



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

2017 Summary Report

Natural Resource Report NPS/KLGO/NRR—2018/1612



**ON THIS PAGE**

Bald eagle perched on a branch in the Dyea Flats

Photo credit: Devon Burton, 2017

ON THE COVER

From upper left corner clockwise: Bee on Alsike Clover at Jeff Smith's Parlor, Closeup view of narrowleaf hawksbeard, and the view at Upper Dewey Lake. All photos taken by Devon Burton, 2017

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

2017 Summary Report

Natural Resource Report NPS/KLGO/NRR—2018/1612

Devon McCabe Burton

National Park Service Klondike Gold Rush National Historical Park
P.O Box 517
Broadway and 2nd Street
Skagway, Alaska 99840

March 2018

U.S. Department of the Interior
National Park Service
Natural Resource Stewardship and Science
Fort Collins, Colorado

The National Park Service, Natural Resource Stewardship and Science office in Fort Collins, Colorado, publishes a range of reports that address natural resource topics. These reports are of interest and applicability to a broad audience in the National Park Service and others in natural resource management, including scientists, conservation and environmental constituencies, and the public.

The Natural Resource Report Series is used to disseminate comprehensive information and analysis about natural resources and related topics concerning lands managed by the National Park Service. The series supports the advancement of science, informed decision-making, and the achievement of the National Park Service mission. The series also provides a forum for presenting more lengthy results that may not be accepted by publications with page limitations.

All manuscripts in the series receive the appropriate level of peer review to ensure that the information is scientifically credible, technically accurate, appropriately written for the intended audience, and designed and published in a professional manner.

Data in this report were collected and analyzed using methods based on established, peer-reviewed protocols and were analyzed and interpreted within the guidelines of the protocols.

Views, statements, findings, conclusions, recommendations, and data in this report do not necessarily reflect views and policies of the National Park Service, U.S. Department of the Interior. Mention of trade names or commercial products does not constitute endorsement or recommendation for use by the U.S. Government.

This report is available in digital format on the [Natural Resource Publications Management website](#).

Please cite this publication as:

Burton, D. M. 2018. Invasive and exotic plant management in Klondike Gold Rush National Historical Park: 2017 summary report. Natural Resource Report NPS/KLGO/NRR—2018/1612. National Park Service, Fort Collins, Colorado.

Contents

	Page
Figures.....	v
Tables.....	vii
Abstract.....	viii
Acknowledgments.....	ix
Acronyms.....	ix
Introduction.....	1
Methods.....	3
Defining Work Areas	3
Prioritization of Species and Treatment	4
Tools for Identification and Data Collection.....	5
Control Methods.....	5
Personnel	5
Results.....	6
2017 Season Overview	6
Inventory and Control Accomplishments.....	8
Skagway	8
Dewey Lakes Trail System.....	12
Dyea Road	13
Dyea & Dyea Restoration Project	18
Chilkoot Trail	22
Laughton Glacier.....	23
Klondike Highway.....	24
Outreach and Education	26
SCA Crew 2017.....	27
Recommendations and Discussion.....	29
Standardized Polygons	29
Jeff Smith’s Parlor.....	29
Pullen Creek Reed Canary Grass Management.....	29

Contents (continued)

	Page
Black Lakes Canada Thistle	29
Lower Dewey Lake Reservoir	29
Taiya Bridge	29
Dyea Townsite	29
Dyea Road out of Nahku Bay	29
KLGO Maintenance Yard	29
Suggested Polygons to Collect	30
Continuing projects	30
Suggested projects	31
Phenology	32
KLGO Natural Resources Exotic Plant Collection	32
Literature Cited	33

Figures

	Page
Figure 1. Boundary map of Klondike Gold Rush National Historical Park	1
Figure 2. Work Areas around KLGO.....	3
Figure 3. Bird vetch before management (left) and after management (right)	8
Figure 4. Yellow toadflax behind Jeff Smith’s Parlor before (left) and after (right) the first management.....	9
Figure 5. Yellow toadflax hidden among equipment at the Maintenance Yard.	9
Figure 6. One of many white sweetclover infestations before (left) and after (right) at the municipal brush pile.....	10
Figure 7. Before (left) mechanical treatment of reed canary grass at Pullen Creek and after (right).....	11
Figure 8. Tarweed fiddleneck at the Seven Pastures brush pile, newly sprouted at the beginning of the season, and sextupled in size by the end.....	11
Figure 9. Tarping photos from 2016 at Lower Dewey Lake Reservoir	12
Figure 10. Removing oxeye daisy from Lower Dewey Lake, before (left) and after (right).....	13
Figure 11. The dandelions and buttercup early in the season at Lower Dewey Lake, one cannot see the oxeye daisy yet.	13
Figure 12. Map showing Dyea Road survey segments in 2017.....	14
Figure 13. Narrowleaf hawksbeard management along fringe of infestation in segment 1, before (left) and after (right)	14
Figure 14. Before (left) and after (right) on a narrowleaf hawksbeard infestation at a pullout on Dyea Road segment 3’s beginning.	16
Figure 15. Before (left) and after (right) of another narrowleaf hawksbeard infestation located on a hill.....	16
Figure 16. White sweetclover along Dyea Road, before (left) and after (right)	17
Figure 17. White sweetclover infestation directly after Taiya Bridge, before (left) and after (right).....	17
Figure 18. Oxeye daisy infestation before (left) and after (right) first treatment.	18
Figure 19. Nelson Slough before (left) and after (right) restoration and invasive plant management.	19
Figure 20. Slide Cemetery parking lot before restoration work (Pictured: Alex, Ami, Karen, Jami, and Abby)	20

Figures (continued)

	Page
Figure 21. Slide Cemetery parking lot after restoration with nursery logs in place and fireweed seed scattered	20
Figure 22. The culvert site before (left) and after (right) restoration.....	20
Figure 23. Additional restoration before (left) and after (right). Tall buttercup removal can be observed as well.....	20
Figure 24. A restoration site received seeding on one side of the road and fern/moss transplants on the other side.....	21
Figure 25. Nursery logs and seeding techniques used at a restoration site.....	21
Figure 26. Dyea town site trailhead island before (during invasive species removal, left) and after (right).	22
Figure 27. Peter Frank standing next to his restoration project from 2012 before (left) and after completion during 2017 (right).....	23
Figure 28. EPMT Devon Burton recording data while Peter Frank applies herbicide on tall buttercup at Sheep Camp.	23
Figure 29. Common dandelion at Laughton Glacier and the glacial terminus environment where it was found.	24
Figure 30. The ground past the Dead Horse Gulch overlook's guardrails is infested with many invasive plant species.....	25
Figure 31. Construction of a new bridge to replace the Captain William Moore Bridge will pose a large disturbed area when finished.	25
Figure 32. Canada thistle with cut flowering heads at the Black Lakes site.....	26

Tables

	Page
Table 1. Summary of Klondike Gold Rush National Historical Park Exotic Plant Management Work.....	6
Table 2. Summary of Detected Invasive Plant Species by 2017 EPMT in KLGO	7
Table 3. Restoration Taxa Summary in Dyea	19

Abstract

Summer 2017 marks the Exotic Plant Management Team's (EPMT) 14th year at Klondike Gold Rush National Historical Park (KLGO). The four main methods used by EPMT to prevent the propagation of invasive plants were: surveying new and old infestations, manual removal of infestations, restoring disturbed areas, and providing public outreach and education. It is important to monitor invasive species in order to track their spread and identify new infestations as they arise for rapid response treatment. A major part of the EPMT's work was to remap past infestations while surveying for new infestations. Using priority guidelines, EPMT focused on removing and treating invasive plants. EPMT helped manage multiple large tasks such as removing reed canary grass (*Phalaris arundinacea*) from Pullen Creek and pulling white sweetclover (*Melilotus albus*) from the municipal brush pile. The tarping project at the Lower Dewey Reservoir from 2016 was monitored and repaired over the 2017 season, finding no new growth of orange hawkweed (*Hieracium aurantiacum*). The construction project from 2016 along Dyea townsite Road had finally concluded, allowing EPMT and the SCA Crew to proceed with a major restoration project to prevent invasive plants from colonizing disturbed soil and to promote native plant growth. Also of note was the spraying of invasive plants at Sheep Camp (along the Chilkoot Trail) with herbicide as part of an ongoing restoration project to eradicate reed canary grass and tall buttercup (*Ranunculus acris*). Over 960 pounds of invasive plants were removed this year, others of note were oxeye daisy (*Leucanthemum vulgare*), yellow toadflax (*Linaria vulgaris*), and common sheep sorrel (*Rumex acetosella*). A new species detected this year was tarweed fiddleneck (*Amsinckia lycopsoides*). In 2017, 57.19 acres were surveyed, 15.44 acres were found infested and 0.88 acres were treated.

Acknowledgments

We would like to thank those that helped contribute to the success of the 2017 EPMT Season at Klondike Gold Rush National Historical Park. Within the park, Jami Belt was instrumental in providing guidance, experience, and education to EPMT efforts. Thanks also go out to Anne Matsov, Hailey Trefon, and Lynn Rhodes for their volunteering in restoration and plant management efforts during the Dyea Restoration project and initial weed pull at maintenance. In addition, we would like to thank Nicole Kovacs and Stephanie Palmer at Skagway Traditional Council (STC) for their partnership and assistance in numerous projects this year. The SCA Crew, led by Lou Eney, with team members Jonathan, Karen, Alex, Ami and Abby are also wholly appreciated for their part in the Dyea restoration project. At the Alaska Regional Office and from Wrangell – St. Elias National Park and Preserve, Peter Frank and Christopher Overbaugh were instrumental in providing training and assistance in spraying invasive plants at Sheep Camp for the restoration project. Girl Scout troop 41206 volunteered their vacation time to help us with removing invasive plants as well, which was very much appreciated. Without all of the support from these people, the EPMT program would not be where it is today.

Acronyms

AMG	Alaska Mountain Guides
EDRR	Early Detection and Rapid Response
EPMT	Exotic Plant Management Team
GPS	Global Positioning System
GIS	Geospatial Information System
KLGO	Klondike Gold Rush National Historical Park
NPS	National Park Service
SCA	Student Conservation Association
STC	Skagway Traditional Council
TIWC	Taiya Inlet Watershed Council
DOT	Department of Transportation

Introduction

Klondike Gold Rush National Historical Park (KLGO) is located in Southeast Alaska at the northern terminus of the Lynn Canal. The park is approximately 13,000 acres that is divided between three separate units (Figure 1). Each of these units is located within the river valleys of the Taiya River and Skagway River. These three distinct units create an area rich in biodiversity, encompassing a unique ecological gradient that includes lowland tidal flats, coastal rainforest, sub-alpine boreal forest, high-alpine meadow, and alpine tundra. This gradient is largely due to varying elevation and aspect found within the park, ranging from sea level to about 6,000 feet at the peaks of the coastal mountains.

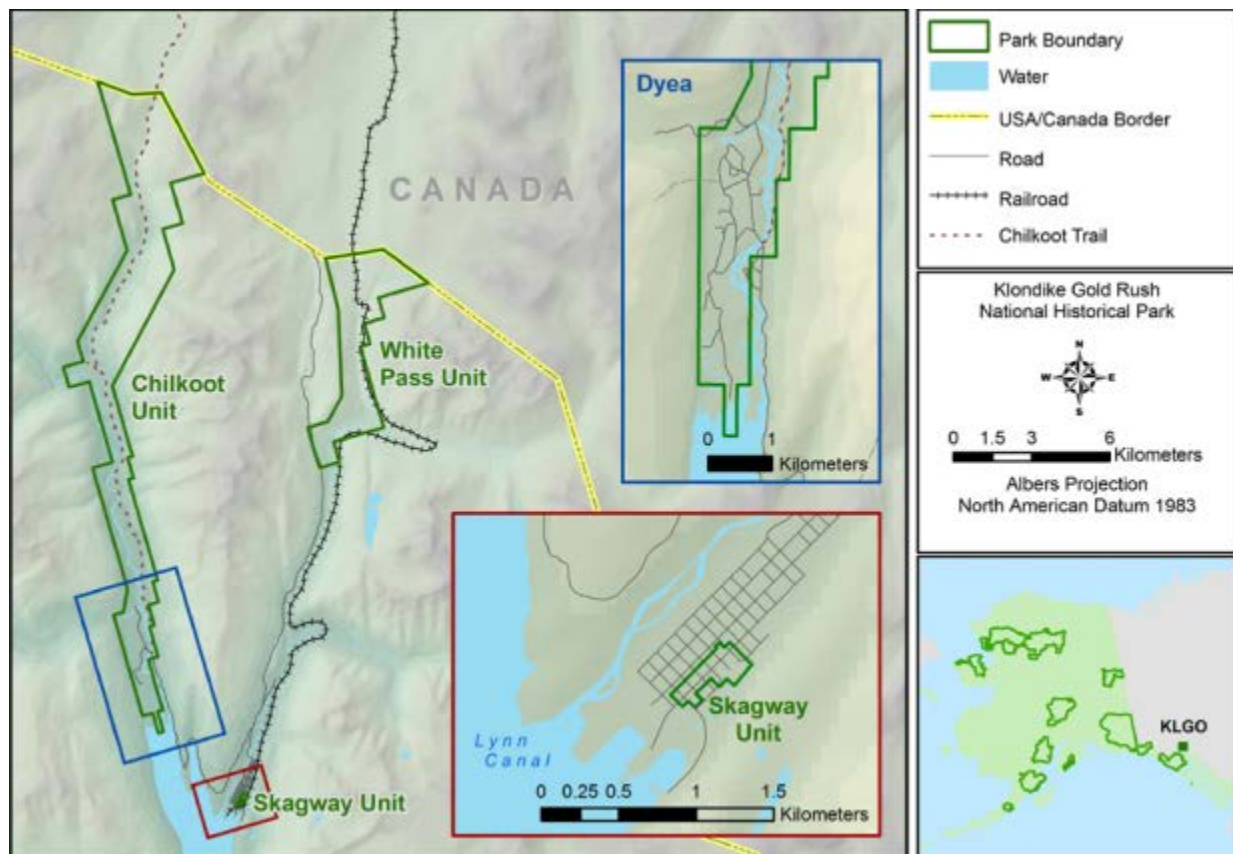


Figure 1. Boundary map of Klondike Gold Rush National Historical Park (Bernatz et al., 2011).

Though rich in biodiversity and ecotones, KLGO is highly vulnerable to the introduction and spread of invasive and exotic plant species. The park's geographic and ecological conditions are not only beneficial to the native plants that grow within the area, but also serve as an ideal habitat for non-native species. In addition to the parks' natural characteristics, the threat of exotic plants being introduced into the area is aided by the ever-growing anthropogenic influence in the region. There are three reasons that make KLGO particularly at risk of introduction of exotic plants due to human activity: 1) the influx of park visitors every year who intentionally or unintentionally transport exotic plants throughout the area via a variety of different methods, 2) the local horticultural interest in Skagway of landowners planting invasive plants as ornamentals for gardens, and 3) maintenance

activities to help improve and build infrastructure of the park and the surrounding areas, oftentimes leading to soil disturbance that fosters the introduction of exotic plants. The multitude of ecological niches created by such diverse ecosystems and high annual visitation creates ideal conditions for the spread and establishment of exotic and invasive plants.

The boundaries of KLGO are unique in that there are three separate units of the park interspersed with private, municipal, USDA Forest Service, and state-owned lands. These three distinct units are as follows: the Skagway Unit, the Dyea-Chilkoot Unit, and the White Pass Unit. Each of these units is unique in terms of their visitor use, terrain, ecology, and vectors for plant introduction. Consequentially, each unit has a unique invasive and exotic plant management strategy. Many of the infestations of invasive plants are found on lands neighboring park boundaries, necessitating efforts to monitor and control invasive plants on non-NPS property.

According to Hodkinson and Thompson (1997), humans play a significant role in seed spread and dispersal. Exotic plant species are often voluntarily introduced due to garden throw-outs from horticultural stock, or have been introduced through the vector of development and maintenance projects. These projects create disturbed areas and therefore ideal locations for invasive plant colonization. It has also been shown that seeds may be dispersed both short and long distances through epizoochory, the unintended external carrying of propagules via dispersal agents such as shoes and tires (Hodkinson and Thompson 1997, Wichmann et al., 2009). KLGO receives over 100,000 visitors annually, largely from cruise ships that originate from locations worldwide. The amount of foot and vehicle traffic that Skagway receives due to its high visitation creates an opportunity for invasive plant species introduction and spread. While controlling present populations remains a high priority, the most effective method for controlling plants is to prevent the establishment of invasive species (USDA 2007).

The Alaska EPMT has been tasked with inventorying, monitoring, and controlling invasive plants within the national parks of Alaska since 2004. Over the past 14 years, EPMT staff has collected baseline data that catalogs the dispersal and spread of invasive species, conducted annual monitoring surveys, established community outreach and prevention methods, and controlled emerging infestations throughout and surrounding the park. KLGO EPMT has focused on the strategy of early detection and rapid response (EDRR), where species are prioritized on a system of triage. This system focuses first on small populations of species of high invasiveness ranking, and later on larger populations of low invasiveness ranking (Carlson et al., 2008). This early response approach to emerging infestations, coupled with increased public education and awareness, has helped to keep the threat of invasive species manageable in KLGO.

Alaska is situated in a unique position compared to the contiguous United States; relatively few invasive plant species have established themselves in the state. Compared to other NPS units in Alaska, KLGO is second only to Glacier Bay National Park and Preserve in the number of exotic plant species documented (48 species as of 2011). KLGO is in a vulnerable position due to high visitation and anthropogenic vectors that create potential routes for invasive plant species establishment and dispersal. Therefore, appropriate steps must be taken to ensure that more species are not allowed to colonize and current populations are not allowed to spread.

Methods

Field work for the 2017 season was conducted between June and September. Methods for all data collection, data management, and mapping were in compliance with the field and office protocols developed by the Alaska Region Exotic Plant Management Team (Overbaugh et al., 2017a, b). EPMT staff utilized existing data, recommendations from previous years, this season's phenology, and available labor, to prioritize treatment of species and infestations, select equipment, and choose appropriate control methods.

Given the cultural significance of many areas in KLGO, special care was taken to ensure that no cultural resources were disturbed during EPMT activities. Tools were selected that would minimize the amount of damage to any potential cultural resources that could be uncovered or buried under work sites.

Defining Work Areas

To facilitate planning control efforts, the park and surrounding areas were divided into seven work areas (Figure 2). Fieldwork was organized and conducted using these work areas and the results were organized by such areas. The six work areas were as follows: Skagway, Dewey Trail System, Dyea, Laughton Glacier, Chilkoot Trail (to Sheep Camp), Laughton Glacier, and the Klondike Highway.

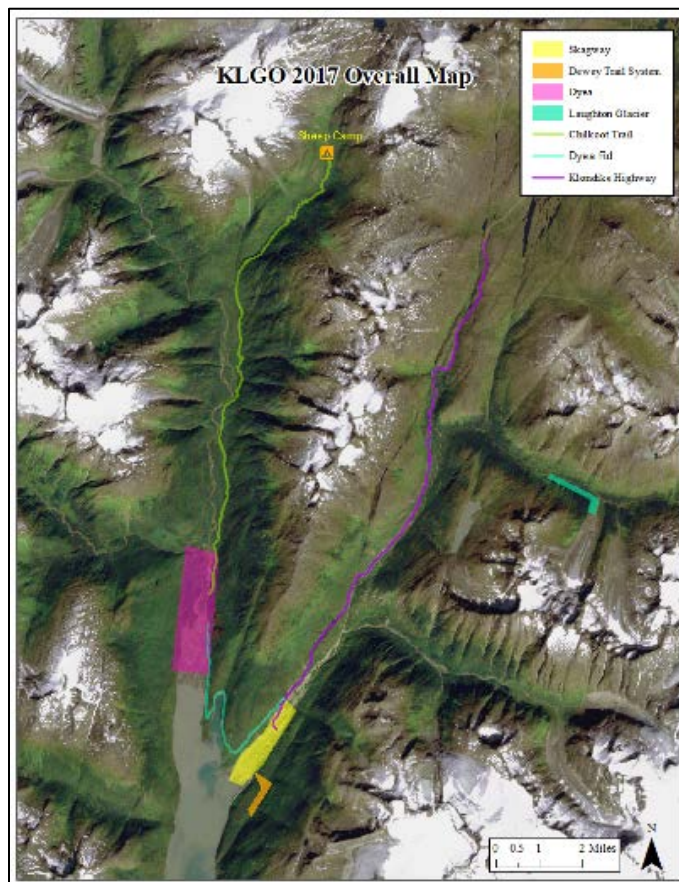


Figure 2. Work Areas around KLGO

Work areas were decided first based on land ownership, and secondly on the proximity of high-priority invasive species to park lands, but other areas were also selected based on the availability of labor support to the project. Careful considerations were made to avoid conflicts with the local community. Highly invasive species found adjacent to park property may invade park lands and reach unmanageable levels. Management was performed with consideration to private property ownership, however, but surveys could be performed without trespass using offset data with the Trimble surveying device.

Work in Skagway centered on performing stewardship on NPS land to remove invasive plants from both Jeff Smith's Parlor and the KLGO maintenance yard, and assisting the municipality with high-profile locations along with STC. The nearby Dewey trail system was home to the orange hawkweed tarping project (which required maintenance throughout the season) and a small meadow at the southern end of Lower Dewey Lake, where the team surveyed invasive plants and managed oxeye daisy. Dyea Road was surveyed by EPMT to track the spread of invasive plants and the effects of last year's construction work, with most work being done within the DOT right-of-way, carefully considering private land rights at the same time. Dyea was a major focus this year after completion of the road improvement to Dyea Flats road where disturbed land restoration was performed in collaboration with the SCA crew. The Chilkoot Trail was not surveyed fully this year due to physical limitations but fair weather allowed restoration work at Sheep Camp, primarily chemical treatment of two invasive taxa; reed canary grass and tall buttercup. A few scattered dandelions and common plantain were found along the trail, as well. Laughton Glacier was surveyed for the orange hawkweed that was reported, but not verified in 2015. Finally, the Klondike Highway was resurveyed along the east side of the road and some 2016 management sites were revisited. The Black Lakes site along Klondike Highway was of specific concern due to a growing Canada thistle (*Cirsium arvense*) infestation.

To garner support for EPMT efforts from both staff and visitors, outreach was performed through multiple weed pulls, education events, and posters to encourage reporting of invasive plant infestations to EPMT staff and reducing false positives through misidentification.

Prioritization of Species and Treatment

Control work in KLGO was prioritized by geographic location, extent, and an invasiveness ranking system. The Alaska Invasiveness Ranking System is an index that provides rankings on a scale from 0 to 100 based on four subcategories for each species: potential ecological impacts, biological attributes and dispersal ability, distribution, and feasibility of control (Carlson et al., 2008). The index is specific to the Alaska region and was used extensively to prioritize treatment in KLGO. Species with a higher invasiveness rank and a smaller geographic extent were considered the highest priority for management. Conversely, species with a lower invasiveness rank and a larger geographic extent were considered lowest priority for management.

The species considered highest priority in 2017 were white sweetclover, reed canary grass, oxeye daisy, narrowleaf hawkbeard (*Crepis tectorum*), Canada thistle, orange hawkweed, and yellow toadflax. One species that is considered high priority but was not managed to the same extent this year was ornamental jewelweed (*Impatiens glandulifera*). While one new infestation of the plant was

discovered in the brush pile at Seven Pastures, it has not expanded much beyond its prior range mapped in 2016. The species focused on this year threaten native species and have been shown to have a growing population or one that is at high risk of spreading to other areas.

Tools for Identification and Data Collection

The primary field guides referenced for plant identification were Plants of the Pacific Northwest Coast (Pojar and Mackinnon, 1994) and A Field Guide to Alaska Grasses (Skinner et al., 2012).

All spatial data on invasive plant infestations were collected using one GPS unit, the Trimble GeoExplorer 6000 GeoXH[®] datalogger, and an external GNSS receiver, the Trimble Tornado L1[®].

Control Methods

The primary control method employed for invasive plant removal was hand pulling combined with hand tools such as trowels. The largest concern with this method is that sometimes the entire root system must be removed for effective treatment. Plants with a tap root are usually pulled easily and effectively, but those with rhizomatous root systems require special care to remove the entire root system. Many invasive plants in the region can regenerate from root segments left in the soil when proper hand pulling techniques are not employed. This is quite frequent with invasive species like yellow toadflax, oxeye daisy, and orange hawkweed.

In addition, a few other methods were utilized this year. At Pullen Creek, machine treatment with a gas powered trimmer was used on reed canary grass, prior to seed development. At Sheep Camp, two different herbicides were applied using a backpack sprayer: AquaMaster[®] for the treatment of reed canary grass and Milestone[®] for the treatment of tall buttercup. These herbicides were applied by Peter Frank from the Alaska EPMT.

All removed plants were bagged on site, weighed in the KLGO maintenance building, and transported by KLGO maintenance staff to the Skagway city incinerator to be burned. This method minimized the potential for seed dispersal while disposing of the invasive species.

Personnel

The full-time EPMT staff member at KLGO during the 2017 season was Devon Burton, a Student Conservation Association intern. The EPMT performed surveying and management mostly solo, but with the occasional support from a volunteer. The Dyea Restoration Project was conducted by the 6 person SCA crew led by Lou Eney, Anne Matsov, Hailey Trefon, and Jami Belt. Jami was the lead in organizing the project. Multiple volunteers assisted with pulling white sweetclover at the municipal brush pile, but they were led by STC staff Nicole Kovacs and Stephanie Palmer, both of which had volunteered their time at multiple prior weed pulls. In early August, Girl Scout Troop 41206 arrived in Skagway and donated two hours of their time to pull weeds.

Results

2017 Season Overview

The 2017 EPMT staff inventoried 57.19 acres and treated 0.88 acres in total this season, with efforts not limited to the KLGO boundaries. Over 960 pounds of invasive plant matter was removed from the various sites this season. The restoration project at Sheep Camp to replace reed canary grass with native plants was completed. The restoration project along Dyea Flats road was also completed, with 11 sites revegetated. Unlike in 2015, bigleaf lupine (*Lupinus polyphyllus*) was not detected within the park. Orange hawkweed was not detected spreading beyond tarps at Lower Dewey Reservoir. White sweetclover continues to spread into Dyea with a confirmed infestation just past Taiya Bridge in the disturbed soil along the DOT right-of-way. 2017 also marked the first year that tarweed fiddleneck was recorded in Skagway at the Seven Pastures brush pile. Table 1 summarizes KLGO EPMT work conducted up to 2017 and Table 2 lists the invasive plants detected by 2017 EPMT in KLGO.

Table 1. Summary of Klondike Gold Rush National Historical Park Exotic Plant Management Work.

Year	Invasive GPS Data NPS Lands (non-NPS lands)		
	Species Acres Surveyed ¹	Species Acres Infested ²	Acres Treated ³
2004	43.531 (52.497)	7.838 (6.842)	0.792 (1.505)
2005	3.106 (6.45)	3.099 (2.617)	0.732 (2.436)
2006	63.145 (74.35)	4.577 (2.308)	2.912 (0.726)
2007	1.481 (7.673)	0.487 (5.513)	0.011 (1.676)
2008	5.842 (47.974)	2.063 (22.159)	0.235 (1.351)
2009	11.931 (83.259)	2.453 (21.645)	0.388 (2.504)
2010	34.638 (245.513)	3.914 (56.212)	0.502 (9.362)
2011	49.720 (98.718)	11.278 (50.695)	3.045 (8.583)
2012	31.430 (153.766)	20.987 (86.004)	0.911 (5.282)
2013	83.455 (182.7)	5.701 (36.220)	0.771 (2.431)
2014	0.63 (4.27)	0.19 (0.74)	<0.001 (0.09)
2015	3.97 (30.56)	0.27 (4.01)	0.10 (1.44)
2016	0.2 (41.33)	0.05 (1.2)	0.01 (0.07)
2017	1.18 (56.01)	0.38 (15.06)	0.12 (0.76)

¹ Acres surveyed represent the total area mapped.

² Acres infested represent the area of a mapped infestation multiplied by the % cover of invasive plants in that mapped area.

³ Acres treated represent the area of a mapped infestation multiplied by the percent cover of invasive plants in that mapped area and by the percent of the infestation treated.

Table 2. Summary of Detected Invasive Plant Species by 2017 EPMT in KLGO

Common name	Scientific name	Skagway	Dyea Road	Dyea	Chilkoot Trail	Klondike Hwy	Dewey Trails
Alsike clover	<i>Trifolium hybridum</i>	X	X	X	–	X	X
Bird vetch	<i>Vicia cracca</i>	X	–	–	–	–	–
Black bindweed	<i>Polygonum convolvulus</i>	X	–	X	–	–	–
Canada thistle	<i>Cirsium arvense</i>	–	–	–	–	X	–
Chickweed	<i>Stellaria media</i>	X	–	X	–	X	–
Common dandelion	<i>Taraxacum officinale</i>	X	X	X	X	X	X
Common eyebright	<i>Euphrasia nemorosa</i>	X	X	X	–	X	–
Common plantain	<i>Plantago major</i>	X	X	X	X	X	X
Common tansy	<i>Tanacetum vulgare</i>	X	X	–	–	–	–
Curly dock	<i>Rumex crispus</i>	X	X	–	–	X	–
European mountain ash	<i>Sorbus aucuparia</i>	X	–	–	X	X	–
Narrowleaf hawksbeard	<i>Crepis tectorum</i>	X	X	–	–	X	–
Night-flowering catchfly	<i>Silene noctiflora</i>	X	–	–	–	–	–
Ornamental jewelweed	<i>Impatiens glandulifera</i>	X	–	–	–	–	–
Oxeye daisy	<i>Leucanthemum vulgare</i>	X	X	X	–	X	X
Pineapple weed	<i>Matricaria discoidea</i>	X	X	X	–	X	–
Prostrate knotweed	<i>Polygonum aviculare</i>	X	–	X	–	–	–
Quackgrass	<i>Elymus repens</i>	–	–	–	X	–	–
Red clover	<i>Trifolium pratense</i>	X	X	X		X	X
Reed canary grass	<i>Phalaris arundinacea</i>	X	–	–	X	–	–
Scentless false mayweed	<i>Tripleurospermum perforatum</i>	X	–	–	–	–	–
Sheep sorrel	<i>Rumex acetosella</i>	X	X	X	–	X	X
Shepherd's purse	<i>Capsella bursa-pastoris</i>	X	X	X	–	X	–
Sticky ragwort	<i>Senecio viscosus</i>	X	–	X	–	X	–
Tall buttercup	<i>Ranunculus acris</i>	X	X	X	X	X	X
Tarweed fiddleneck	<i>Amsinckia lycopsoides</i>	X	–	–	–	–	–
White clover	<i>Trifolium repens</i>	X	X	X	X	X	X
White sweetclover	<i>Melilotus officinalis</i>	X	X	X	–	–	–
Yellow toadflax	<i>Linaria vulgaris</i>	X	X	–	–	X	–

Inventory and Control Accomplishments

Skagway

The town of Skagway has a wide variety of invasive plants. Most are restricted to disturbed areas such as along gravel alleys between the roads but there are also many that are planted as ornamentals. Because most invasive plants around town are relatively non-threatening to native vegetation or are on private property, managing invasive plants around town was a relatively low priority during the 2017 season. Most areas owned by the municipality however are open to manual management efforts with permission and/or collaboration with STC. The exceptions to note were areas where the invasive plants were at high risk of spreading to other areas outside of town or into areas of native vegetation such as Pullen Creek. Other exceptions were when species are seen in town that were either new to the area and relatively unestablished, or very highly ranked by the Alaska Invasive Plants Ranking System.

Airport

The Skagway airport has been a common site for community weed pulls during past EPMT efforts, however the circumstances did not work out well this year because of weather and DOT mowing.

Bird Vetch at 9th Avenue & Spring Street

One of the more aggressive invasive species, bird vetch (*Vicia cracca*) has a ranking of 73, making it one of the more invasive plants found in Skagway (Figure 3). In July, the SCA crew and EPMT took some time to manually remove the infestation from the woods near the railroad. The infestation has started to move from just the clearing it was originally found in to under the canopy where other plants grow, strangling native species. Also found among the bird vetch was one occurrence of black bindweed (*Polygonum convolvulus*). A total of 93.5 pounds of plant material was removed from the site, taking care to get as much of the plant as possible to prevent it from lasting. When revisited later in the season (middle to late August) the infestation was still present and had begun to sprout again. In the end, additional seeding was prevented. Also present within the infestation was tall buttercup.

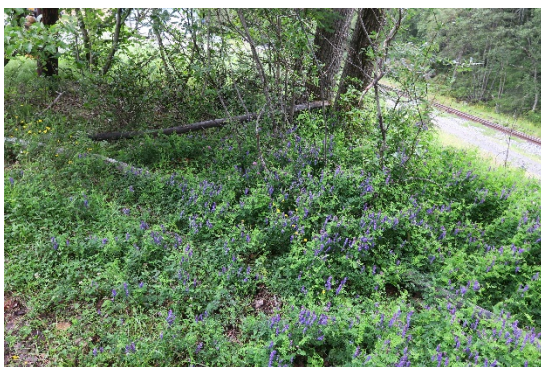


Figure 3. Bird vetch before management (left) and after management (right)

Jeff Smith's Parlor

One of the more popular attractions for visitors of Skagway thanks to the guided interpretation tours that pass through daily is Jeff Smith's Parlor. Consequently it is also a vector for invasive species. The EPMT surveyed and managed this location twice, revealing white, red, and alsike clovers (*Trifolium repens*, *pretense*, *hybridum*); pineapple weed (*Matricaria discoidea*), sticky ragwort (*Senecio viscosus*), tall buttercup, shepherd's purse (*Capsella bursa-pastoris*), yellow toadflax, common sheep sorrel, narrowleaf hawksbeard, common dandelion (*Taraxacum* ssp. *officinale*), and common plantain (*Plantago major*). Management focused on tall buttercup, narrowleaf hawksbeard, and yellow toadflax (Figure 4). The yellow toadflax is reportedly growing out from a crawlspace underneath the building. The site is mowed frequently by KLGO maintenance staff.



Figure 4. Yellow toadflax behind Jeff Smith's Parlor before (left) and after (right) the first management

KLGO Maintenance Yard

The EPMT intern collaborated with Lynn Rhodes from the maintenance team at KLGO to remove invasive plants like yellow toadflax (Figure 5), common sheep sorrel, tall buttercup, pineapple weed and common chickweed (*Stellaria media*) from the maintenance yard, pulling a total of 68 pounds of plants. Devon attended a morning maintenance meeting to perform outreach about different invasive plants that are found around maintenance and the park. The KLGO Maintenance Yard could act as a vector for invasive plants by traveling in fill, vehicle tires or heli-ops staging. If heli-ops staging is a vector for invasive plants, transport of infestations to spots along the Chilkoot Trail or even the relatively undisturbed White Pass unit, could occur.



Figure 5. Yellow toadflax hidden among equipment at the Maintenance Yard.

Municipal Brush Pile

Located opposite of the beginning of Dyea Road, the municipal brush pile was the target of the 9th Annual Skagway Community Weed Pull (Figure 6). It was the second time that the site was targeted by EPMT for a community weed pull, as the 8th annual weed pull between STC and the EPMT was also hosted there. Specifically, the weed pull addressed white sweetclover, but most other *Trifolium* clover species were surveyed along with narrowleaf hawksbeard, pineapple weed, a few isolated tall buttercups, and foxtail barley (*Hordeum jubatum*). Eleven participants showed up to the weed pull, and a total of 237 pounds of white sweetclover was removed from the area. Data collected during pre-management surveying indicated that the amount of white sweetclover has increased from last year, but anecdotal evidence from STC's Nicole Kovacs indicates that the opposite is true. After the weed pull, someone from the local community went back with a weed trimmer to manage the narrowleaf hawksbeard, which could cause the plant to go to seed, because it is a member of the aster family, whose petals are capable of going to seed if cut from the plant. Scentless false mayweed was also detected but not surveyed, due to lack of time.



Figure 6. One of many white sweetclover infestations before (left) and after (right) at the municipal brush pile

Pullen Creek

A result of contaminated soil imported to the site during a restoration project, the infestation of reed canary grass persists alongside Pullen Creek, and was managed by the 2016 EPMT who clipped the seed culms off of the plants. This year, STC and EPMT collaborated in an effort to remove the plant through mechanical means using a gas powered trimmer. During these efforts, 253 pounds of reed canary grass was removed from the site and STC periodically clipped additional flowering culms to prevent further spread (Figure 7). This was also beneficial to the municipality by opening up space for recreation along the side of the creek.



Figure 7. Before (left) mechanical treatment of reed canary grass at Pullen Creek and after (right)

Seven Pastures

The Seven Pastures site is a popular local area where events including live music or sporting events are held. It used to serve as the main brush pile for Skagway until another brush pile was created. The site is home to the following invasive plants: yellow toadflax, all *Trifolium* clovers, scentless mayweed, dandelion, common plantain, pineapple weed, tall buttercup, curley doc (*Rumex crispus*), narrowleaf hawksbeard, night-flowering catchfly (*Silene noctiflora*), ornamental jewelweed, common sheep sorrel and reportedly in the past white sweetclover. Early on in the season, 56 stems of ornamental jewelweed were removed by STC and EPMT, which remained unseen for the rest of the season. The site was the location for two separate weed pull events. The first event was outreach with STC's youth summer camp program 'Weed Whackers' which resulted in 108 pounds of weeds being pulled. In early August, Girl Scout Troop 42016 volunteered 2 hours of time to help pull yellow toadflax from the woods adjacent to the Skagway River and Seven Pastures parking lot, resulting in 17 pounds of weeds removed. Management is important at this site because of its proximity to local recreation and human disturbance. Also of note at the Seven Pastures site, EPMT identified the first occurrence of tarweed fiddleneck in Skagway on the main brush pile (Figure 8). The plant is listed as an exotic plant but lacks an invasiveness ranking. White sweetclover was not seen this year but it could be possible that it simply grew later in the season. Unfortunately when the main brush pile was visited by EPMT for a resurvey, bees dissuaded a thorough investigation.



Figure 8. Tarweed fiddleneck at the Seven Pastures brush pile, newly sprouted at the beginning of the season, and sextupled in size by the end.

Dewey Lakes Trail System

Because of its close proximity to town, the Dewey Lakes trail system receives a high amount of traffic from tourists. This opens the door for many invasive plants to become dispersed throughout the trail and to other areas. Fortunately, the trail system only has a few areas where invasive plants are found. Since the trails are so highly traveled, this area is of high priority to keep free of invasive plants.

Lower Dewey Reservoir

The Lower Dewey Reservoir is the site of 2016's orange hawkweed tarping project (Figure 9). First identified in 2015, orange hawkweed is ranked 79 on Alaska's invasive plant ranking system and has already spread to unmanageable levels in Haines and Juneau. Because of its high ranking status and small, manageable population size in Skagway, it was one of the highest priorities of the 2016 season. Hand pulling this plant is not a feasible option due to its ability to re-sprout from small root fragments. 2017 EPMT efforts were focused on maintaining the two tarping installations at the site. Tarping so far appears to be successful, with no detection of orange hawkweed escaping the tarp. The moss mat created in 2016 to restore a small area infested with tall buttercup is also intact and growing nicely. Repairs were needed throughout the season to keep the restoration tarping in good order. The tarp will likely remain in place until 2021. Tall buttercup, common dandelion and white clover are omnipresent in the open areas around the reservoir.



Figure 9. Tarping photos from 2016 at Lower Dewey Lake Reservoir (*Photos by Kylie Mosher, 2016*)

Lower Dewey Lake

The meadow at the far southern end of the lake is infested with tall buttercup, common dandelion, and oxeye daisy (Figure 10, 11). The oxeye daisy patch has been referenced in 2015 and 2016 reports, and was managed again in 2017 by removing the flowering seed heads once in the season. This is not enough to fully manage an infestation however because oxeye daisy grows fast and new flowering seed heads can appear within a week. Common dandelion were also found spreading into the trail system.



Figure 10. Removing oxeye daisy from Lower Dewey Lake, before (left) and after (right)



Figure 11. The dandelions and buttercup early in the season at Lower Dewey Lake, one cannot see the oxeye daisy yet.

Dyea Road

The DOT right-of-way along Dyea Road is a highly-disturbed area where construction has taken place in the past year and is surrounded by private property, which makes management a difficult issue. There are three segments to the road: Beginning to AB Mountain Trail, AB Mountain Trail to Nahku Road and Nahku Road to Taiya Bridge (Figure 12). The road was surveyed by bike, car, and occasionally foot. The next EPMT should try to schedule a day to survey the entire road by bike or foot for maximum accuracy as suggested in 2013 and 2014 reports, with special care to double check certain spots when common tansy begins to bloom.



Figure 12. Map showing Dyea Road survey segments in 2017.

Beginning to AB Mountain Trail (Segment 1)

Narrowleaf hawksbeard has returned in great numbers after a construction project disturbed the North side of the road for a large portion from the intersection with Klondike Highway, ending a bit before the overlook of Skagway (Figure 13). It was absent along this ditch last year. Efforts to remove the infestation were delayed by the sheer amount of invasive plants present, which required assistance to remove. It could not be removed until the last day of the SCA crew's availability, but by then it was too late and the plant had mostly gone to seed. Removal early on in the season was performed at the fringe of the main infestation's range along the first segment to prevent too much spread.



Figure 13. Narrowleaf hawksbeard management along fringe of infestation in segment 1, before (left) and after (right)

Oxeye daisy was surveyed; one infestation being directly after the Skagway overlook, and another infestation planted ornamentally in a garden on private property had jumped over the road since 2016 and began moving down the hill. Additionally, there is possibly an infestation of common tansy near the overlook, which hasn't been confirmed. The oxeye daisy infestation near AB Mountain Trail was not present when surveyed.

Near the AB Mountain Trail, tall buttercup was found early in the season in the ditch and roadside and has been surveyed in the past. White and alsike clover were abundant and essentially naturalized alongside all non-gravel roadsides along with a multitude of dandelions, which were not exhaustively surveyed to save time.

AB Mountain Trail to Nahku Road (Segment 2)

This segment of the road contains Nahku Bay. Common dandelion and *Trifolium* clover infestations were not inventoried this season. The oxeye daisy infestation treated 100% by the EPMT in 2016 was surveyed again by the EPMT, but not managed due to its precarious position on a steep bank. Data from 2004-2016 indicates that this infestation is moving up the road and has been getting smaller over time until now. It is unlikely that this infestation will be easily managed without assistance.

It can also be noted that the shooting range is present on this segment of the road. It has only been surveyed once in 2012 by EPMT lead Peter Frank. There are currently no plans to revisit the site, but STC might be able to gain access to this site and manage the infestation. There were reports of narrowleaf hawksbeard and white sweetclover at this location.

The east side of Nahku Bay has infestations of common tansy on occasion that were removed by the EPMT in 2016. While no instances of the plant were seen yet in 2017, the late bloom for the plant could be the cause of this. The property at the top of Nahku Bay contains oxeye daisy. The west side of Nahku Bay meanwhile had sparse, single plant instances of tall buttercup, oxeye daisy, and narrowleaf hawksbeard which were all managed by hand pulling.

The end of the segment contains Nahku Road and the curve entering the Dyea flats segment of the road. On Nahku Point Road, there is one property that has abundant white sweetclover; it was not fully surveyed however to respect private land property rights and outreach has not taken place. The curve at the end of this segment of Dyea Road contains oxeye daisy which was manually managed by removing seed heads in 2016 but not managed by the EPMT in 2017. Instead, it was observed by the EPMT and before management or surveying could take place, the land owners mechanically treated the infestation. It is likely that they mowed the plant down and bagged the refuse because no scattered plant matter was seen in or around the area. There has been little spatial difference in this infestation over time. It is unknown when exactly the mechanical treatment took place.

Nahku Road to Taiya Bridge (Segment 3)

This segment of Dyea Road consists of the length running parallel to the Dyea flats (Figures 14, 15). Along this segment there are sparse infestations of narrowleaf hawksbeard, and EPMT efforts were assisted by the SCA crew in looking for and removing the plant. Additionally, there were small infestations of tall buttercup and yellow toadflax scattered about that did not get surveyed before

removal. Some narrowleaf hawksbeard plants were hidden behind alder saplings. There were a few spots where narrowleaf hawksbeard was more prevalent such as on a grassy hill before a pullout, a pullout just after the curve into the segment, and at a section of land near the raft pull out used by Chilkat Guides directly after an area for parking.



Figure 14. Before (left) and after (right) on a narrowleaf hawksbeard infestation at a pullout on Dyea Road segment 3's beginning.



Figure 15. Before (left) and after (right) of another narrowleaf hawksbeard infestation located on a hill

Additionally, the white sweetclover identified in 2016 was found again along Dyea Road closer to the flats (Figure 16). Three stems were removed in 2016. This year EPMT and KLGO Resources removed more than 100. The first removal was performed by the EPMT and can be seen in figure 15. The second, follow up removal was performed by Jami Belt in the same location where new growth was beginning to appear as the seed bank began to take hold. This spot will need consistent retreatment throughout next season.



Figure 16. White sweetclover along Dyea Road, before (left) and after (right)

The segment of road across from the Chilkoot Trail Outpost leading up to the Taiya Bridge contains tall buttercup, which can also be seen across from the raft pull out. A small patch of tall buttercup was pulled by the EPMT early in the season closer to the parking lot for the Chilkoot Trail. Tall buttercup can also be found around the bathrooms at the trailhead. Additionally, the stand of reed canary grass remains in the location where it was first surveyed in 2012; on private property owned by the Chilkoot Trail Outpost. It is unlikely that management nor outreach can be performed on this patch due to disagreements in the past regarding it. (See EPMT reports 2012 and 2013) The Chilkoot Trailhead contains a couple of dandelions and tall buttercup plants which were managed.

Post Taiya Bridge

The stretch of road North of Taiya Bridge is home to three different high-profile infestations, all of which were surveyed or managed in some way by the EPMT. In the ditch on the left side is a tall buttercup infestation interspersed with red columbine (*Aquilegia canadensis*). On the opposite side a new infestation of white sweetclover was found (Figure 17). Over 25 pounds of the plant were pulled throughout the season from this location. Additionally, the ditch further on has a large infestation of oxeye daisy requiring seed head removal (Figure 18). Both of these infestations were treated on a weekly basis until mid-late August. These two infestations are within DOT right-of-way. In the fall of 2017 the park plans to pursue permits to treat these infestations with Milestone®. Tall buttercup was also present in the right side of the ditch as well, but management efforts were not taken.



Figure 17. White sweetclover infestation directly after Taiya Bridge, before (left) and after (right)



Figure 18. Oxeye daisy infestation before (left) and after (right) first treatment.

Dyea & Dyea Restoration Project

Dyea continues to be a priority area for the EPMT within the park. Dyea is the most heavily used and accessible natural area within the park, making it vulnerable to the introduction of new invasive species. While there are few high priority species located within NPS-administered land in Dyea, several high priority species are found just outside the park boundaries. Due to this, it is important to monitor and control them before they can spread into the park. Of the species that are located on park property, most are concentrated along highly disturbed sites along road and trail systems.

From May 2016 to early July 2017 a large construction project to raise and in some places widen the Dyea townsite road was completed. With any road project comes disturbance, opening opportunities for invasive plants to move in. To prevent this, a restoration plan was implemented that involved removing invasive plants and harvesting native plants prior to construction and restoring the area with native plants and seeds. This project was supposed to begin in fall of 2016. However, the contractors exceeded their work deadlines. In 2017, the EPMT surveyed the Dyea Flats road for possible restoration sites and invasive species. When the SCA crew arrived in late July, work began to replant salvaged moss and various native taxa (seen in Table 3) at 11 different sites including Slide Cemetery trailhead, the Dyea townsite trailhead and Nelson Slough (Figures 19-25). A total of 0.14 acres were restored. The main invasive species managed within Dyea were dandelion, common eyebright (*Euphrasia nemorosa*), sheep sorrel, *Trifolium* clovers, tall buttercup, chickweed, and a single prostrate knotweed (*Polygonum aviculare*). Oxeye daisy was not detected anywhere within the Dyea area of the park past the Taiya Bridge infestation. Currently, there is also a transportation study underway in the park to determine if and how transit can be coordinated by the NPS to Dyea for park visitors, which could mean increased future visitation to the Dyea area.

Table 3. Restoration Taxa Summary in Dyea

Native Taxon	Restoration Method	Native Taxon	Restoration Method
<i>Iris setosa</i>	Transplant	<i>Iris setosa</i>	Seed
<i>Comandra umbellata</i> var. <i>californica</i>	Transplant	<i>Dryopteris expansa</i>	Transplant
<i>Viburnum edule</i>	Transplant	<i>Chamaenerion angustifolium</i>	Seed
<i>Rhinanthus minor</i>	Seed	<i>Prenanthes alata</i>	Transplant
<i>Cornus sericea</i>	Cutting	<i>Streptopus amplexifolius</i>	Transplant
<i>Ribes rubrum</i>	Transplant	<i>Cornus canadensis</i>	Transplant
<i>Pyrola asarifolia</i>	Transplant	<i>Tsuga heterophylla</i>	Transplant
<i>Trientalis borealis</i>	Transplant	<i>Aquilegia canadensis</i>	Transplant
<i>Heracleum lanatum</i>	Seed	<i>Carex spp.</i>	Seed
<i>Arctagrostis latifolia</i>	Seed	<i>Deschampsia cespitosa</i>	Seed
<i>Festuca rubra</i>	Seed	<i>Lathyrus japonicas</i>	Seed
<i>Actaea rubia</i>	Transplant	<i>Sambucus racemosa</i>	Transplant
<i>Fritillaria camschatcensis</i>	Transplant	<i>Lupinus nootkatensis</i>	Seed
<i>Galium aparine</i>	Cutting	<i>Cornus sericea</i>	Cutting
<i>Circaea lutetiana</i>	Transplant	<i>Athyrium filix-femina</i>	Transplant
Unknown native moss	Transplant	Unknown native grass	Transplant



Figure 19. Nelson Slough before (left) and after (right) restoration and invasive plant management.



Figure 20. Slide Cemetery parking lot before restoration work (Pictured: Alex, Ami, Karen, Jami, and Abby)



Figure 21. Slide Cemetery parking lot after restoration with nursery logs in place and fireweed seed scattered



Figure 22. The culvert site before (left) and after (right) restoration



Figure 23. Additional restoration before (left) and after (right). Tall buttercup removal can be observed as well.



Figure 24. A restoration site received seeding on one side of the road and fern/moss transplants on the other side.



Figure 25. Nursery logs and seeding techniques used at a restoration site.

The Dyea townsite consisted of three main problem areas. First, sheep sorrel was able to easily move in and establish populations in disturbed areas. The plant also became established on the thick moss mats that make up the area. EPMT work in August attempted to manage the infestations, starting in the flats area of the townsite, but had little success. Stephanie from STC was the sole volunteer to come out and assist in the efforts, despite her regular outreach duties. In total, 67.5 pounds were removed from the area.

Second was the island at the townsite trailhead (Figure 26). This spot was repeatedly being run over by vehicles and horses, leading to a large amount of invasive plants covering it by the time the SCA crew arrived. This island was planned to be a native plant garden of sorts during this season, but that plan was not able to be implemented this year.



Figure 26. Dyea town site trailhead island before (during invasive species removal, left) and after (right).

Finally, the Dyea townsite area immediately at the beginning contains tall buttercup. Plans to do an efficacy study on herbicide treatment methods and collateral damage to native taxa are underway. Once this study has results, the best method will likely be used on infestations of tall buttercup elsewhere in Dyea.

A few smaller infestations of invasive plants were managed along the road, including a sheep sorrel infestation and a tall buttercup infestation as well.

Chilkoot Trail

The US side of the Chilkoot Trail was surveyed up to Sheep Camp during the 2017 season. Common dandelion was found in two instances past Saintly Hill and manually removed.

Sheep Camp Restoration Project

Sheep Camp is one of the more popular campgrounds along the Chilkoot Trail and lies 13 miles up the trail. Reed canary grass was first detected at Sheep Camp in 2011. Since then, there has been an ongoing project to eradicate reed canary grass on the Chilkoot Trail. The infestation was initially tarped in 2011. After tarping methods failed to kill the last culms, herbicide was applied in 2015. In 2016, attempts were made to spray herbicide on the reed canary grass, but consistent rainfall prevented the chemical treatment from taking place. In 2017, EPMT intern Devon Burton, Jami Belt and Peter Frank hiked to Sheep Camp in one day and were able to spray 26 stems of reed canary grass with AquaMaster® and 189 tall buttercup plants with Milestone® (Figures 27, 28). There was also one confirmed instance of quackgrass (*Elymus repens*) identified and pulled at Sheep Camp this year.



Figure 27. Peter Frank standing next to his restoration project from 2012 before (left) and after completion during 2017 (right)



Figure 28. EPMT Devon Burton recording data while Peter Frank applies herbicide on tall buttercup at Sheep Camp.

Laughton Glacier

Laughton Glacier is a popular hiking destination on Tongass National Forest land along the White Pass and Yukon Route Railroad, located approximately one mile east of the White Pass Unit of KLGO. The majority of invasive species found at Laughton Glacier were concentrated at the large clearing around the train stop. White clover and common dandelion accounted for most of the ground cover along with common sheep sorrel and common plantain (Figure 29). These infestations are beginning to move down the trail, specifically with common dandelion and tall buttercup (according to one AMG employee). Concerns about the presence of orange hawkweed were brought up in the 2015 season due to an unconfirmed report by a park staff member, but nothing has been found since then. The EPMT performed two gridded surveys along the rocky clearings on Laughton Glacier's trail along with an intensive trail survey and did not find the invasive orange hawkweed, only the native white hawkweed (*Hieracium albiflorum*). However, along the glacial terminus there were two common dandelions growing which were removed by the tap root. It is likely they were spread by hikers, which means a boot brush at the trailhead could be beneficial.

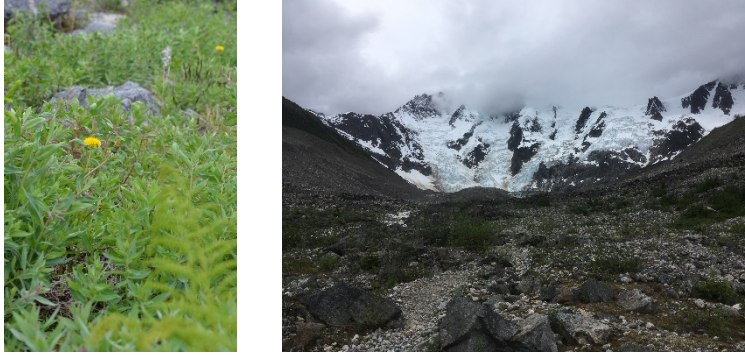


Figure 29. Common dandelion at Laughton Glacier and the glacial terminus environment where it was found.

Klondike Highway

The Klondike is one of the main corridors connecting the Yukon Territory and British Columbia to Skagway and is an excellent conduit for invasive plant dispersal across international borders. Frequent maintenance creates disturbed soil and facilitates the introduction, establishment, and spread of invasive plant species. The US portion of the Klondike Highway extends 14 miles. EPMT staff drove a vehicle on August 17th (the same day that EPMT staff performed bike surveying in 2016 along the west side of the road) to survey the east side of the road. The EPMT began surveying from directly after the intersection of Dyea Road, using an offset to collect data while driving, usually ranging from 3-4 meters to the right. The most common invasive plant throughout the road was common dandelion along with common plantain, alsike clover and white clover. Groundsel (*Senecio vulgaris*) was reported in 2016, but the 2017 EPMT believes this is a misidentification of sticky ragwort (*Senecio viscosus*), as it has ray florets. The sticky ragwort was primarily found in landslide/erosion disturbances along the cliffs of the highway and the ditches alongside them. Tall buttercup and chickweed were found at the pull out directly after the cliffs.

As surveying reached the Dead Horse Gulch overlook, dead stands of narrowleaf hawksbeard were identified along the roadside in a sizable number alongside dense monocultures of common dandelion (Figure 30). The US Customs Office was not surveyed for the reported oxeye daisy as EPMT was stuck in traffic going through customs. Also found here was a native dandelion, likely rock dandelion (*Taraxacum laevigatum*). Most overlooks are mowed by large moving tractors to keep visibility high. Five to ten seeding culms of foxtail barley were found in the upper regions.



Figure 30. The ground past the Dead Horse Gulch overlook's guardrails is infested with many invasive plant species.

Captain William Moore Bridge

The Captain William Moore Bridge underwent heavy construction this season including rock blasting with heavy equipment (Figure 31). Construction will continue until 2018. Directly after the bridge the following can be found: sheep sorrel, common dandelion, and narrowleaf hawksbeard.



Figure 31. Construction of a new bridge to replace the Captain William Moore Bridge will pose a large disturbed area when finished.

US-Canada Border

The US-Canadian border area is a big stop for tourists to pose in front of the Welcome to Alaska sign. Found here are a few patches of tall buttercup, but little else that could be considered invasive.

Past EPMT Locations

The EPMT intern removed oxeye daisy from a site near the waste management facility. The polygon described as a clearing alongside the road is actually a spot where a mowing machine is stored when not in use. It contains common eyebright, oxeye daisy, common plantain, chickweed, sheep sorrel and alsike clover. There are two known yellow toadflax sites; one on the west side of the road right before a concrete barrier and small waterfall, and another on the side road leading to the Goat Lake Hydroelectric Substation. These were not surveyed this year because of a combination of their inaccessibility from a vehicle and inclement weather. Finally, the white sweetclover near the blocked off road from the 2016 report was no longer blocked off. It leads onto private property where prior

reports from 2012 describe the quarry yard as infested with a lot of white sweetclover. If a proper outreach channel is established by STC with the landowner, this might be a management possibility.

Black Lakes Site

A bit before the actual Black Lakes, there are two DOT pullouts along the road. The one on the east side has been surveyed and contains Canada thistle, curley doc, common plantain, and alsike clover in abundance (Figure 32). The Canada thistle infestation is of great concern as management could backfire due to the plant's prolific ability to regrow from root fragments. STC has been cutting the flowering heads during this season.



Figure 32. Canada thistle with cut flowering heads at the Black Lakes site.

Outreach and Education

During the season, EPMT participated in collaboration with multiple projects on different levels of involvement. Educating the public can be an invaluable tool when trying to reduce the spread of invasive plants. Most of the time invasive plants are spread unknowingly, because people do not realize what they are doing is harmful to the environment. By making people think about the problems invasive cause the environment, we can empower them to make knowledgeable choices to do what they can to prevent spreading seeds. EPMT worked on the following outreach and education projects:

- Weed Whackers Summer Day Camp
 - Taught young children about invasive plants, how to make plantain salve, and brought them to Seven Pastures to help out with pulling weeds; resulting in 108 pounds of invasive plants removed.
- Municipal brush pile 9th Annual Skagway Community Weed Pull
 - Removed white sweetclover with 11 volunteers at the Skagway municipal brush pile.



Volunteers from the Weed Pull and EPMT (Yellow shirt, back) after event

- o Junior Ranger Day -Minor involvement this year, as it coincided with the SCA crew's working hitch
- o Provided invasive plants to Deb from the museum, to use to make pressed flower bookmarks.
- o Girl Scouts volunteer weed pull at Seven Pastures
- o Organized through KLGO's education specialist. The event lasted two hours and removed 17 pounds of yellow toadflax
- o This was a one-time experience for them. It is unlikely that they will be returning next year as they were here on a cruise vacation.



Girl Scout Troop posing after weed pull at Seven Pastures

- o Talked at KLGO Maintenance about invasive plants at a meeting one morning.
- o Informally spoke with local guides on the Laughton Glacier trail about the unconfirmed orange hawkweed.

Effort was made to garner community members for volunteering on weed removal. The EPMT participated once in the science Sunday Facebook posts through KLGO's Facebook page in August. The EPMT also left behind two different outreach fliers for next year's EPMT to adjust and reuse.

SCA Crew 2017

The SCA crew arrived between July 17th and July 21st this year, spending their time from the 17th to 20th exclusively assisting Dyea restoration efforts and EPMT invasive plant management efforts. On

the 21st, they assisted in surveying Dyea road for narrowleaf hawksbeard, removing infestations whenever seen. Earlier in the week, the infestation in Skagway along Dyea Road was not yet in seed, but by the 21st when we arrived to remove the infestation, it had already gone to seed. If possible, the SCA crew should work with EPMT a week or two earlier. Their assistance was essential in finishing the road restoration project in a shorter amount of time than anticipated. Many of them looked to the EPMT to learn about what invasive plants exist in the park and what management methods were the best to get rid of them. Refer back to the section on the Dyea restoration for statistics on acres restored. They were responsible for over 169.5 pounds of weeds removed and contributed well over 64 control hours to the EPMT project.



SCA Crew and Jami Belt after bird vetch management



SCA Crew and others at Nelson Slough Restoration Site



Restoration work at Slide Cemetery

Recommendations and Discussion

Standardized Polygons

One of the priorities for the EPMT this season was to identify infestations appropriate for standardized polygons in the AKEPMT KLGO Data Dictionary. A standardized polygon indicates a location where invasive plants have been found multiple times and management is underway to remove them. This solves issues with recording data from year to year that might not be consistent and also assists with tracking effort spent on managing an infestation year to year and yield of managed plant material. Here are some locations in KLGO that the EPMT intern has identified as suitable for standardized polygons in future:

Jeff Smith's Parlor

This location is the JSP building in Skagway. The location makes for a good standardized polygon because of the diversity of invasive plants located here. If new ones appear it can be a simple addition to the standardized polygon.

Pullen Creek Reed Canary Grass Management

The polygon collected for reed canary grass in 2017 would make a suitable standardized polygon in order to track the efficacy of mechanical treatment methods and seed head clipping. Flowering culms could be counted at each treatment and data can be received from STC for incorporation.

Black Lakes Canada Thistle

Similar to Pullen Creek, the Black Lakes site Canada thistle was mainly treated by STC this year.

Lower Dewey Lake Reservoir

The two tarps at Lower Dewey Lake Reservoir should, without a doubt, be standardized polygons that can be easily collected every visit, and notes can be recorded on when maintenance was performed on the tarping.

Taiya Bridge

The Taiya Bridge infestation of oxeye daisy should be one larger standardized polygon. This will help keep track of how many seed heads are managed weekly and help track spraying efficacy in 2018.

Dyea Townsite

The island at the Dyea town site trailhead should be turned into a standardized polygon to track invasive plants before and after the project is finished there.

Dyea Road out of Nahku Bay

The oxeye daisy along the hill entering the Dyea Flats segment of road could act as a standardized polygon as its' range and shape has not changed much over the past few years.

KLGO Maintenance Yard

A standardized polygon for the KLGO Maintenance Yard would be beneficial to management efforts.

Suggested Polygons to Collect

Suggested polygons to collect are the following:

- Open rocky area along the Laughton Glacier trail before the glacial terminus where orange hawkweed was suspected to be.
 - The 2017 EPMT did not have this to work off of and did not think to do this until much later. Having it would make surveying the site much easier.
- The Dyea Road alder sapling groves that are hiding narrowleaf hawksbeard beneath the former location of Dyea Road, aka Hackett's Hill.
 - These are on the right side of the road when driving out towards Dyea. Narrowleaf hawksbeard specimens were spotted and pulled from behind the trees.
- The Moore House property is also a potential surveying spot because Greg Clem removes common dandelion with herbicide from its grounds.

Next year's EPMT should focus on continuing surveying efforts in areas missed by 2017 EPMT, on revisiting project sites around Dyea from the restoration project and maintaining them to keep out invasive plants, and managing standardized polygon locations. A greater focus on outreach should be performed with higher levels of collaboration with STC and other groups. Additionally, more use of herbicide should be planned and permitted along DOT rights-of-way on NPS land in Dyea.

Continuing projects

The biweekly surveys of Lower Dewey Lake Reservoir at the orange hawkweed tarping site should be continued and tarps should be repaired/replaced as needed. The tall buttercup present grew exponentially during the season and should be surveyed as a polygon while at peak bloom.

Laughton Glacier should be resurveyed again to see if common dandelion is continuing to spread onto the glacial terminus and if the orange hawkweed can be found anywhere. In addition, the EPMT should establish polygons around where they surveyed and indicate that there was no presence of the flower upon data collection. If dandelions are starting to spread onto the terminus, a boot brush would be a solution. Outreach with Tongass National Forest should be initiated about getting permission to place an orange hawkweed information sign on the trail notice board. Additionally, outreach should continue with AMG to confirm that their guides are still educated on looking out for orange hawkweed.

The Klondike Highway should be surveyed again in 2018, preferably in August, and specifically on August 17th to keep things consistent. The west side of the road requires an investigation next year.

The newly established sheep sorrel in Dyea town site should be removed by EPMT to the best of their ability, with careful consideration taken about cultural artifacts. Moss block transplants were suggested in 2017 to restore some of the disturbed areas where sheep sorrel had been removed. The Dyea area is an easily marketable community service opportunity.

The Dyea Road Restoration should be monitored and surveyed for the incursions of invasive plants into restoration sites and the success of transplanted, cut, or seeded plants at the different sites. The

native seed collection could also be replenished, as all of the stock collected in 2016 was used for the project this year.

Sheep Camp will need an initial survey early on in the season to determine the status of the 2017 treatment and restoration efforts and whether any new infestations have started. Later in the season, a return trip should be scheduled in order to treat any new infestations. Herbicides should be properly measured out and sent to Sheep Camp with heli-ops and stored correctly when returned. The EPMT should also calibrate their spraying at the beginning of the season with water and attempt to recalibrate multiple times before the first application of herbicide.

Outreach events should continue in places such as Seven Pastures, the municipal brush pile, and the airport for community weed pulls with collaboration from STC. This includes the bird vetch infestation and Pullen Creek. The EPMT will need weed whacker training (provided by KLGO maintenance staff).

The Dyea Road and its three distinct segments should be standardized for data collection purposes. It should also be biked or walked in its entirety for a more accurate survey, as has been done in previous years.

Suggested projects

The following invasive plant removal projects should be performed consistently. The white sweetclover infestation north of Taiya Bridge and along Dyea Road segment 3 (adjacent to the beginning of the Flats) should be removed once at the beginning of the season and then repeated biweekly. Oxeye daisy in the same location north of Taiya Bridge can wait until it starts to bloom in July and then be treated once every week if possible. Seed heads and stems removed should be recorded for a total at the end of the season. The white sweetclover infestation on Dyea road should receive biweekly management.

In addition, we have made plans with the Chief of Maintenance to do monthly management between June and September at the KLGO Maintenance Yard with assistance from the maintenance staff. The EPMT is responsible for arranging this each month and should schedule a talk with maintenance whenever possible. Also, Jeff Smith's Parlor needs a survey and pulling twice per season, targeting yellow toadflax, narrowleaf hawksbeard, and tall buttercup.

Outreach projects discussed in the past with STC included an outreach event along Dyea Road to remove narrowleaf hawksbeard along the roadside, and the name "Hawk Block Weed Walk" was suggested. This needs time for proper scheduling and advertisement. Narrowleaf hawksbeard is notoriously fast growing and can easily regrow three times in a season thanks to its saturated seed bank.

The EPMT should read through as many past reports as possible to assess the history of EPMT work at KLGO. Of particular note are 2012-2016; especially 2016, as many of the suggestions put forwards in the 2016 report still apply for future EPMT work in KLGO.

All oxeye daisy locations that have been mapped and that are treatable should be done so by either removing seed heads or removing the entire plant, taking care to remove the entire root mass in order to avoid regrowth.

Time is always a limiting factor in finishing all the projects necessary. It is important to set deadlines ahead of time for when different projects should be completed. More logistically difficult trips should be planned further in advance, such as surveying trips for the Chilkoot or Loughton Glacier. Enlisting help from volunteers can also be a very useful resource that should be utilized. Certain projects such as removing reed canary grass at Pullen Creek are easy but very time consuming, and can be done in significantly less time with help. Communication with other organizations, specifically STC and TIWC, is also key for completing projects and sharing information. Collaboration with STC is key to success for outreach efforts, and should be collaborated with more than in 2017.

As many infestations as possible should be collected as polygons in order to avoid discrepancies in data collection.

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 their seeds to new locations. This is particularly important for species such as oxeye daisy, Canada thistle, and narrowleaf hawksbeard.

KLGO Natural Resources Exotic Plant Collection

The following species, which have been documented around the Skagway area, need to be added to the herbarium collection:

Amsinckia lycopoides

Anthemis arvensis

Bromus inermis

Cerastium fontanum

Collomia linearis

Galeopsis tetrahit

Galeopsis bifida

Lepidium densiflorum

Medicago lupulina

Poa pratensis

Polygonum convolvulus

Potentilla gracilis

Silene cucubalus

Stellaria media

Thlaspi arvense

Tripleurospermum inodorum

Literature Cited

- Bernatz, G. C., Robertson, A. G., 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.
- Carlson, M. L., Lapina, I. V., Shephard, M. Conn, J. S., Densmore, R., Spencer, P., Heys, J. Riley, J., and J. Nielsen. 2008. *Invasiveness Ranking System for Non-Native Plants of Alaska*. USDA Forest Service, R10, R10-TP-143.
- Hodkinson D. J. and K. Thompson. 1997. Plant dispersal: The role of man. *J. Applied Ecology*. 34: 1484-1496.
- Overbaugh, C., Frank, P. 2017a, b. *Alaska Exotic Plant Management Team 2017 Field Protocol and Office Protocol*. 2017. U.S. Department of the Interior, National Park Service, Anchorage, Alaska.
- Pojar and Mackinnon. 1994. *Plants of the Pacific Northwest Coast*. Lone Line Publishing, Vancouver, British Columbia.
- Skinner, Q. D., Wright, S. J., Henszey, J. L., and S. K. Wyman. 2012. *A Field Guide to Alaska Grasses*. Education Resources Publishing. Cumming, Georgia.
- U.S. Department of Agriculture (USDA). 2007. 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.
- Wichmann, M. C., Alexander. M. J., Soons, M. B., Galsworthy, S., Dunne, L. Gould, R., Fairfax, C., Niggeman, M., Hails, R. S., and J. M. Bullock. 2009. Human-mediated seed dispersal over long distances. *Proceedings of the Royal Society of London, B*, 276 (1656). 523-5

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 461/143827, March 2018

National Park Service
U.S. Department of the Interior



[Natural Resource Stewardship and Science](#)

1201 Oakridge Drive, Suite 150
Fort Collins, CO 80525