	white sweetclover
common dandelion	<i>Taraxacum officinale</i>	<i>Neslia paniculata</i>	ball mustard
common plantain	<i>Plantago major</i>	<i>Phalaris arundinacea</i>	reed canarygrass
creeping buttercup	<i>Ranunculus repens</i>	<i>Plantago major</i>	common plantain
European mountain ash	<i>Sorbus aucuparia</i>	<i>Poa annua</i>	annual bluegrass
Kentucky bluegrass	<i>Poa pratensis</i>	<i>Poa pratensis</i>	Kentucky bluegrass
mouse-ear chickweed	<i>Cerastium fontanum</i>	<i>Poa pratensis</i>	spreading bluegrass
orange hawkweed	<i>Hieracium aurantiacum</i>	<i>Ranunculus acris</i>	tall buttercup
quackgrass	<i>Elymus repens</i>	<i>Ranunculus repens</i>	creeping buttercup
reed canarygrass	<i>Phalaris arundinacea</i>	<i>Rumex acetosella</i>	sheep sorrel
sheep sorrel	<i>Rumex acetosella</i>	<i>Sorbus aucuparia</i>	European mountain ash
spreading bluegrass	<i>Poa pratensis</i>	<i>Stellaria media</i>	common chickweed
tall buttercup	<i>Ranunculus acris</i>	<i>Taraxacum officinale</i>	common dandelion
white clover	<i>Trifolium repens</i>	<i>Trifolium repens</i>	white clover
white sweetclover	<i>Melilotus albus</i>	<i>Vicia cracca</i>	bird vetch

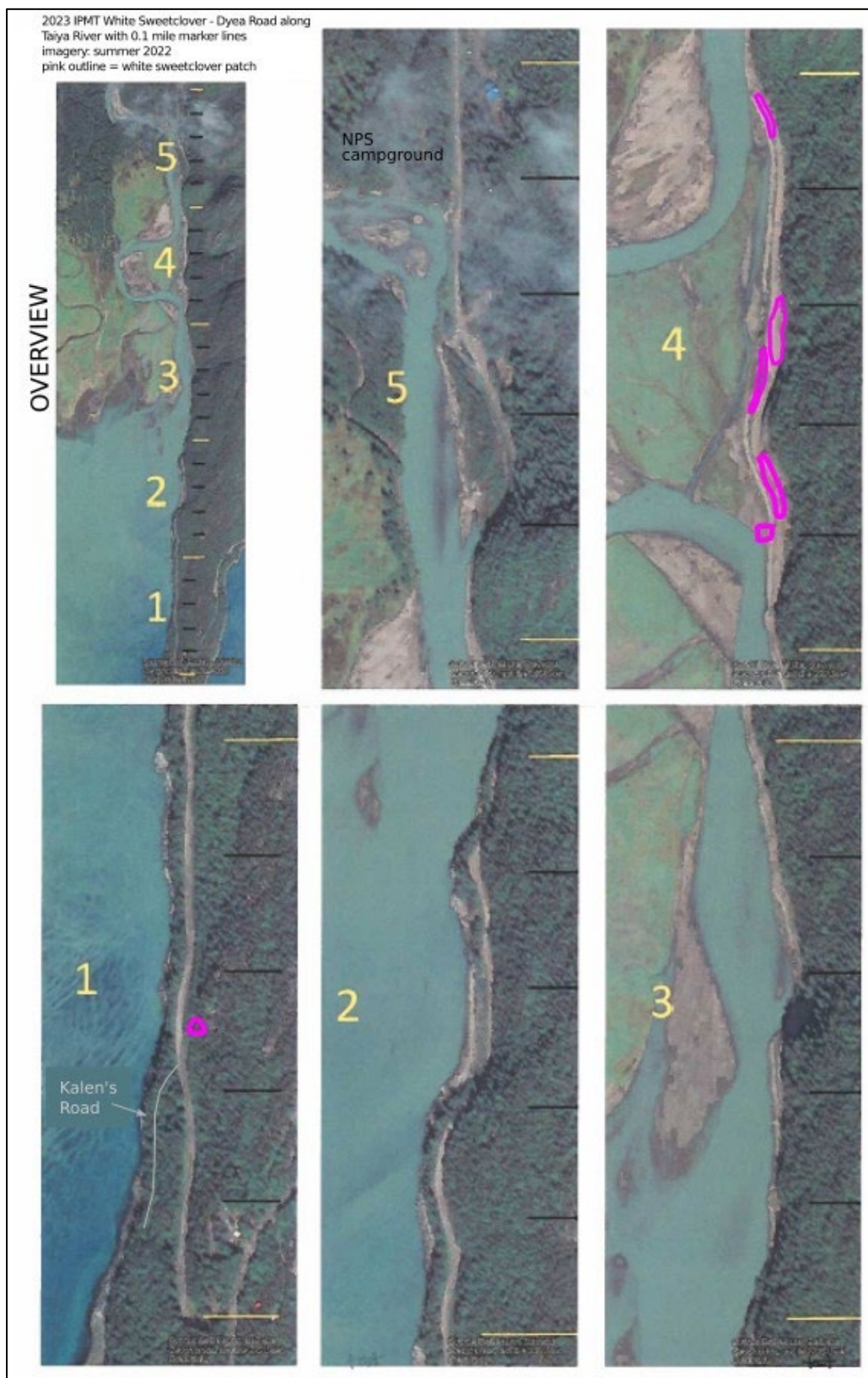
NATIVES

Common name (sort)	Scientific name	Scientific name (sort)	Common name
angelica	<i>Angelica lucida</i>	<i>Angelica lucida</i>	angelica
beach pea	<i>Lathyrus japonicus</i>	<i>Achiella millefolium</i>	yarrow
beachhead iris	<i>Iris setosa</i>	<i>Aquilegia formosa</i>	western columbine
fireweed	<i>Chamerion angustifolia</i>	<i>Chamerion angustifolia</i>	fireweed
Nootka lupine	<i>Lupinus nootkatensis</i>	<i>Corydalis sempervirens</i> (aka <i>Capnoides sempervirens</i>)	rock harlequin
rock harlequin	<i>Corydalis sempervirens</i> (aka <i>Capnoides sempervirens</i>)	<i>Dodecatheon pulchellum</i>	shooting star
shooting star	<i>Dodecatheon pulchellum</i>	<i>Iris setosa</i>	beachhead iris
silverweed	<i>Potentilla anserina</i> (aka <i>Argentina egedii</i>)	<i>Lathyrus japonicus</i>	beach pea
western columbine	<i>Aquilegia formosa</i>	<i>Lupinus nootkatensis</i>	Nootka lupine
yarrow	<i>Achiella millefolium</i>	<i>Potentilla anserina</i> (aka <i>Argentina egedii</i>)	silverweed

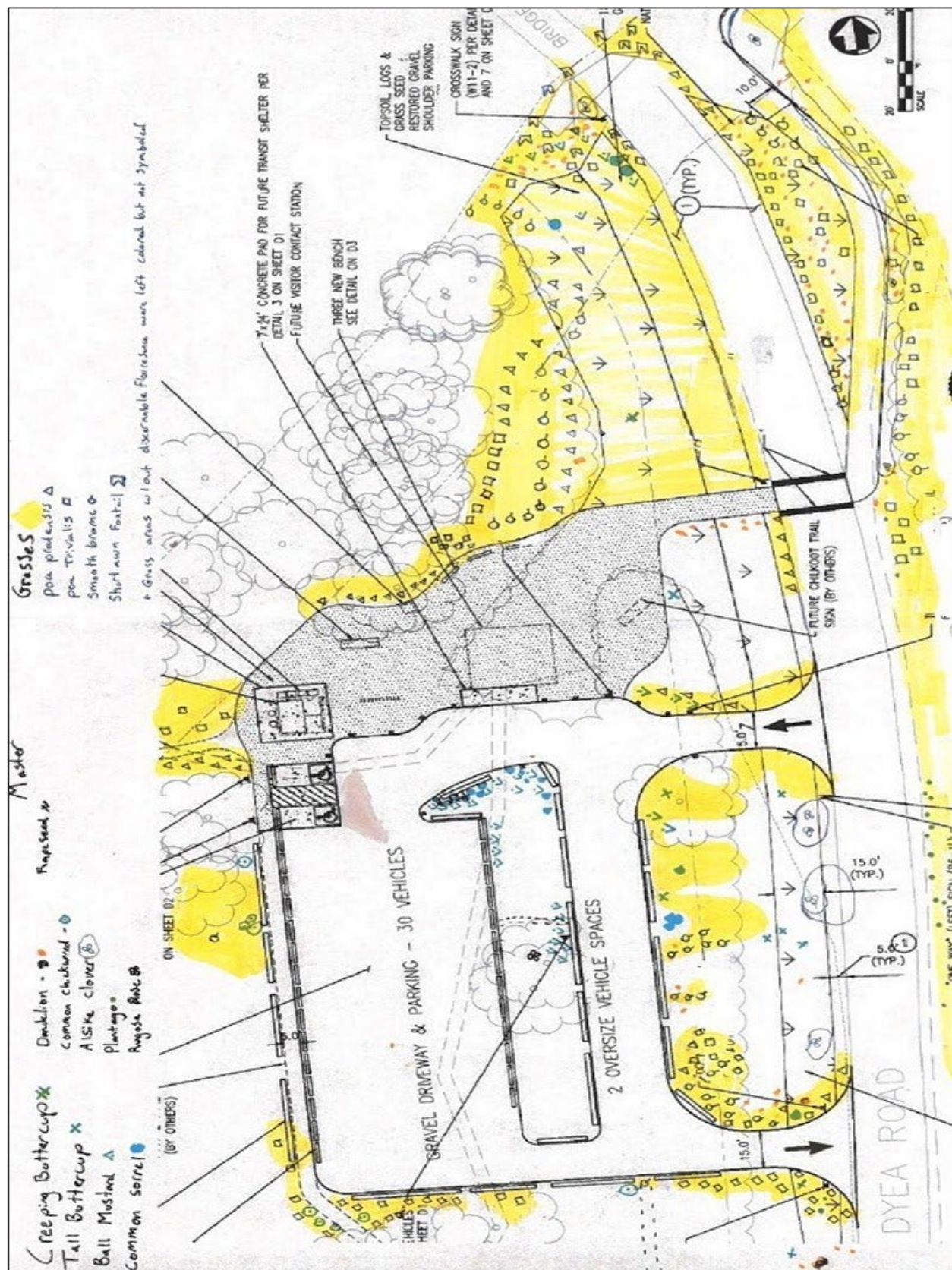
Appendix B - Orange Hawkweed at Reservoir Map



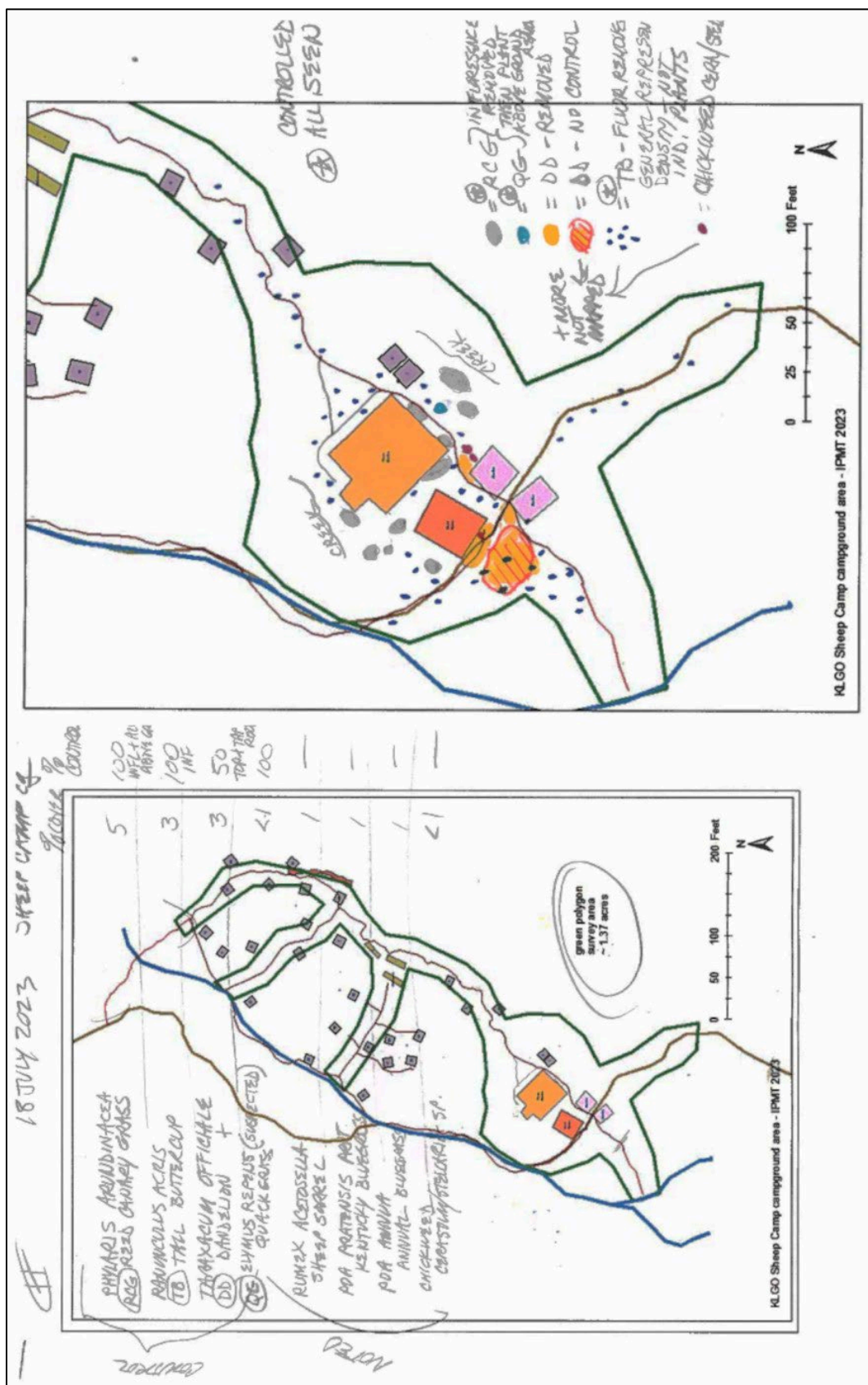
Appendix C - White Sweetclover on Dyea Road Map



Appendix D - Invasive Plants at Chilkoot Arrival Siteplan Map



Appendix E - Invasive Plants at Sheep Camp Campground Map



Appendix F - Distinguishing Bird Vetch and Beach Pea

Vicia Cracca ssp. *Cracca*

Bird Vetch

Invasiveness score: 73

Competes with and strangles natives

- Growth pattern of climbing up stems
- Up to 150 cm long
- Tendrils on tips of leaves
- Up to two meters tall
- 8-12 leaflet pairs
- Leaves are 3-8 cm in length
- Flowers are violet/ purplish/bluish
- White hairs on stem and leaves



Differentiating features of *V. Cracca* and *L. Japonicus*

- Leaf shape: *V. Cracca* has longer lanceolate leaf than *L. Japonicus*' broader more obovate leaf
- *V. Cracca* climbs and strangles other plants, *L. Japonicus* grows in a thicket
- *V. Cracca* has a flatter "snow pea" like pod, vibrant green in maturity, while *L. Japonicus* has a rounder pea pod, green brown in maturity
- *V. Cracca* has a hairy stem and leaf, *L. Japonicus* has a waxy stem and leaf
- *L. Japonicus* has five to twelve flowers, *V. Cracca* has ten to forty flowers

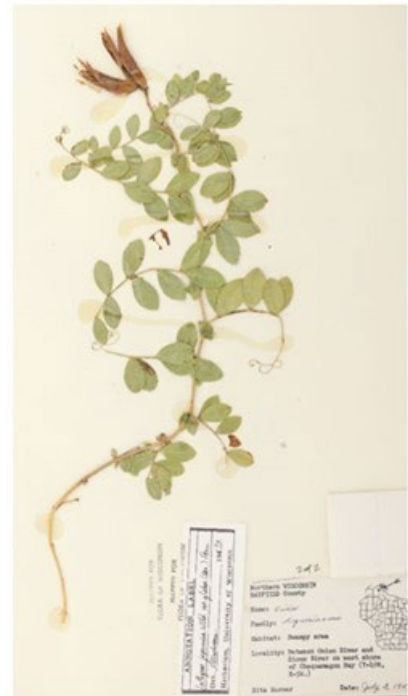
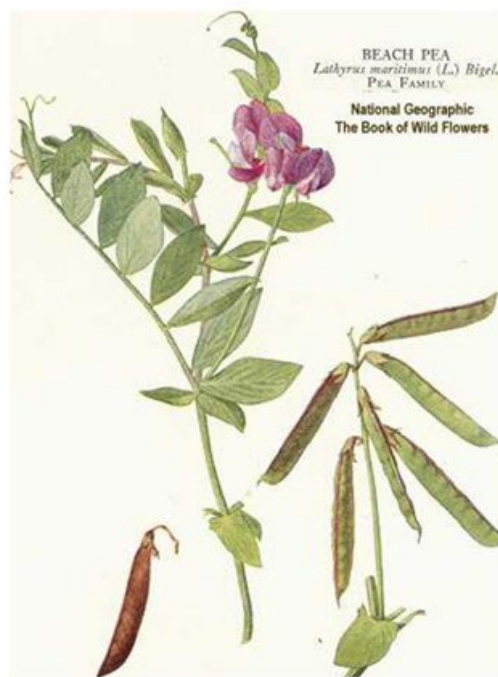


Distinguishing from Native Species

Lathyrus Japonicus

Beach pea

- Grows 15-50 cm tall
- Leaves are hairless
 - oarlike in shape
- Flowers are violet/ purplish/bluish
- 3-5 leaflet pairs
- Leaves are 5-10 cm in length
- Grows by creeping on the ground
- Tendrils on tips of leaves



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.

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Klondike Gold Rush NHP
P.O. Box 517
Skagway, Alaska 99840

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