



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

2013 Summary Report

Natural Resource Data Series NPS/KLGO/NRDS—2014/640



ON THE COVER

From top left moving clockwise: Ornamental jewelweed planting at a storefront in Skagway; fried dandelion flowers served at the You Say Tomato edible invasives display; reed canarygrass and invasive plant information sign located at the shade covers at Sheep Camp on the Chilkoot Trail; “Welcome to Klondike Gold Rush National Historic Park” display in southern Skagway.

NPS Photographs by: David Golden

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Abbreviations

AACD	Alaska Association of Conservation Districts
AKDOT	Alaska Department of Transportation
AKNHP	Alaska National Heritage Program
EDRR	Early Detection & Rapid Response
EPMT	Exotic Plant Management Team
ESRI	the Economic and Social Research Institute
GIS	Geographic Information System
GPS	Global Positioning System
KLGO	Klondike Gold Rush National Historic Park
NPS	National Park Service
TIWC	Taiya Inlet Watershed Council
USFS	United States Forest Service

Abstract

The 2013 season marked the tenth season of the EPMT program at Klondike Gold Rush National Historic Park. The program's goal of early detection and rapid response was employed with the two primary objectives of 1) monitoring the extent of known infestations and documenting new-found infestations, and 2) prioritizing and controlling infestations to prevent their spread into or within park boundaries. During the 2013 season, EPMT staff and volunteers contributed a total of approximately 662 man-hours toward the EPMT program. Approximately 213 of these hours were dedicated to surveying, mapping, and controlling invasive species. Approximately 66 hours were devoted to outreach and education. The remainder was devoted to report writing, data management, project planning, administrative tasks, and assisting with various other park natural resource projects. In total, 266.2 acres were surveyed over the course of the season, and 84.3 of these acres were within park boundaries. Within the areas surveyed, 41.92 acres were found to be infested with invasive plant species, and 4.93 of these infested acres were within park boundaries. Notable infestations include that of tall buttercup (*Ranunculus acris*) which is widely distributed throughout park boundaries and was found to have increased in abundance at Sheep Camp along the Chilkoot Trail, as well as white sweetclover (*Melilotus alba*) whose population at the Skagway Airport has seen a marked decrease over the past few years due to efforts by EPMT staff and volunteers. Additionally, an extensive long-term control project of reed canarygrass (*Phalaris arundinacea*) at Sheep Camp was found to be thus far effective and going according to schedule. Several small isolated populations of yellow toadflax (*Linaria vulgaris*), oxeye daisy (*Leucanthemum vulgare*), and common eyebright (*Euphrasia nemorosa*) were not detected in 2013 and therefore past control efforts were deemed to have successfully led to their eradication. Outreach and education continued to be an important element of the 2013 EPMT focus with effort aimed at educating park staff and visitors as well as local residents of the risks associated with invasive plants. Notable changes to the invasive plant management plan were discussed and laid out in 2013 to be implemented in subsequent seasons.

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The author would like to acknowledge all those in the service of Klondike Gold Rush National Historic Park, for without them this project would never have occurred. Their ongoing support and dedication to the goals of the EPMT and natural resources department is invaluable. Lastly, thank you to those who have reviewed and provided comments for this report.

Introduction

Klondike Gold Rush National Historic Park is located in Southeast Alaska at the northern terminus of the Lynn Canal. The total acreage of the park is around 13,000 acres, though this area is dispersed between three distinct park units (Figure 1). The Chilkoot Unit (approx. 9,670 acres) includes the Chilkoot Trail, Dyea, the tidal flats, and the Chilkoot Trailhead, and is located approximately eight road-miles west of Skagway. The White Pass Unit (approx. 3,320 acres) is located about seven miles north of Skagway, and includes portions of the White Pass Trail and White Pass City. The Skagway Unit is comprised of 12 square blocks in the town of Skagway (NPS 1996). These three units encompass a large collection of eco-tones between various ecosystems of coastal rainforest, lowland tidal flats, sub-alpine boreal forest, high-alpine meadow, and alpine tundra. The elevation and aspect gradients of these ecosystems are as diverse as they are numerous. The vertical range of KLGO spans from sea level to around 6,000 feet above sea level. This diversity of environments creates a multitude of ecological niches and therefore a high biodiversity inside the park (Frank 2012).

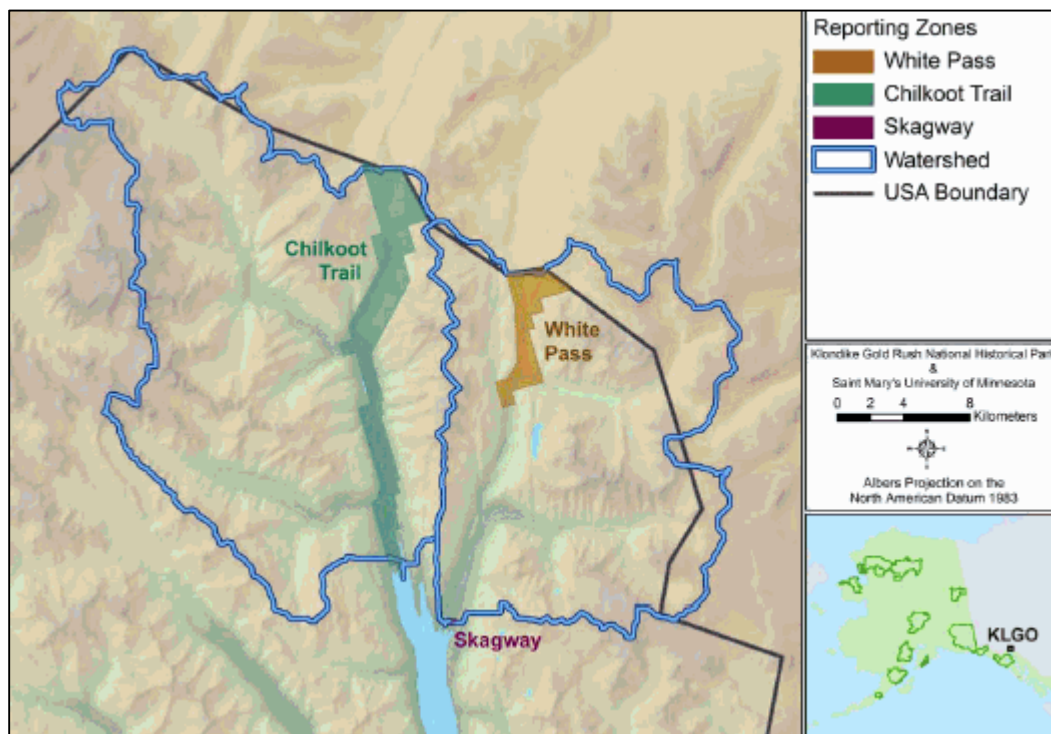


Figure 1. Distribution of the three distinct park units of KLGO (Drazkowski *et al.* 2011).

The unique geographic attributes of KLGO are further escalated by its location north and northeast of the Chilkat Mountains. This location puts KLGO in the rain shadow of these mountains, and the park therefore receives little precipitation compared to the remainder of the coastal rainforests of Southeast Alaska. Despite this reduction in rainfall, the coastal environments of KLGO are still considered to be temperate rainforest (Drazkowski *et al.* 2011).

Skagway and nearby Dyea are popular vacation destinations and therefore receive high levels of foot traffic. In 2012, KLGO received over 854,000 visitors, and this number was expected to

have increased by as much as 100,000 in 2013 (NPS 2013). These high numbers of visitors, combined with the multitude of ecological niches contained by the diverse ecosystem, provides an ideal vector for the establishment and spread of invasive plant species within the park and surrounding areas.

Invasive plants can be defined as non-native plant species that have the potential to spread into and dominate previously un-colonized ecosystems, establish self-sustaining populations, and disrupt these ecosystems (USDA 2007). These species are capable of displacing native species, disrupting food webs and pollinator ecology, altering soil chemistry and hydrologic cycles, and changing natural disturbance regimes (Mack *et al.* 2000). The colonization of invasive species creates novel ecosystems that are often recognized as second only to habitat loss in the reduction of species biodiversity (Carlson *et al.* 2008). These vast effects of invasive plant establishment consequently pose significant economic threats, and these threats are further exasperated by a lack of understanding of the inseparable link between economy and nature (Mack *et al.* 2000).

According to Hodkinson *et al.* (1997), humans play a significant role in seed spread and dispersal. Exotic plant species are often voluntarily introduced due to garden throw-outs or from horticultural stock, or have been introduced through the vector of development and maintenance projects. These projects create disturbed areas and are 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 *et al.* 1997, Wichmann *et al.* 2009). The extensive amount of foot and vehicle traffic in Skagway creates a sustainable opportunity for invasive plant species introduction and spread. While the controlling of already present populations remains a high priority, it is often agreed upon that the most effective method for controlling invasive plants is to prevent the spread or establishment of novel or already present invasive species populations (USDA 2007).

The Alaska EPMT has been tasked with the monitoring and controlling of invasive plant species within Alaska's National Parks. In KLGO, EPMT efforts have been in effect since 2004. Over the past ten years, park EPMT staff has gathered baseline data that catalogs the dispersal and spread of invasive species throughout the park as well as surrounding areas. Staff has conducted annual field surveys for invasive plants, implemented control measures to deal with known infestations, and prepared community awareness and outreach events and activities. The park's strategy has been of early detection and rapid response (EDRR), where species are prioritized based on a system of triage. This system focuses first on small populations of species of high-invasiveness, and later on larger populations of low-invasiveness ranking (Carlson *et al.* 2008).

Because of the unique position of KLGO in that it has multiple separate units in confluence, the KLGO EPMT has in the past and continues to focus on areas that are both contained in and outside of park boundaries. This is because invasive species are known to rapidly spread and colonize new areas and, in operating with the park's EDRR strategy, it is the park's ultimate goal to eradicate populations of invasive species before they have the ability to colonize within the park.

Alaska as a whole is situated in a unique position compared to the contiguous United States, in that relatively few invasive plant species have so far established themselves in the state.

However, 48 non-native invasive plant species have already been detected in Skagway and KLGO, and the park is second only to Glacier Bay National Park and Preserve in number of invasive species that have been documented (Frank 2012). This stresses the point that KLGO is in a vulnerable position due to the amount of foreign traffic and human vectors that create potential routes for invasive plant species establishment and dispersal. Appropriate steps must be taken to ensure that more species are not allowed to colonize and current populations are not allowed to spread.

The goal of this season's EPMT was to identify and eradicate high-priority infestations in KLGO through manual control. A second and also high priority of this season was to engage in community education and outreach, as this has been proven to be a successful use of resources in the past. Priority was not given to the controlling of larger populations, as this season's EPMT consisted of far fewer staff and volunteers than available in previous years. The aim of this report is to document those efforts that were allotted over the course of this season, and to provide recommendations for the most practical and effective actions that should be taken during the following and subsequent seasons.

Methods

Field work for the 2013 season was conducted between the months of June and August. Methods used for all data collection and data management were in compliance with the Alaska Exotic Plant Management Team 2013 Field Protocol (Million *et al.* 2013). EPMT staff utilized existing data, recommendations from previous years, this season's phenology, and available labor, to prioritize treatment of infestations and species, select equipment, and choose appropriate control methods.

Defining Work Areas

In order to better manage prioritization of species infestations, work areas for the 2013 season were divided into three unique locations. Field work was divided between these areas, and therefore results and recommendations are organized in accordance to these six divisions. The six work areas are:

1. Nelson Slough Restoration Site
2. The Chilkoot Trail
3. Dyea
4. The Dyea Road
5. Skagway
6. The Klondike Highway

Highest priority was given to the control and eradication of infestations within the first three locations, as these areas are contained within KLGO park boundaries. Special accommodation was given to the Chilkoot Trail due to its remote location. However, because it receives high foot traffic and is a primary conduit for seed dispersal, care was given to ensure that appropriate inventory and control methods were allotted. The Nelson Slough Restoration Site also received special attention due to its vulnerability to the spread of invasive species. Containment and prevention was the primary objective when dealing with the remaining three locations.

It should be noted that much of KLGO EPMT field work in 2013 was devoted to areas outside of park boundaries, or within park boundaries but on non-federal property. Many areas within the three park units are owned by the State of Alaska or the Skagway Municipality. Because invasive plants in these areas are subject to disperse into federally-owned park property, they were still considered a target for control measures.

A map of surveyed areas and work zones and can be found in Appendix B.

Prioritization of Species

Prioritization of non-native invasive plant species in Alaska is guided by the Alaska Invasiveness Ranking System outlined by Carlson *et al.* (2008). This index provides a ranking of 0-100 based on the four subcategories of invasiveness: ecological impacts, biological characteristics and dispersal ability, distribution, and feasibility of control. This index provided a baseline for species prioritization within KLGO. Within this regional ranking system, species were further prioritized in KLGO based on a system of triage that placed highest priority on species with small infestations and high invasiveness ranking, and lowest priority on species with large infestations and low invasiveness ranking. Still further, prioritization of treatments was given to

species present in undeveloped front and backcountry within the park, and later to highly disturbed areas such as roadsides and urban zones.

Since discussions in 2006 between KLGO Natural Resources staff and AK Regional EPMT staff, six species have been identified for prioritization of treatment in KLGO: bird vetch (*Vicia cracca*), common tansy (*Tanacetum vulgare*), white sweetclover (*Melilotus albus*), oxeye daisy (*Leucanthemum vulgare*), yellow toadflax (*Linaria vulgaris*), and narrowleaf hawksbeard (*Crepis tectorum*). Three additional species have been added to this list since 2012 due to their high invasiveness ranking and low extent within the park: ornamental jewelweed (*Impatiens glandulifera*), reed canarygrass (*Phalaris arundinacea*), and Canada thistle (*Cirsium arvense*).

Tools for Identification and Data Collection

The primary field guides used for the identification of invasive plant species were Plants of the Pacific Northwest Coast (Pojar and Mackinnon 1994) and the Identification of Non-Native Plants in Alaska (AKNHP 2013). Additional materials used for identification were A Field Guide to Alaska Grasses (Skinner *et al.* 2012), How to Identify Grasses & Grasslike Plants (Harrington 1977), and Flora of Alaska and Neighboring Territories (Hultén 1968). Most plants that were encountered in the 2013 season were also available in the KLGO herbarium, as well as in the KLGO natural resources exotic pressed plant collection, started in 2010.

Spatial data on the invasive plant infestations were collected using two GPS units: the Trimble GeoXH6000[®] datalogger and the Trimble Recon[®] datalogger with the Trimble Tornado 4L1[®] antenna. Each of these units is set to be accurate within zero to five meters, in compliance with the 2013 Alaska Exotic Plant Management Team field protocol (Million *et al.* 2013). Trimble Pathfinder Office 5.40[®] was used to differentially correct positions using the CORS Gustavus, AK or CORS Skagway, AK base station data and then edit the data.

Collected data were sent to the Alaska EPMT Liaison for entry into the National Park Service's Alien Plant Control and Management (APCAM) database every two weeks. The regional EPMT staff converted the GPS data to ArcMap[®] shapefiles for use in KLGO GIS projects and the Alaska Regional invasive plant geodatabase. For mapping and analysis by KLGO EPMT staff, some data were exported to ArcMap[®] shapefiles and manipulated using ESRI ArcGIS 10.1[®].

Control Methods

The primary control method employed for invasive plant removal was hand pulling and handtools such as trowels. The greatest concern with this method was that the entire root system must be removed with the plant for the treatment to be effective. Plants with just a single tap root are pulled easily, but those with rhizomatous root systems require special care to remove the entire root system. Many invasive plants can regenerate from root fragments left in the soil when proper hand pulling techniques are not employed. This has been observed in previous years with several species including common tansy, yellow toadflax, and oxeye daisy.

All flowering or seed-bearing removed plants were bagged on-site 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 exotic species. Care was also taken to ensure bags used in town were not reused outside of Skagway due to the potential for unwanted seed dispersal. A bicycle and trailer were used as the primary transportation method for weed waste in

Skagway, freeing up vehicle use for other NPS employees. Bicycles from the KLGO bicycle fleet were also often used for conducting road surveys (Klondike highway and Dyea road) and for transportation to and from survey sites.

The discovery of reed canarygrass on the Chilkoot trail in 2011 necessitated the use of different control methods as the infestation was too large to be reasonably controlled by digging the plants by hand. Shade covers, which eliminate plants by depriving them of sunlight, were selected as the most feasible method of control. In 2011, KLGO EPMT covered the reed canarygrass infestations with one layer of 6mm black plastic followed by a layer of black non-woven geotextile. In 2012, after finding this method deficient at fully controlling reed canarygrass, the shade covers were expanded and fortified with one layer of 10mm opaque plastic followed by one layer of 6mm black plastic topped with black non-woven geotextile. Shade covers were staked down with landscape staples and the margins were weighted down with rocks. Covers were to remain in place for two full growing seasons or until the summer of 2014. The site should be monitored at least once per season to ensure the integrity of the shade covers. Sheep Camp remains the only location where shade covers have been used as a method for controlling exotic plants in 2013.

The use of chemical herbicides for control is not widely employed by the National Park Service in Alaska at this time. The Alaska Region Invasive Plant Management Plan contains a protocol for employing the use of chemical control. This plan was utilized this year to treat large, high priority infestations at several parks across Alaska, but not at KLGO. The Taiya Inlet Watershed Council and Alaska Association of Conservation Districts in partnership with the municipality of Skagway have considered the use of herbicides for high priority infestations outside of the park in the past. In 2013, the Municipality of Skagway made the decision to not use pesticides or other chemical vegetation control measures within the Skagway Bureau.

Personnel

The full-time EPMT staff member during the 2013 season was David Golden, a Student Conservation Association intern. Work conducted by this staff member spanned from June 3 to August 15. A total of 33 people volunteered for the KLGO EPMT this summer. On July 13th, thirty volunteers participated in the Community Weed Pull held at the Skagway Airport.

Results

A total of approximately 662 man-hours were dedicated to the EPMT program by EPMT staff and volunteers during the 2013 season. Of these, approximately 213 hours were dedicated to the surveying, mapping, and controlling of invasive species. In total, 41.92 acres of infested area were mapped, of which 3.2 acres were controlled.

In accordance with recommendations put forth by the 2012 EPMT staff, many “background species” infestations were not recorded during the 2013 season. Three years of data already exists for these species, and it can be accepted that these species have a ubiquitous presence along many of the survey sites. Dyea Road, Klondike Highway, and much of Dyea and Skagway are four examples of such sites. It can be assumed that these species still inhabit their previous ranges, as there is no reason to assume that their populations have subsided. It is likely that these species have expanded their range, many notable areas of large dense infestations were still mapped. These species are contained in the triage category of lowest priority for control, as their spread is extensive and their invasiveness ranking is low (Carlson *et al.* 2008). These species include: common dandelion (*Taraxacum officinale*), clover (*Trifolium spp.*), common plantain (*Plantago major*) and pineapple weed (*Matricaria discoidea*) as well as several additional species. Because these species were generally not surveyed in 2013, any maps produced by the 2013 EPMT staff utilized distribution data collected in 2012 and in previous years for representing their extents. Although these species were not surveyed in the four previously cited work areas, due to their relatively low abundance in the Nelson Slough Restoration Site and along the Chilkoot Trail, these background species were still surveyed in these two sites during the 2013 season.

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

Year	Invasive GPS Data* and GPRA Goals - NPS Lands(non-NPS lands)					
	Species Acres Surveyed	Species Acres Infested	Acres Treated		Canopy Acres Controlled	
			Actual	GPRA Goal	Actual	GPRA Goal
2004	43.531 (52.497)	7.838 (6.842)	0.792 (1.505)	-	-	-
2005	3.106 (6.450)	3.099 (2.617)	0.732 (2.436)	-	-	-
2006	63.145 (74.350)	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)	0.5	0.5	0.1
2009	11.931 (83.259)	2.453 (21.645)	0.388 (2.504)	0.5	0.6	0.6
2010	34.638 (245.513)	3.914 (56.212)	0.502 (9.362)	0.5	0.8	0.7
2011	49.720 (98.718)	11.278 (50.695)	3.045 (8.583)	0.5	0.8	0.8
2012	31.430(153.766)	20.987(86.004)	0.911 (5.282)	0.5	0.9	0.9
2013	83.455 (182.7)	5.701 (36.220)	0.771 (2.431)	0.5	0.9	0.9

* All acreage was calculated using January 2012 NPS land status. Acres infested are calculated by acres mapped multiplied by the percent cover in areas greater than or equal to 0.5 acres. If under 0.5 acres, acres mapped is counted as 100%. Acres treated are calculated by taking the acres infested that were labeled as treated and applying the percent of the infestation treated.

Table 2. Summary of the 2012 infested acres in Klondike Gold Rush National Historical Park.

Species		AKEPIC ranking	Chilkoot Trail	Dyea	Dyea Road	Klondik e Hwy	Skagway	White Pass
Latin Name	Common Name							
<i>Caragana arborescens</i>	Siberian peashrub	74	-	-	-	-	0.003	-
<i>Cirsium arvense</i>	Canada thistle	76	-	-	-	-	-	-
<i>Chenopodium album</i>	lambquarter	37	-	-	-	-	0.184*	-
<i>Crepis tectorum</i>	narrowleaf hawksbeard	56	-	-	0.157	6.78	15.42	-
<i>Euphrasia nemorosa</i>	common eyebright	42	-	*	-	-	-	-
<i>Impatiens glandulifera</i>	ornamental jewelweed	82	-	-	-	-	0.009	-
<i>Leucanthemum vulgare</i>	oxeye daisy	61	-	0.0001	0.081	0.433	-	-
<i>Linaria vulgaris</i>	yellow toadflax	69	-	-	0.0002	2.313	0.447	-
<i>Melilotus alba</i>	white sweetclover	81	-	-	-	0.011	0.553	-
<i>Phalaris arundinacea</i>	reed canarygrass	83	-	-	0.0001	0.004	0.123	-
<i>Plantago major</i> *	common plantain	44	0.0001	0.078	1.717	-	0.869	-
<i>Ranunculus acris</i>	tall buttercup	54	0.191	0.683	2.812	13.948	1.423	-
<i>Ranunculus repens</i>	creeping buttercup	54	-	-	-	-	-	-
<i>Rumex acetosella</i>	common sheep sorrel	51	-	-	1.420*	14.385	1.961*	-
<i>Rumex crispus</i> *	curly dock	48	-	-	*	*	0.853*	-
<i>Sorbus aucuparia</i>	European mountain ash	59	0.0001	-	0.0001	-	-	-
<i>Tanacetum vulgare</i>	common tansy	60	-	-	-	-	0.003	-
<i>Taraxacum officinale</i> *	common dandelion	58	0.487	0.278*	2.677*	5.5*	1.4*	1.307
<i>Trifolium hybridum</i> *	alsike clover	57	-	*	0.518	*	*	-
<i>Trifolium pratense</i> *	red clover	53	-	*	0.528*	8.073	0.101*	-
<i>Trifolium repens</i> *	white clover	59	0.192	4.063	1.93*	15.221	1.052*	1.098
<i>Vicia cracca</i>	bird vetch	73	-	-	-	-	0.007	-
*Denotes a species that was considered a background species and therefore numbers may not represent actual acreage.								

Skagway

The town of Skagway remains the home of the highest richness of invasive plants in KLGO, with 43 documented invasive plant species. Many of these species are horticultural stock throughout the town, though several have escaped cultivation and have spread to roadsides, private and public lots, as well as municipal and state property. The KLGO Skagway unit only encompasses 12 square blocks of the town of Skagway, though monitoring efforts extend beyond this range in accordance with the park's EDRR strategy. Especially in such a heavily disturbed location such as Skagway, invasive species can spread rapidly. Thus, it is important to monitor and control species before they have the opportunity to colonize within park boundaries.

Despite this attentiveness to naturalized species, many invasive plants have found their way into KLGO park boundaries through horticultural introduction.

European mountain ash (*Sorbus aucuparia*) can be commonly found throughout Skagway and inside park boundaries as an ornamental tree. This tree can even be found in front of the Moore House, Peniel Mission, as well as other NPS park staff housing (Figure 2). The mountain ash at the Moore House was planted to reconstruct the same ornamental planted by Ben Moore and can therefore be considered a part of the cultural landscape. The colonization of this



Figure 2. European mountain ash as an ornamental in front of NPS housing facilities.

species to new areas is a concern, as it is typically not spread by human exozoochory, but rather its copious berry mast is propagated by frugivorous avian species. Therefore, it has the ability to spread into areas beyond just anthropogenic disturbances and into backcountry regions where surveys and control measures are infeasible. Rugosa rose (*Rosa rugosa*) can be found planted as an ornamental throughout Skagway and even on NPS property. Removal efforts have been denied in previous years by the Park, as this shrub has been cited as having potential historical significance. Siberian peashrub has also been documented on NPS property in front of the Peniel Mission, though removal efforts by EPMT have been denied by maintenance staff due to the negative aesthetic impacts that its removal would create.

Reed canarygrass (*Phalaris arundinacea*) is a high priority species for eradication in Skagway, where a dense population exists surrounding Pullen Creek just south of the Dewey Lakes trailhead bridge. The extent of this population matches that of the 2007 Pullen Creek restoration project, and therefore was most likely introduced during this development. Past EPMT attempts of manual control have proven to be time-consuming and largely ineffective. Therefore, manual control has not been attempted over the past two years. Instead, EPMT and volunteers have clipped inflorescences of the infestation before any grasses have gone to seed. In 2013, EPMT staff and two volunteers devoted 3 ½ man-hours to the control of this population of reed canarygrass. The extent of this population has not seemed to expand since the 2012 season.

White sweetclover is another high priority species of the KLGO EPMT found throughout Skagway and is therefore a focus for control efforts. Its greatest density was found within Skagway Airport boundaries and empty lots immediately adjacent to airport property. *Melilotus alba* has also been found and controlled in sporadic patches throughout private and public property in Skagway. Three stems were found in northern Skagway next to the Little Dippers Schoolyard and were controlled. In 2012, a large infestation of white sweetclover was found and controlled at the Seven Pastures dump north of Skagway. EPMT staff returned to this site in 2013 to conduct a visual survey but was unable to locate any infestation. The Seven Pastures dump site is a constantly shifting environment where dump piles are often moved, removed, or added. The absence of this infestation is most likely due to this variation of the environment. Joanne and Andy Beierly, two Skagway residents, have assisted EPMT staff with the control of white sweetclover in Skagway over the past several years. This partnership was continued throughout the 2013 season, and these two volunteers pulled and bagged at least 10.5 pounds of white sweetclover throughout the season.



Figure 3. Yellow toadflax documented growing north of Seven Pastures in Skagway.

Yellow toadflax has been numerous documented throughout Skagway, notably on private properties as ornamentals in gardens. It has also been documented on municipal properties in northern Skagway, near the entrance to the Seven Pastures dump (Figure 3), and by the Dewey Lakes trailhead in southern Skagway. EPMT monitored these northern infestations periodically throughout its flowering season to pull all flowering stems before they could go to seed. *Linaria vulgaris* was also found and controlled at the NPS maintenance yard when found in flower, though this infestation was often mowed before it could go to seed. Yellow toadflax was also found escaping into the NPS maintained garden at the intersection of 5th and Broadway. Upon receiving permission from park staff, EPMT staff removed all stems found at this location.

Narrowleaf hawksbeard was documented throughout Skagway in varying relative abundances. Most occurrences were single stems or small patches on roadsides or in empty lots. It was growing sporadically in the NPS maintenance yard and was controlled. *Crepis tectorum* was particularly dense and abundant in empty lots on the northern edges of Skagway. It was found overwhelmingly in the empty lot owned by the Municipality in northwestern Skagway adjacent to the Skagway River Bridge. Where growing alongside *Linaria vulgaris* it was controlled, but due to time constraints the vast majority of this infestation was not controlled. It was also found growing alongside yellow toadflax north of Seven Pastures and was controlled at this location.

Bird vetch (*Vicia cracca*) was documented growing on the east side of Spring Street at the intersection of 9th street. This population has been monitored since 2006 but has not been controlled due to the ineffectiveness of manual treatment. Although it seems to be choking out

native vegetation, it has been relatively slow to expand and has not spread beyond this small infestation.

Large-leaf lupine (*Lupinus polyphyllus*) was documented growing in Skagway for the first time in 2013. The infestation was located on private property, growing in a garden on 5th St. between State and Main St. This discovery is of little surprise, as this species is commonly sold as an ornamental. No outreach attempts were made by EPMT to the homeowner.

Ornamental jewelweed has been identified in eight different locations throughout Skagway on private property and public land, seven of which were detected in 2013. An outreach attempt toward private landowners with ornamental jewelweed on their property was denied in 2012 by the park superintendent and was therefore not attempted in 2013. One infestation found and controlled in 2011 on municipal property on 6th street at the private park next to Pullen Creek was not detected in 2013. Ornamental jewelweed's seeds are viable for two years, and as this occurrence was not documented in 2012 or 2013, this population has likely been eradicated. Ornamental jewelweed was found as an ornamental beside or near several local businesses in downtown Skagway, including Starfire restaurant, Dedman's Photo Shop, the Skagway Outlet Store, and Corrington's Alaskan Ivory (Figure 4). It was also identified in private gardens between State and Broadway on 15th Street, and on the corner of 4th and State St. Lastly, it was identified escaping cultivation on 20th St. between State and Main. These infestations were only monitored during the 2013 season.



Figure 4. Ornamental jewelweed found planted in a private storefront.

Populations of common dandelion (*Taraxacum officinale*), clover (*Trifolium spp.*), common plantain (*Plantago major*), curly dock (*Rumex crispus*), sheep sorrel (*Rumex acetosella*), pineapple weed (*Matricaria discoidea*) and stinking chamomile (*Anthemis arvensis*), as well as several other low-priority species, are commonly found throughout Skagway, and either do not pose as severe a threat to native flora or are too abundant to suggest viable control efforts be made (as is the case of *Taraxacum officinale*). These species were not typically mapped, as significant data does exist from previous years to mark their presence.

Skagway Airport

The Skagway Airport has remained an area of focus for KLGO EPMT efforts throughout the program's history due to its large and dense invasive plant populations. Due to the high priority of white sweetclover (*Melilotus alba*) and its concentrated presence in the Skagway Airport, this species in particular has been of heavy focus for control efforts. For the past several years, EPMT staff and volunteers have removed all white sweetclover at the airport before it has gone to seed. This work seems to have been effective, as populations of white sweetclover at the airport seem to have steadily decreased. EPMT staff spent five hours surveying the Skagway Airport on July 10 in preparation for the Community Weed Pull. EPMT staff coordinated with Missy Tyson of AKDOT in order to obtain permission and access to perform this survey.

Although all but background species were thoroughly documented in this survey, EPMT staff took extra care to document the extent of *Melilotus alba* so that its decline may be articulated. As in past years, white sweetclover was concentrated greatest in the runway medians, though even these populations were small and patchy. Narrowleaf hawksbeard (*Crepis tectorum*) was abundantly present throughout the median, as well as small isolated presences of yellow toadflax (*Linaria vulgaris*).

The eastern edge of the runway proved to hold the greatest richness and evenness of invasive plant species. Narrowleaf hawksbeard in particular occupied several large dense stands along this edge, though there were also several notable infestations of white sweetclover and yellow toadflax. Several other lower priority species including curly dock, sheep sorrel, and lambsquarters were documented along this eastern strip. Although previous reports have noted a high density of narrowleaf hawksbeard along the western edge of the runway, this infestation seems to have greatly subsided during the 2013 season. Although narrowleaf hawksbeard was present on this edge along with sheep sorrel, this population of *Crepis tectorum* was small and very manageable in size.

For the third consecutive year, perennial sowthistle (*Sonchus arvensis*), originally documented in 2009 and 2010, was not found during this season's airport survey. Additionally, oxeye daisy (*Leucanthemum vulgare*), which was observed and treated in the 2012 season on the runway margin near the third public hanger, was not found in the 2013 survey.

Efforts at the Community Weed Pull on July 13 were focused on eradicating the manageably sized populations of white sweetclover and yellow toadflax. It was determined that these species would be ideal candidates for control efforts due to their feasibility of eradication. Volunteers were briefed on the established species priorities as white sweetclover having the highest priority, yellow toadflax of second priority, and narrowleaf hawksbeard third priority. EPMT staff and volunteers successfully removed all infestations of white sweetclover from airport property, populations of yellow toadflax were thinned on the eastern edge and removed from the inner-margin, and narrowleaf hawksbeard was thinned along much of northern areas of the airport. Three volunteers also controlled white sweetclover outside airport property south of the airport. Accompanied by Andy Beierly, these volunteers were able to gain access for the first time to control infestations at the truckyard at the corner of State and Main Street. EPMT staff returned later in the season to remove all white sweetclover plants that had recently emerged along the airport runway margin.

A map of infestations found in Skagway can be found in Appendix C.

Dyea

Dyea was thoroughly surveyed in late June and mid-July, as well as periodically throughout the season. Generally speaking, much of Dyea has managed to remain free from intensive invasive species establishment. However, several heavily frequented areas such as roadsides and trailheads have become host to several high-priority invasive plant species. Within park boundaries, Dyea is the most heavily accessed natural area and is therefore vulnerable to the spread of invasive plants. Due to this high traffic, Dyea continues to be a focal point of EPMT effort.

Dyea Townsite Road & Trail System

The Dyea Townsite Road begins just north of the Taiya River Bridge and leads to its terminus at the Dyea Flats as well as to the Lost Lake trailhead. This natural area is frequented daily by car, bike, foot, and horse traffic, and is particularly vulnerable to invasion. This road system boasts one of the highest concentrations of invasive plants in the area, particularly of *Ranunculus acris*, as well as several infestations of background species, mainly *Taraxacum officinalis* and *Trifolium spp.* Two intensive surveys in late-June and mid-July concluded that these infestations are particularly prevalent in the first mile of the road, though they continue sporadically for its duration. Surprisingly, the road to the Lost Lake trailhead is mostly clear of invasive plant colonization, despite its use as a horse trail. A mid-July survey revealed some infestations of *Trifolium spp.* along this stretch, as well as very infrequent patches of *Ranunculus acris*, all of which were controlled.

The Dyea trail system has remained relatively pristine and clear of invasive plants. Again, some background species including *Taraxacum officinale* and *Trifolium spp.* have managed to invade, though these species represent the bulk of invasive species present. Sporadic tall buttercup stems and small infestations were found during periodic surveys and were controlled. However, it is clear that visitor traffic, and most likely horse traffic specifically, plays a significant role in seed dispersal. In the more southern areas of the horse trail network, where canopy enclosed woodland gives way to more open meadow, dense infestations of tall buttercup are typically found. Some control work was done on the tall buttercup infestation where the Townsite Road meets the horse trail on the southern end of the Dyea Townsite. However, manual treatment does not appear to be effective in treating such a dense infestation. Extensive manual treatment was performed on this population in 2012 but did not seem to be effective.

Nelson Slough Restoration Site

Since 2006, this native plant restoration site has been host to the development of several notable native plant populations including Nootka lupine (*Lupinus nootkatensis*), wild-flag iris (*Iris setosa*), and Sitka spruce (*Picea stichensis*). However, until these native plants have fully established themselves in the slough, the area is vulnerable to invasive plant establishment. When the restoration project began, soil fill that was imported was not weed seed-free, and therefore was the most likely source for initial invasive plant establishment. This demonstrates the importance of appropriating weed seed-free material fill for future maintenance projects. The past few years have shown positive trends toward the establishment of native plant species and crowding out of invasive plants. Due to this promising development, the Nelson Slough Restoration Site is of particular importance for survey and control work. Although background infestations of common dandelion, red clover, white clover, alsike clover, and common plantain can be found in isolated patches alongside the footpath, the Nelson Slough zone is free of any severe plant invasions.

As in 2012, monitoring efforts in this area was largely restricted to tall buttercup. However, even the presence of this species seems to have greatly decreased with past control efforts as well as with the further establishment of native species. In 2013, tall buttercup was found to be mainly restricted to the margin areas just in front of the Nelson Slough Bridge as well as in the water beside the bridge, though even here stems were sparse. Isolated tall buttercup stems can be seen throughout the Slough, though these are by no means a threat to the native flora and should be expected to be naturally crowded out, assuming trends continue in their current direction.

Past years' EPMT staff has documented numerous infestations of common eyebright in the Nelson Slough area. In 2012, a single infestation was documented at the edge of the restoration site south of the bridge and was controlled. In 2013, no infestations of common eyebright were found in or around the Nelson Slough Restoration Site.

Dyea Flats

The road margins throughout the Dyea Flats were surveyed in mid-July and found to be relatively undisturbed by invasive plant populations. A large-spread infestation of sheep sorrel appears throughout the flats but does not appear to be interfering with native plant dispersal. Common eyebright and tall buttercup were found by the bridge to the dog camp, and two volunteers dedicated two man-hours to controlling this infestation of common eyebright. Common dandelion as well as white clover were also found sporadically in small patches throughout the flats. Low priority species interspersed with native vegetation beyond road boundaries were not mapped due to time constraints. EPMT staff located and controlled three oxeye daisy stems that were found adjacent to a dirt road on the flats. This is the first time that oxeye daisy has been documented in this location.

A map of infestations found in Dyea can be found in Appendix E.

Dyea Road

Dyea Road remains an important focus for EPMT efforts, as it serves as both a medium for invasive plant dispersal to new areas, as well as a highly suitable environment for invasive plant colonization and establishment. The entirety of Dyea Road was surveyed by foot in late June and early July. A second survey was conducted by car in early August. Dyea Road was also visually surveyed throughout the season to monitor the phenology as well as spread of known populations. The initial survey provided a thorough overview of the infestations located along Dyea Road. The latter survey concentrated on mapping high-priority populations that had not yet gone to flower and therefore had not been detected in the previous survey. These surveys resulted in the documentation of a community of invasive plants fairly comparable to that of previous years. As noted above, the 2013 Dyea Road surveys focused on high-priority species and did not map "background" infestations. Approximately eight miles of road in total were surveyed, spanning from the Klondike Highway (Mile 0) to the West Creek River Bridge (Mile 8.3). For the purpose of this report, these surveys were broken up into four discrete sections of Dyea Road. West Creek Road was visually surveyed throughout this season and no GPS data was collected. Several small infestations of *Taraxacum officinale* were found along the road as well as several other background species. EPMT 2013 staff determined that due to the low traffic it receives and presence of only low-priority species, there was no need for a formal survey. West Creek Rd has never been formally surveyed by park EPMT staff. For ease of discriminating location, the Dyea Road work zone has been divided into the following four sections:

Mile 0-2 (Skagway Overlook)

Two large fields on either side of Dyea Road at the intersection of Dyea Road and Klondike Highway were found to be the host of large infestations of narrowleaf hawksbeard, tall buttercup and smooth brome, as well as several other background species. Although infestations of most of these species are fairly common throughout this section of the road, this area stands out as being particularly infested. Continuing up the road, background species, notably *Taraxacum officinale*

and *Trifolium spp.* are very prevalent. An infestation of narrowleaf hawksbeard was found along the first mile of road. One EPMT staff member spent 2.5 hours controlling an infestation of *Crepis tectorum* about a half-mile up the road. Later spot surveys of this area revealed that this treatment at least thinned the population, making it more manageable for future control efforts. Along the first mile stretch of road, *Linaria vulgaris* can be found growing sporadically on the western margin. Further up the road, *Ranunculus acris* appears somewhat frequently, especially in the ditch on the eastern road edge. Due to the extent of this infestation, control efforts were not attempted. Oxeye daisy was observed in four locations in this section. These infestations occurred on private property north of the Skagway scenic overlook as well as just south of it. Outreach to landowners has been attempted in past years but has been met with resistance; therefore, control efforts or further outreach was not attempted. Reed canarygrass was documented in a small patch just south of the AB Mountain trailhead. This population does not seem to have expanded since previous years.

Mile 2-4 (Nahku Bay)

The Dyea Road surrounding Nahku Bay harbors an ongoing infestation of tall buttercup. This population is particularly large just north of where Dyea Road meets Nahku Road. Several very dense and sizeable populations of *Ranunculus acris* exist along this first stretch. Several adjunct populations of oxeye daisy were documented near the intersection of Nahku Road. One large infestation is located on private property at this location but has escaped extensively onto municipal land. Two volunteers and EPMT staff dedicated 2 ½ man hours in mid-July to controlling this infestation. The larger infestation seems to be a source population for several small occurrences of oxeye daisy found on private land on the other side of the road, though outreach to homeowners was not attempted. *Trifolium spp.* can be found nearly ubiquitously throughout this section of road. Common dandelion and other species, including common plantain, have also been documented as very common background species along this section. Extensive road maintenance was conducted this season on the western side of the Bay. Due to the disturbance caused by this construction project, much of this section was devoid of any vegetation. However, it remains to be seen how this maintenance will affect the expansion of invasive plant populations in this area in the future through disturbance and fill.

Mile 4-6.7 (Taiya River Estuary)

This section of road was also subject to extensive road maintenance over the course of this season, and therefore much of it has been highly disturbed and free of vegetation. Although few invasive plants were documented in these newly disturbed areas, it remains to be seen what invasive species will take this opportunity to colonize. Tall buttercup was documented growing extensively throughout this section, notably in the northern half beyond the road maintenance areas. *Trifolium spp.* as well as *Taraxacum officinale* was also observed throughout this section. Just south of the Dyea campground, small isolated colonies of narrowleaf hawksbeard were documented. EPMT staff returned in late-July to control this infestation of narrowleaf hawksbeard. However, by this time, many stems had already gone to seed. All stems were removed, though the effectiveness of this control measure remains to be seen.

Mile 6.7-8.3 (Dyea)

This section of road extends from the NPS campground to the West Creek Bridge. This section in many areas is largely free of invasives, as dense populations of native woody flora exist. Narrowleaf hawksbeard was found on Dyea Road near the ranger station, though this infestation

seems to taper off significantly with distance from the campground. A continuous infestation of tall buttercup does, however, inhabit this road stretch, especially east of the Taiya River Bridge. The infestation of oxeye daisy which was found and controlled in 2012 just east of the Taiya River Bridge did not again appear in the 2013 season. Occurrence of background species including common dandelion, common plantain, as well as *Trifolium spp.* were also found sporadically along the Dyea section of road. A small but dense population of reed canarygrass was monitored in front of the Chilkoot Outpost. This population has expanded since its original documentation in 2011 and is now clogging a stream that meanders through this stand. This population is located less than 20 meters west of the KLGO boundary line. 2013 EPMT staff did not pursue any control measures, as this infestation is partly on municipal land but may extend into private land owned by the Chilkoot Outpost.

A map of infestations found along Dyea Road can be found in Appendix D.

Chilkoot Trail

Despite its high influx of human foot traffic, the Chilkoot Trail remains relatively free of invasive plant species establishment. In accordance with the park's strategy of early detection and rapid response, however, EPMT staff conducts at least one annual intensive survey along the 16.5 mile section of trail from the Dyea Trailhead to the United States border at the Chilkoot Pass. In 2013, several visual surveys were conducted in early and late June and early July, and a thorough GPS survey was conducted in mid-July. The 2013 season marks the fourth consecutive season that the Chilkoot Trail has been included in EPMT efforts. Due to the vast area and shifting ecosystems that this survey covers, this park unit was broken up into the following four sections for this report:

Dyea Trailhead to Finnegan's Point

The Chilkoot Trail begins in Dyea immediately adjacent to the Dyea Road. The trail opens up with a short gravel segment that was found to be infested with common dandelion as well as a four tall buttercup plants which were pulled by EPMT. Following this gravel trail entrance, presence of invasive species immediately tapers off. Some sporadic patches of common dandelion do appear but are crowded out by native vegetation. The majority of invasive species were found within the first two miles of trail, the distance that most guided day hiker groups travel during their visit. Along this section, common plantain, common dandelion, and white clover can be found sporadically. Following Saintly Hill and continuing north to Sheep Camp, much of the trail margins had been recently brush cut by trail crew, resulting in difficulty in identification. However, several patches of common dandelion were identified, especially immediately south of Finnegan's Point.

Finnegan's Point to Sheep Camp

Surveys yielded no invasive plant species found between Finnegan's Point and Canyon City. A survey of the connecting trail to the Canyon City ruins also found no invasive species. Surveys to the Canyon City helicopter pad and Canyon City trail crew cabin were not conducted due to time restraints, however past years' surveys concluded that there were no invasive species present on these trails. Continuing north from Canyon City, no invasive plant species were found until just south of the Sheep Camp ranger station. Isolated stems of tall buttercup were found in this short section and were controlled.

Sheep Camp

Just as in past years, in 2013 Sheep Camp was found to host the highest concentrated area of invasive species along the United States portion of the Chilkoot Trail. A total of 13 tall buttercup plants were found and controlled in and around the Sheep Camp camping area. This is a small but marked increase since past years, and backcountry rangers were notified of this and briefed on identification and control procedures for this species. Small patches of white clover were also found on the trail section through the camp as well as scattered around the historic section of the camp itself. Additionally, the open area behind the Sheep Camp ranger station contains a large infestation of common dandelion. These populations did not seem to be escaping from this restricted area of disturbance and due to their extent and low priority status were surveyed but not controlled.

In past years, major time and effort has been put forth to control a population of reed canarygrass in the Sheep Camp campground. Reed canarygrass can be particularly damaging to riparian ecosystems, such as that at Sheep Camp, and is therefore a high priority for control. Treatment began during the 2011 season when EPMT staff installed a total of 12 shade covers in an effort to eradicate the population (Figure 5). In 2012, EPMT staff returned to this control site to evaluate the condition and effectiveness of this treatment. Reed canarygrass was found to be growing in the margins of 10 of the 12 shade covers, and many stems were found to have grown through the covers. 2012 EPMT removed all exposed stems and laid an additional layer to expand the covers' thickness. 2012 EPMT also discovered additional populations of reed canarygrass that had apparently escaped from the shade covers. Eleven additional shade covers were placed in an expansion effort that resulted in a 44% increase in areas covered. In 2013, EPMT returned to the site in early June to monitor the condition of the shade covers. No major damages were found, and maintenance efforts included replacing noticeably worn signs as well as replacing several lining rocks. EPMT staff returned to the site several times throughout the season to ensure that reed canarygrass did not again escape from the covers, and no escaping stems were ever found.



Figure 5. Shade covers at Sheep Camp were found still intact in 2013.

In 2012, a possible European mountain ash tree was found in front of the Sheep Camp ranger station. A sample of the tree was taken and sent to regional for identification but confirmation of the tree's invasive status was not confirmed during the 2012 season. In 2013, EPMT obtained approval for the removal of this tree from park staff, and cut down the tree in late July. However, strictly manual control was required and therefore, because European mountain ash commonly resprouts, additional control effort will likely be required. Backcountry rangers were informed of this and asked to remove any resprouting stems that they observe. On an informal scouting of the backcountry around Sheep Camp, EPMT staff discovered a second possible European mountain ash but was unable to document its location. European mountain ash is avian-dispersed and it is therefore probable that it has spread into the backcountry and beyond the reach of EPMT monitoring efforts.

Sheep Camp to Chilkoot Pass

Eight tall buttercup plants were found just north of Sheep Camp and were controlled. The common dandelion infestations in this section that were found by 2012 staff were not detected during this year's survey. As noted above, this could be because of the brush cutting by trail crew that had occurred recently over this section of trail. Common dandelion infestations that were originally documented in 2004 and 2005 on Long Hill were again not found during this survey, suggesting that these populations have been successfully eradicated. No invasive plants were found on Long Hill or from the Scales to the Chilkoot Pass. It should be noted that although the invasive common dandelion, *Taraxacum Officinale*, has not been recently documented on Long Hill, the native dandelion, *Taraxacum lyratum*, has been identified there.

A map of infestations on the Chilkoot Trail can be found in Appendix H.

Klondike Highway and White Pass Unit

The Klondike Highway, spanning from the northern edge of Skagway into the Yukon Territory of Canada, serves as an excellent conduit for invasive plant dispersal between international borders. This 14-mile section of highway was surveyed twice in mid-late July. Both surveys were conducted on bike; the first was largely a visual survey to assess the plurality and locations of invasive species present, and the second was to accurately map all observed infestations. Although both surveys focused on the western side of road for safety reasons, particular vigilance was given to high-priority species on the eastern margin. Additionally, visual surveying was conducted by car on the east side in an effort to identify the locations of high-priority infestations.

In general, invasive populations were found to be largely congruent with previous years, though with a few notable exceptions. Tall buttercup was found in sporadic patches beginning a mile south of the Canada-U.S. border and steadily gaining in density with increased proximity to Skagway. This population notably increased, becoming a crowding dense patch, about a mile north of the highway's intersection with Dyea Road.

Two of the three infestations of reed canarygrass, located in 2012, were documented in 2013. Just as in 2012, these two infestations were between the 8 and 11 mile markers. The first infestation was found just south of the Bridal Vail Falls pullout on the western roadside, and the second was located near an eastern roadside pullout close to mile 11. The inflorescences of all culms were clipped as a manual control.

Narrowleaf hawksbeard was documented on the Klondike Highway, with its density notably increasing at the rock quarry on the east side of the road one mile north of the intersection with Dyea Road. This infestation continued regularly along the road margin largely until the highway's terminus at the Skagway River Bridge. Yellow toadflax was also documented along this section, though this population extended further north and appeared sporadically in dense patches. Canada thistle, documented and controlled for the first time by KLGO EPMT in 2012, was not detected during the 2013 survey.



Figure 6. *Melilotus alba* growing alongside the Klondike Highway.

White sweetclover was found escaping from the rock quarry one mile north of the intersection with Dyea Road (Figure 6). Several intermittent but small infestations were found along the road continuing south through the road margin in front of the AKDOT maintenance yard. In total, 48 white sweetclover plants were documented and controlled. The infestation at the rock quarry which was documented in 2012 was not found in the 2013 survey. This is most probably due to the varying environment created by often shifting rock piles, which allows for short-lived but perhaps dense invasive plant populations to colonize.

Oxeye daisy was located several times throughout the Klondike Highway, most notably at an infestation just south of the U.S. customs station. A second large infestation was documented at the mile-11 road pullout on the eastern road margin. Infestations were found growing sporadically on both the eastern and western roadsides. A third large infestation was documented spanning the road margin in front of the AKDOT maintenance yard.

Several low-priority species are ubiquitous along the length of the Klondike Highway. These infestations include: common dandelion, common plantain, red clover, white clover, alsike clover, sheep sorrel, lambsquarters, pineapple weed, sticky ragwort, nightflowering catchflies, and shepherd's purse. These species decrease in density with increased distance from Skagway. This is probably due to a combination of Skagway's being a source population for dispersal, as well as the geographic and climactic barrier imposed by the increased elevations and decreased temperatures of the alpine and sub-alpine regions.

A map of infestations along the Klondike Highway can be found in Appendix G.

A survey of the White Pass Unit was conducted in early August. This survey encompassed much of the northern section of the White Pass Unit but did not progress to more southern sections that have been surveyed in past years for safety reasons. This survey focused on the railroad tracks, as this is the only notable human disturbance in the area and the only location where invasives have ever been detected. Absence data was collected during off-trail backcountry travel. Along the railroad tracks, only common dandelion and white clover were documented. Each were present as sporadic single stems or patches, though two notable dandelion infestations were documented just south of the pump station at the Canada-U.S. border and just north of the tunnel. Some control work was done on these infestations, though most control was focused on smaller more manageably sized populations throughout the rail tracks.

A map of infestations found in the White Pass Unit can be found in Appendix F.

Outreach and Education

Just as in past years, outreach and education remained a high priority of focus during the 2013 season. EPMT staff coordinated with multiple community organizations and businesses in order to educate and involve the community in regard to the management of invasive plants. Invasive

plant education for park staff was also a high priority and so multiple informal educational presentations were held directly for staff throughout the season. Weekly trail meetings proved to be a successful outlet for educating backcountry rangers as well as various other park staff on invasive plant identification. EPMT staff created identification handouts for reed canarygrass (*Phalaris arundinacea*) and tall buttercup (*Ranunculus acris*). These two species were chosen due to their frequency and worrisome spread along the Chilkoot Trail. Because surveys of the Chilkoot are time intensive and are therefore infrequent, these sessions were provided in the hope that backcountry rangers and staff may identify newly encountered populations of invasive plants along the trail and notify EPMT staff as to their whereabouts.



Figure 7. Edible invasives display at You Say Tomato.

Two educational displays were set-up during the 2013 Alaska Invasive Weeds Awareness Week from June 17-21. One display at the Skagway City Library featured invasive plant identification and information cards, an overview of invasive plants in Skagway, as well as live botanical specimens. This display was put up on June 13 and remained on display until July 15. A second display at the local health foods store, You Say Tomato, featured information about culinary uses for invasive plants, local invasive plant recipe cards, and several prepared dishes (Figure 7). This display was put up on June 18, and, although the empty food dishes were collected the following day, the remaining informational materials remained until July

15.

In an effort to reach out to the local community about the concerns regarding the spread of invasive plants, an article about Skagway invasive plant communities was published in the Capital City Weekly newspaper. This also provided an excellent opportunity to advertise for the upcoming Skagway Community Weed Pull, which was hosted by EPMT staff in coordination with the Taiya Inlet Watershed Council and the Skagway Department of Transportation. The Community Weed Pull was scheduled for July 13, in accordance with the season's phenology. Volunteers focused on removing infestations of white sweetclover, yellow toadflax, and narrowleaf hawksbeard within the boundaries of the Skagway Airport. Thirty volunteers participated in the event, more than in any previous year, and together pulled a total of 210 pounds of invasive plants. Due to this abundance of volunteers, many were tasked with pulling the profuse infestations of narrowleaf hawksbeard within the inner-margin of the runway, while a separate smaller taskforce controlled white sweetclover and yellow toadflax on the eastern edge. Three volunteers controlled white sweetclover infestations outside of airport property. The event took place from 9am to 1pm and all volunteers were provided with a free Community Weed Pull T-shirt as well as lunch provided by the TICW.

The EPMT staff assisted with two youth-based education events in the 2013 season. On June 20, EPMT staff provided support for a summer camp activity that educated kids about the importance of native seed dispersal. The activity included making paper-mâché "seed bombs," native seeds encapsulated in a paper-mâché ball. On July 11, EPMT staff partnered with the Skagway Library to create an invasive plant themed display booth at the 2013 Junior Ranger

Day. The display booth included invasive plant coloring-books, as well as a collection of pressed flowers for kids to create invasive plant bookmarks.

Gypsy Moth Monitoring

The 2013 season marked the third season that EPMT staff at KLGO has participated in the gypsy moth monitoring program. Over the past three years, this trapping program has been incorporated into the KLGO EPMT staff annual monitoring efforts. In accordance with the Alaska EPMT EDRR strategy, these traps are intended to lure the Asian and European gypsy moths (*Lymantria dispar* & *Lymantria dispar* spp. *japonica*) in an effort to determine their spread. These target species would be a major threat to native plant and insect communities if they were allowed to spread into Skagway or KLGO, and Skagway is a primary target for monitoring efforts due to its location as a major tourist port (Mack *et al.* 2000). Because of this vulnerability, as well as due to multiple previous interceptions of both European and Asian Gypsy Moth in Ketchikan, Alaska, it is of utmost importance that proactive monitoring efforts be taken by KLGO. In 2013, three moth traps in total were placed by EPMT staff in Skagway (one above the boat harbor and one at Yukatania Point) and Dyea (at the NPS campground). These delta traps (Figure 8) contain a synthetic pheromone lure that is intended to attract both Asian and European gypsy moths. The traps were placed in late June, checked periodically throughout the summer, and collected in mid-August. They were placed on the boles of and within stands of known gypsy moth host tree species, alder (*Alnus* spp.) and birch (*Beula* spp.), in accordance to the guidelines put forth by the Alaska Survey. No gypsy moths were recorded during the 2013 season.



Figure 8. Gypsy moth trap set-up at Yakutania Point.

A map of the placement of these three traps can be found in Appendix I.

Discussion and Recommendations

Skagway

As noted above, Skagway contains the highest number of invasive plants as compared to any other unit of the park. Furthermore, due to its location as a starting point for visitor traffic to other areas around the park, it is a prime source for the dispersal of invasive plants to surrounding ecosystems. Many of Skagway's numerous invasive plant species are present in gardens as ornamentals or are located on private property. However, some species have successfully colonized larger areas in the surrounding region, and have even spread to further extents along the State-owned Dyea Road and the Klondike Highway. For this reason, it is important that high-priority species be eradicated from Skagway where possible, or controlled to the point of limiting their dispersal.

Reed canarygrass exhibits the highest invasiveness ranking of species noticeably present in Skagway. The only known population exists surrounding Pullen Creek just south of the Dewey Lakes trailhead on White Pass & Yukon Route Railroad right-of-way. A plan for herbicide treatment was proposed in 2012 and discussed by regional parties including John Hudson of the U.S. Fish and Wildlife Service and Brian Maupin of the AACD as well as local parties including Rachel Ford of the TIWC and the Municipality of Skagway. As of yet, these plans have not culminated in any action. Until herbicide becomes a realistic possibility for its eradication, the inflorescences of this population should be clipped before they go to seed. Since the decision by the Municipality to prohibit herbicide use within the Bureau of Skagway, chemical control for this population may not be a realistic goal. This infestation should be monitored regularly throughout the season in order to assess its phenology. Reed canarygrass often spreads by its rhizomatous roots, and therefore removing its seed is not a viable means for controlling this population. However, this treatment option, though certainly not completely effective, will at least limit one vector for reed canarygrass's dispersal. Rachel Ford and the TIWC proved in 2013 to be of great assistance in managing this population, and this partnership should certainly be continued in 2014.

A second high-priority species that has potential for eradication in Skagway is white sweetclover. *Melilotus alba* has been documented throughout Skagway, though it is most noticeably present in and around the State owned Skagway Airport property as well as along the roadsides of northern Skagway. At this year's Community Weed Pull, white sweetclover was identified to volunteers as the first priority species for control work and eradication. Volunteers removed all white sweetclover plants from airport property. After discussing the plant's spread over the past years with Missy Tyson of the AKDOT, it was determined that efforts over the past years have been successful at greatly reducing white sweetclover's extent on airport property. In 2014, this practice should be continued and EPMT should purposefully schedule the Community Weed Pull according to the season's phenology in order to target white sweetclover as the primary control target. A dense population of white sweetclover was discovered and controlled in 2012 at the Municipal owned Seven Pastures dump site in northern Skagway but was not detected in 2013. This area should be again surveyed in 2014 to ensure that this population has not re-established. Joanne and Andy Beierly are two motivated Skagway residents who have taken it upon themselves to aid EPMT in the eradication of *Melilotus alba* from Skagway. These two dedicated volunteers pulled and bagged white sweetclover throughout Skagway using bags provided by EPMT. Their partnership should be sustained in 2014.

A plan for the eradication of the bird vetch located on Spring and 9th Streets should be a priority for the 2014 season. Herbicide has been discussed as a possible treatment option by the TIWC, AACD, and city, though no action has yet been taken. Manual control has proven in the past to not be a viable means for population control. Efforts should begin early in the season to develop a plan and then follow through with it throughout the season, though herbicide treatment may not be a realistic option since the 2013 Skagway Bureau decision opposing herbicide use.

The seven populations of ornamental jewelweed in Skagway should be monitored in 2014. The population that exists on 20th St between Main and State is of particular concern due to its proximity to Pullen Creek and ornamental jewelweed's known ability to colonize and crowd riparian areas. Past outreach attempts have been made toward property owners of the infestations at Dedman's Photography and Corrington's Alaskan Ivory but have been met with resistance. These infestations throughout Skagway on private land should therefore just be monitored. Any future outreach attempts should be made by TIWC or AACD by offering to replace these infestations with native vegetation.

Common tansy (*Tanacetum vulgare*) can be found in Skagway planted in an NPS-maintained garden at the intersection of 5th St. and Broadway. The KLGO management staff has expressed concern about the public's reaction to the removal of this exotic species. Because common tansy has not as of yet been observed spreading beyond this contained location, control at this location should maintain low priority, despite its presence on federal land within the Skagway Unit park boundary.

Other noteworthy species are abundant throughout Skagway, including yellow toadflax, tall buttercup, and narrowleaf hawksbeard. These species should certainly be monitored and effort should be made to prevent their further spread. Yellow toadflax is densest in northern Skagway where it may easily spread along the Klondike Highway. Control efforts of yellow toadflax in Skagway should take second priority to the species listed prior, but should entail visiting these populations throughout their flowering season and pulling all flowerheads before they can go to seed. *Linaria vulgaris* produces a significant taproot as well as horizontal roots which are often difficult to effectively remove. Biocontrol measures do exist for the control of yellow toadflax, and can be found outlined by Wilson *et al.* (2005). The relatively moderate extent of yellow toadflax was determined by 2013 EPMT to not merit such measures, however if its extent is drastically expanded in future years, perhaps this alternative should be considered by EPMT staff and park management.

Dyea

Surveys of the NPS owned Dyea Townsite Road and trail system, Nelson Slough Restoration Area, NPS campground, and the Municipal owned Dyea Flats should be conducted periodically throughout the season. 2013 EPMT staff found that periodic visual surveys were an excellent means to quickly assess the season's phenology and determine emerging populations. The Nelson Slough Restoration Area should receive special attention, as this will continue to be a vulnerable area to invasion until the native flora community has completely re-established itself. Multiple infestations of common eyebright have been documented and controlled in this area in past years, including one just south of the Nelson Slough Bridge on Municipal owned property. Although these infestations were not detected here in 2013, EPMT should maintain necessary vigilance in case they re-emerge. Common eyebright was found and controlled in 2013 by the

bridge to the dog camp in the northern area of the Dyea Flats. This small population should be returned to and controlled in 2014, as it is a candidate for eradication.

In 2012, a small population of yellow toadflax was documented and controlled emerging at the far southern tip of the Dyea meadow adjacent to the road on Municipal property. This population was not detected in 2013. 2014 EPMT should monitor this area carefully to ensure that the population does not return. Yellow toadflax has not been documented growing in any other stands of Dyea.

Tall buttercup remains very abundant in this area, especially along the Dyea Townsite Road and among the flats and trail system where horse trails are contiguous. Unless 2014 EPMT has an abundance of volunteers or a SAGA crew at its disposal, manual control of these populations should not be attempted. However, several small and manageable populations were found and controlled during regular surveys of the trail system. This was determined to be the most effective and efficient manner of preventing the species' spread.

Dyea Road

In 2013, a survey of the entire length of the State owned Dyea Road was conducted over the series of a couple days in early-July by foot. This method seemed to work well, as it allowed EPMT the highest level of accuracy for recording high priority infestations. The 2014 survey should be scheduled according to the season's phenology, specifically after yellow toadflax is in flower. Low priority species were not mapped in 2013, as there are now multiple years-worth of data to support their ubiquitous presence. In 2014, this practice should be continued, though a more thorough survey should perhaps be conducted in 2015 as a means to track the expansion of all invasive species over time. During the 2013 season, large amounts of road construction occurred on Dyea Road along Nahku Bay and the Taiya River Estuary. EPMT staff should focus on this area and track the colonization of all invasive plant species along this section. Particular care should be given in 2014 to determine the effects of these large-scale disturbances on the establishment of invasive species.

Due to the limited time and personnel available during the 2013 season, control work along Dyea Road was limited to small-scale infestations. These included the infestation of narrowleaf hawksbeard just south of the NPS campground of which all stems were removed. This infestation site should be returned to in 2014 and all stems should be removed. It is very manageably sized and is a candidate for eradication in future years.

An infestation of oxeye daisy at Nahku Point was found to be escaping from private property and was controlled by EPMT staff and volunteers. Although the source of this population is located on private land, EPMT staff should manually control all stems that escape from private property in order to limit its dispersal along Dyea Road. 2013 EPMT staff surveyed the area just north of the Taiya River Bridge for oxeye daisy which was found at this location in 2012 but it was not detected. 2014 staff should return to this location to ensure that this infestation has been eradicated.

If resources allow, 2014 EPMT should additionally focus on larger more widespread infestations of tall buttercup, specifically along the section from the Taiya River Bridge to the West Creek Bridge. This infestation occurs in low density and would therefore be manageable with the help

of a few volunteers, though its control should be second priority to prior listed infestations. Lastly, the population of reed canarygrass existing just south of the AB Mountain trailhead should be manually controlled via clipping of the inflorescences. Due to past disputes that have occurred between the park service and local citizens near the Chilkoot Outpost, the population of reed canarygrass just north of the Chilkoot Outpost but outside of park boundaries should be monitored for expansion but not controlled.

Chilkoot Trail

An annual intensive survey of the Chilkoot Trail has now been conducted for the past four seasons, and this practice should be continued in 2014. This survey is to assess the overall dispersal of invasive plants along the Trail, as this site is certainly a case study for human foot traffic as a dispersal agent. In addition to this singular survey, visual surveys along the Chilkoot Trail as far as Sheep Camp were performed throughout the 2013 season during miscellaneous work trips. This exercise should be repeated in 2014, as it was a successful means to assess the spread as well as phenology of invasive plants in this region. In 2014, rigorous treatment and restoration measures will need to be conducted at the Sheep Camp tarps, recommendations for which are outlined below. Multiple trips will need to be taken to Sheep Camp for this service work, and these will be excellent opportunities for visual surveys to be conducted. EPMT staff should schedule a trip in early June to assess the condition of the tarps, noting that reed canarygrass will not have flowered at this point and will therefore be very difficult to identify if it has escaped. A second trip and more extensive trip should be taken later that month or early July to remove the tarps and begin revegetation efforts. Subsequent trips should be taken according to the progress and speed of revegetation. A final trip should be taken in August, or when time allows in late season, to assess the success of the revegetation project. During this trip, EPMT should evaluate the responsibilities of future EPMT staff to ensure the revegetation project's success.

Preventative as opposed to reactive measures for limiting the dispersal of invasive plants along the Chilkoot Trail has proven to be the best management practice. Several collective measures should be taken to ensure that this strategy of early detection rapid response is continued in 2014. In 2012, EPMT staff worked to install boot brush stations in three locations around the park. These stations would serve a functional purpose in preventing seed dispersal in locations such as the Chilkoot Trail that have not yet been colonized by many of the park's known invasive species, as well as serve the educational purpose of informing visitors of the threats of invasive plants. In 2013, compliance came through to construct these stations at the proposed sites; the only issue that remains is that of funding. Procuring funding for this project should be a top priority for 2014 EPMT staff.

Klondike Highway and White Pass Unit

The entire length of the Klondike Highway should be surveyed again in 2014. In 2013, this survey was conducted by bike in late-July and this method worked well. Just as on Dyea Road, low-priority species were not intensively surveyed for in 2013, though their presence was noted and mapped. Attention was instead given to infestations of tall buttercup at higher elevations, yellow toadflax, narrowleaf hawksbeard, reed canarygrass, oxeye daisy, and white sweetclover. Infestations of white sweetclover seem to have subsided over the past couple years, as control efforts have been continuous. The largest concentration of *Melilotus alba* is located around the rock quarry about a mile north of the Dyea Road intersection, as well as in front of the AKDOT

maintenance lot. Though the infestation located at the rock quarry itself was not detected in 2013, this site should be returned to and inspected for invasive plant establishment in 2014. All plants found should be removed.

In 2013, the inflorescences of all reed canarygrass found along the Highway were clipped. This practice should be continued in 2014. If time allows, manual control should be conducted at the patches of oxeye daisy along the road, specifically at the large patch at the mile-11 pullout on the east side of the road. This is a fairly sizeable patch but could probably be controlled in a couple hours, especially if volunteers are available.

The annual survey of the White Pass Unit should be continued in 2014. In past years, this survey has coincided with an annual amphibian survey of the area as to maximize resource efficiency, and this coordination has worked well. This survey works best when scheduled as an overnight trip, as this allows for ample time to collect data as well as to assist with the amphibian survey. In 2013, the survey of the railroad tracks was limited to north of the tunnel due to safety concerns. The railroad tracks south of the tunnel have only been surveyed by EPMT in 2012. If possible, 2014 EPMT should schedule this survey on a day when the train is not running, or should at least coordinate with the railroad to determine what times may be safe to cross through this tunnel. Efforts to circumnavigate the tunnel off-trail in 2013 were unsuccessful due to difficulty of terrain.

Survey Work

Surveys are a vital component of invasive plant management. Early detection of species will help control infestations before they become more serious threats. The table below shows the date and amount of time invested in each survey during the 2013 season, as well as the personnel needed to conduct the surveys. These times reflect time devoted to survey work alone. Although survey work may include periodic control of small infestations, time devoted strictly to control work was not included in this table. This table does not reflect time devoted to travel to and from survey locations.

Table 3. Summary of surveys conducted throughout the 2013 season.

Date	Location	Personnel	Time
Throughout season	Skagway	1	-
7/10	Skagway Airport	1	5 hrs
Throughout season	Dyea	1	-
6/10, 7/1, 7/2, 7/8	Dyea Road	1	13.5 hrs
7/17, 7/18	Chilkoot Trail	1	11 hrs
7/22, 7/23	Klondike Hwy	1	6 hrs
8/1	White Pass Unit	1	6 hrs

Outreach and Education

Community education and outreach proved to be a worthwhile use of time during the 2013 season and should continue as a high priority focus in future seasons. The benefits gained from these efforts far outweigh the amount of time devoted to them, as education may be the most useful tool in preventing the spread and colonization of invasive species. In the 2013 season, past

partnerships were sustained with the TIWC, DOT, as well as other local businesses and organizations. These partnerships proved to be successful in advancing the goals of KLGO EPMT and should therefore be continued in the 2014 season.

The 2013 Community Weed Pull attracted an astounding 30 volunteers, far more than in any previous year. This event should certainly be held again in 2014. It was coordinated by KLGO EPMT, AKDOT, and members of TIWC. Extensive advertisement for this event, including posting flyers on bulletin boards across town, an announcement in the local newspaper, and announcements via multiple local email lists, can be attributed as the reason for such a successful turnout. Volunteers successfully eradicated white sweetclover from the airport premises, and EPMT staff followed up later in the season to remove any re-emerging or late-blooming stems. This species should continue to be the focus in 2014, as it is now a candidate for eradication in this location. Collaboration with Missy Tyson of the AKDOT was vital to the success of this event.



Figure 9. Invasive plant bookmark station at Junior Ranger Day

Partnership with the Skagway Library was an important element of 2013 EPMT's community outreach programming. An invasive plant informative display was put up in the beginning of the season in the library display case, and remained up for a month's time. This display should be again put up in 2014, as it was a successful means of reaching a large number of people. Several times throughout the season, 2013 EPMT staff received comments from library staff and the public regarding this information display, which can only be a testament to this location as a successful outlet for public outreach. 2013 EPMT also worked with the Skagway Library staff by manning an invasive plant activity booth at Junior

Ranger Day (Figure 9). Julene Fairbanks of the Skagway Library was always very willing and excited to incorporate invasive plants into library outreach efforts. Therefore, 2014 EPMT staff should certainly continue this mutually beneficial partnership.

Invasive plant education should also be provided to park staff in 2014. Brief and informal identification talks were delivered at trail meetings in 2013 to park staff and backcountry rangers. These talks were successful in accomplishing their goals and are one way to incorporate the park's EDRR strategy, and therefore should be continued in 2014. EPMT staff should take care to provide these identification briefings in layman's terms in order to ensure the highest level of comprehension.

Boot brush stations have been discussed with both park and regional EPMT staff for the past two seasons but have not culminated in any significant progress. All necessary compliance has been established and the only remaining hindrance is the issue of funding. In 2014, this project should be a high priority, as it would be an excellent outreach opportunity and certainly coincides with the EPMT's goals of preventative weed management. Detailed plans for the construction of the

boot brush stations can be found outlined by in the appendices of the 2012 KLGO EPMT annual report (Frank 2012).

Restoration

Restoration is an important aspect of any successful large-scale invasive plant control project. When invasive plants are cleared on a large-scale, there is almost always significant disturbance to the control site, leaving increased opportunity for new opportunist invasive plant species to establish. Because of this, it is very important that these anthropogenic disturbances be revegetated in an effort to prevent the future establishment of invasive plants.

In 2011, the widespread infestation of reed canarygrass at Sheep Camp was tarped, as this was determined to be the most effective and appropriate treatment method. After the infestation was found to be escaping from the tarp margins, as well as infesting surrounding areas, the tarps were expanded and thickened during the 2012 EPMT season. This treatment project increased the expanse of the tarps by 44%, creating a total covered ground area of approximately 251 square meters. As per recommendations outlined by 2012 EPMT staff, the tarps are scheduled for removal during the 2014 season. When they are removed, this expansive area will be completely devoid of vegetation and consequently susceptible to invasive plant establishment. Therefore, revegetation of this area should be a high priority for the 2014 season.

As outlined by Frank (2012), “The revegetation plan should combine the local transplant of small shrubs with active reseeding of native plants. Sitka alder (*Alnus viridis* spp. *sinuate*) and various willow species (*Salix* spp.) can be found around the Sheep Camp campground and would make ideal candidates for transplanting. Both species, specifically willow, have been found to be very resilient to transplant (Densmore 2000).” ... “Blue joint grass (*Calamagrostis canadensis*), Blueberry (*Vaccinium* spp.), devil’s club (*Oplopanax horridus*), clasping twisted stem (*Streptopus amplexifolius*) and goats beard (*Aruncus dioicus*) are all herbaceous plants which grow readily around the Sheep Camp campground and would be strong candidates for seed collection.”

After consulting with the KLGO Chief of Resources in 2013, it may be difficult to gain compliance for revegetation that includes any form of active digging or planting due to the cultural significance of this area. However, establishing a plan for revegetation early on in the 2014 season should be very high priority. EPMT staff should work in cohesion with cultural resource staff to develop a plan that will minimize subsurface disturbance, prevent invasive plant re-colonization, and promote native plant colonization. This plan may contain some form of assisted natural revegetation, including seeding the surface with a dense diversity of native grass species.

For recommendations and discussion of revegetation procedures relevant to the Alaska region, EPMT should consult the Native Plant Revegetation Manual for Denali National Park and Preserve (Densmore 2000).

Future Partnership and Management Recommendations

Discussion in 2013 between the KLGO Chief of Resources and the Alaska EPMT Regional Liaison, Chris Overbaugh, yielded the following decisions for future KLGO EPMT work:

In past years, distribution of EPMT resources in KLGO has been equally divided between monitoring and controlling invasive plant species on federal, state, and municipal property, and outreach toward the local community. However, beginning with the 2014 season, first priority will be given to building partnerships with outside governmental agencies. Second priority will be delegated to monitor and control efforts on federal land only. Third priority for KLGO EPMT staff will be outreach and education within the local community.

It is clear that the long term trajectory of NPS managing exotics on lands other than those federally owned and managed properties is not sustainable through time without the active partnership of landowners. Therefore, 2014 EPMT should begin to work toward governmental and private partnerships that will enable the sustainability of weed management over time. The Municipality of Skagway owns significant portions of land within and surrounding the Chilkoot Trail and Dyea unit, as well as within and around the Skagway unit. The Municipality and Borough of Skagway create laws and regulations that are enforceable throughout the Taiya and Dyea River valleys within the Borough boundaries. The State of Alaska owns the Rights-of-Ways for the Dyea Road, the Klondike Highway, the Skagway Airport, and the Skagway Ferry terminal. Additionally, White Pass and Yukon Route Railroad owns the Right-of-Way beginning in Skagway and operates through USFS properties and into NPS owned lands in the White Pass unit.

In order for exotic plant management within and surrounding Skagway and park boundaries to be sustainable through time it is imperative that the NPS work in concert with other governmental agencies to produce the desired effect. Rather than actively controlling invasive species on Municipality, State, and White Pass, the NPS shall be partnering with each of these agencies to plan for a more equitable way to share the work involved.

The 2014 KLGO EMPT staff should direct their primary efforts at partnership building in these areas. A holistic plan for management of invasives throughout the two watersheds should be the priority if invasive plant management is to become sustainable. This partnership building will require that the park's management team be involved in planning discussions.

As noted, the Taiya Inlet Watershed Council has been instrumental in working with the NPS in the EPMT program. They should be included as should the Skagway Traditional Council, as well as any other businesses or organizations that exhibit interest in pursuing the goals of the EPMT program.

The plan should involve appropriate parties at the State of Alaska. The State transportation corridors are the primary routes for the spread of exotics. Measures for all parties to take could include educational materials on the ferry and at the airport for visitors. Additionally, staff at these areas should be made aware of how their services may inadvertently bring unwanted plants into the community. A Memorandum of Understanding currently exists for Chilkoot Trail operations on State property. A similar instrument is needed for White Pass. At present, the current MOU does not mention exotic plant management within the managed areas.

Discussions with the Municipality could include the potential for city funded assistance for annual inventory and control measures. The 2014 EPMT could research other communities to

see what they have done to reduce their exotics. This information would be valuable to all parties and may provide a template for future ordinances.

As mentioned, the White Pass unit is the where the WP&YRR has a Right-of-Way and is likely the transportation corridor for exotics. For this reason the WP&YRR should be brought into the long range planning for exotic plant management.

In 2014 the EPMT's secondary priority should be limited to inventorying and managing exotics *on federal property*. Since high-invasiveness-ranking Skagway exotics are primarily described as those purposefully planted either for recreating or maintaining cultural landscapes, or for purposes of ornamental plantings at various greenspaces within Skagway, the work in Skagway will be limited. The bulk of federal property is located in Dyea, the campground areas along the Chilkoot Trail and the eastern half of White Pass (not including the WP&YRR Right-of-Way which requires authorization for entry by White Pass).

The third priority for the EPMT for 2014 should be outreach to the local community. This outreach should include local gardeners and the local schools. Presentation can be coordinated with the parks interpretive staff so that the message is developed using tried and true NPS interpretive methods for delivering effective messages.

Wind Dispersal Considerations

The strong southerly winds that rush from the cold Pacific into the warm continental interior during the summer months have a strong effect on the dispersal of seed for many plants growing in the Skagway area. Many exotic plant species found in the Skagway area, such as narrowleaf hawksbeard, common dandelion, and tall buttercup are regularly dispersed by wind. The strong south wind in open areas such as the Skagway airport and the Dyea flats can also move larger, less mobile seeds, such as those of white sweetclover, considerable distances. Known introduction points, or high density areas, followed by decreasing densities of a species to the north are often evidence of wind dispersal.

It is recommended that when hand pulling in open areas, work should begin on infestations from the north end, moving south. This practice will help to contain species with wind-driven seed dispersal mechanisms to their southern limit, as north winds during the summer and early fall are rare.

Cultural Resources Integration

Klondike Gold Rush National Historic Park is located within two National Historic Landmarks, one in each river valley, and therefore is host to extensive archaeological remains. Due to the historical significance of many areas in KLGO a meeting concerning proper cultural resource field methods should occur annually. Manual control of invasive species has the potential to damage subsurface historical remains. Therefore, any time control work is conducted in the Dyea Townsite or other areas of historical significance, all workers should be briefed on the procedures enacted if a cultural artifact is found. Possible artifacts or archaeological sites found while conducting surveys should be photographed, mapped and discussed with the Cultural Resources department.

KLGO Natural Resources Exotic Plant Collection

Pressed plants are the best level of proof that certain species exists in the area, and also aid in species identification for other park staff. The KLGO Natural Resources Exotic Plant Collection was started in 2010 with a few samples collected. The following species, which have been documented around the Skagway area, need to be added to the collection:

Anthemis arvensis, *Bromus inermis*, *Capsella bursa-pastoris*, *Cerastium fontanum*, *Chenopodium album*, *Collomia linearis*, *Elymus repens*, *Erysimum cheiranthoides*, *Euphrasia nemorosa*, *Galeopsis tetrahit*, *Galeopsis bifida*, *Hordeum jubatum*, *Lepidium densiflorum*, *Medicago lupulina*, *Papaver nudicaule*, *Phalaris arundinacea*, *Phleum pratense*, *Plantago major*, *Poa pratensis*, *Polygonum aviculare*, *Polygonum convolvulus*, *Potentilla gracilis*, *Ranunculus acris*, *Rumex acetosella*, *Rumex crispus*, *Senecio vulgaris*, *Silene cucubalus*, *Stellaria media*, *Tanacetum vulgare*, *Viola tricolor*, *Thlaspi arvense*, *Trifolium repens*, *Tripleurospermum inodorum*, *Vicia cracca*.

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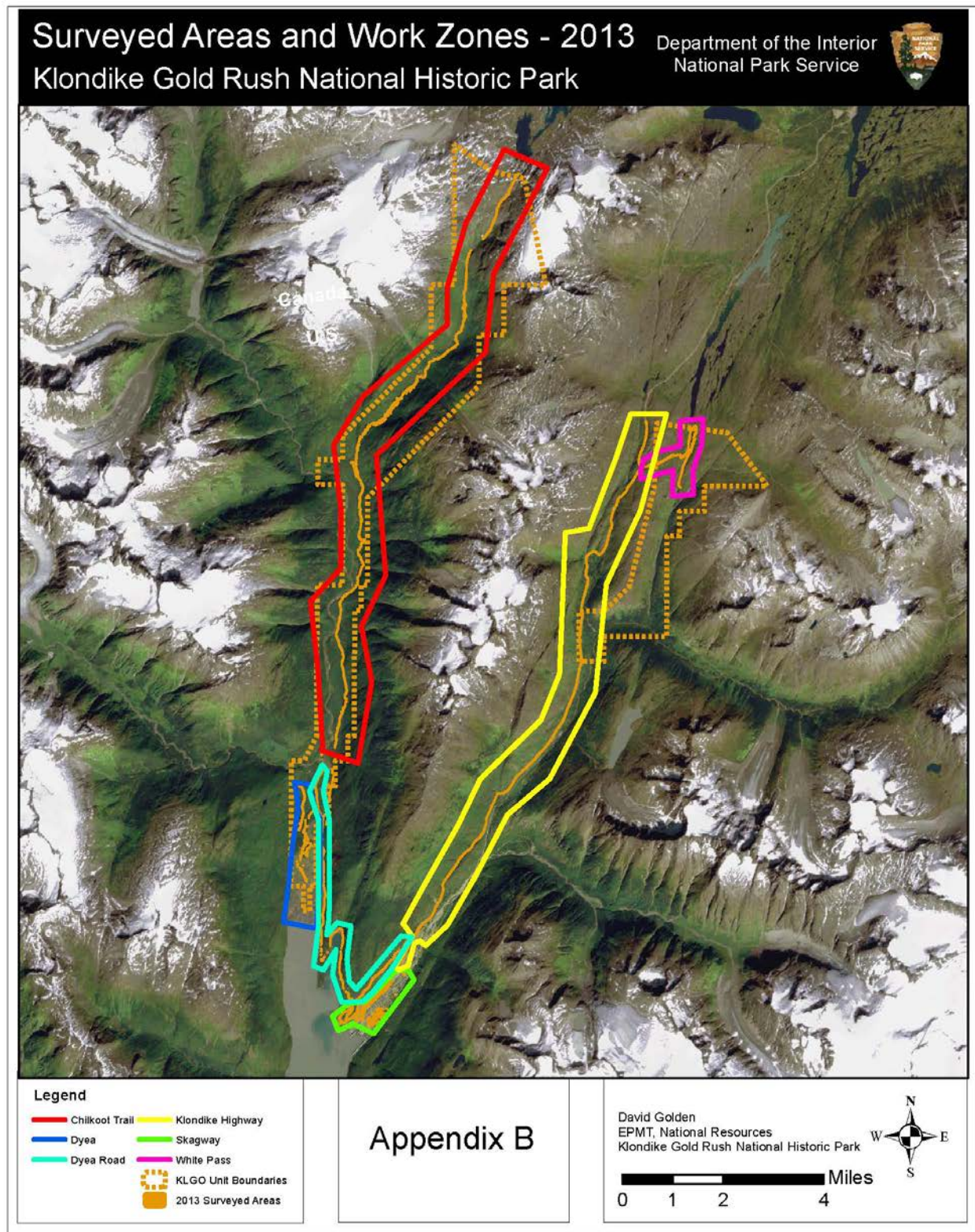
Appendix A: Klondike Gold Rush National Historic Park Exotic Species List

Latin Name	Common Name	Chilkoot Trail	Dyea	Dyea Road	Klondike Highway	Skagway	White Pass
<i>Anthemis arvensis</i>	corn chamomile					X	
<i>Anthemis arvensis</i>	stinking chamomile					X	
<i>Bromus inermis</i>	smooth brome				XO	XO	X
<i>Capsella bursa-pastoris</i>	shepherd's purse		XO	XO	XO	XO	
<i>Caragana arborescens</i>	Siberian peashrub		XO			XO	
<i>Centaurea montana</i>	perennial cornflower					XO	
<i>Cerastium fontanum</i>	mouse-ear chickweed		X	XO	XO	XO	
<i>Chenopodium album</i>	lambquarters		X	X	XO	XO	
<i>Cirsium arvense</i>	Canada thistle				XO		
<i>Collomia linearis</i>	narrow-leaved collomia				X	X	
<i>Crepis tectorum</i>	narrowleaf hawksbeard		XO	XO	XO	XO	XO
<i>Elymus repens</i>	quackgrass		XO	XO	XO	XO	
<i>Erysimum cheiranthoides</i>	wormseed mustard		X	X		X	
<i>Euphrasia nemorosa</i>	common eyebright		XO			XO	
<i>Galeopsis tetrahit</i>	bristlem stem hempnettle		X				
<i>Galeopsis bifida</i>	splitlip hempnettle					XO	
<i>Hesperis matronalis</i>	dames rocket					XO	
<i>Hordeum jubatum</i>	foxtail barley		X	X	X	X	X
<i>Impatiens glandulifera</i>	ornamental jewelweed					XO	
<i>Lepidium densiflorum</i>	common pepperweed					X	
<i>Leucanthemum vulgare</i>	oxeye daisy		XO	XO	XO	XO	
<i>Linaria vulgaris</i>	yellow toadflax		XO	XO	XO	XO	XO
<i>Lonicera tartarica</i>	Tatarian honeysuckle					XO	
<i>Lupinus polyphyllus</i>	large-leaf lupine					*	
<i>Matricaria discoidea</i>	pineapple weed		XO	XO	XO	XO	XO
<i>Medicago lupulina</i>	black medic					X	
<i>Melilotus alba</i>	white sweetclover			XO	XO	XO	
<i>Papaver nudicaule</i>	iceland poppy					X	
<i>Phalaris arundinacea</i>	reed canarygrass	XO		XO	XO	XO	X
<i>Phleum pratense</i>	timothy grass		XO	XO	XO	XO	
<i>Plantago major</i>	common plantain		XO	XO	XO	XO	XO
<i>Poa pratensis</i>	Kentucky bluegrass	X	X				X
<i>Poa annua</i>	Annual bluegrass	XO	XO				
<i>Polygonum aviculare</i>	prostrate knotweed		X	X	XO	XO	XO
<i>Polygonum convolvulus</i>	black bindweed					X	
<i>Prunus padus</i>	European bird cherry					XO	
<i>Prunus virginiana</i>	chokecherry					XO	

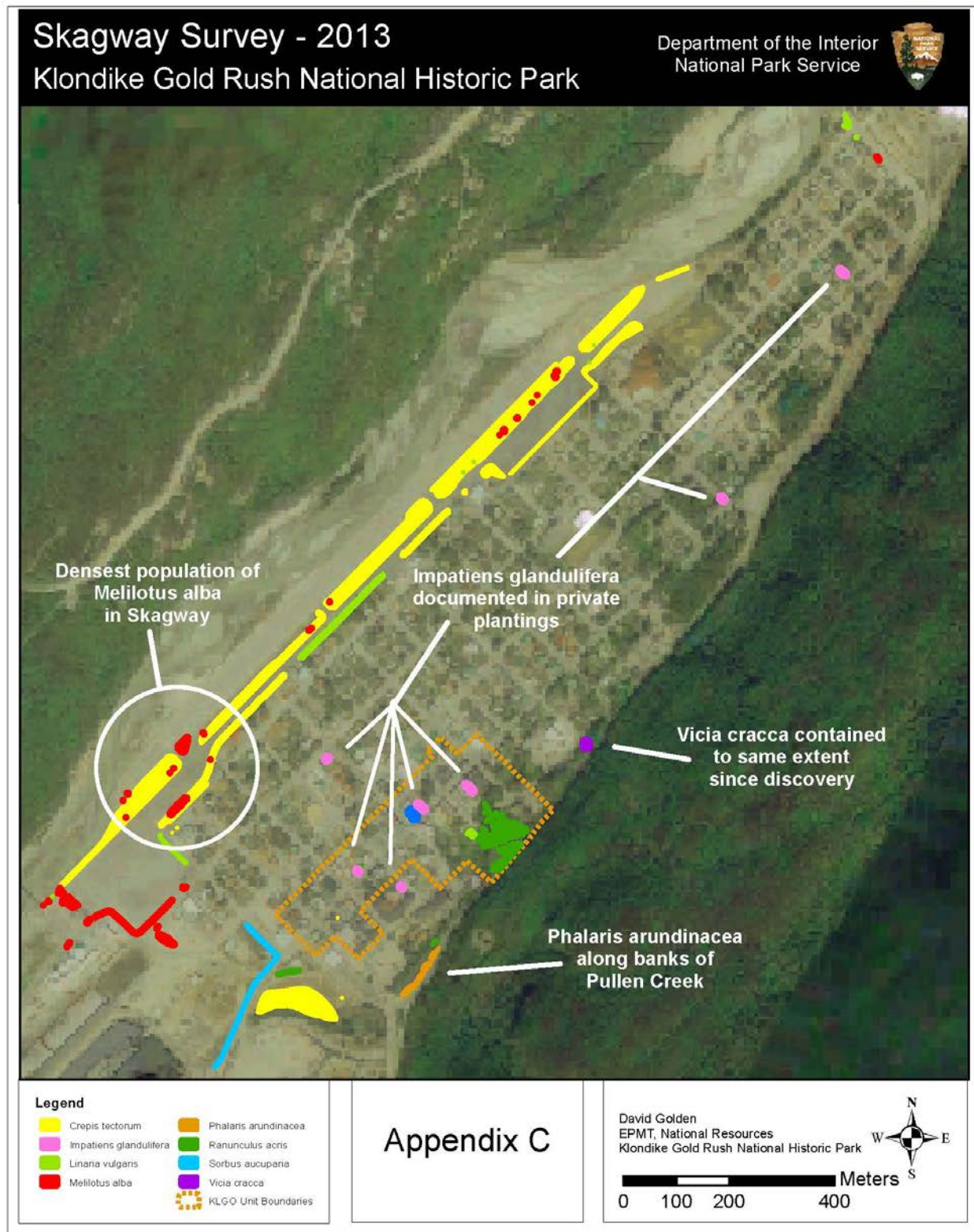
Latin Name	Common Name	Chilkoot Trail	Dyea	Dyea Road	Klondike Highway	Skagway	White Pass
<i>Potentilla gracilis</i>	slender cinquefoil		X				
<i>Ranunculus acris</i>	tall buttercup	XO	XO	XO	XO	XO	XO
<i>Ranunculus repens</i>	creeping buttercup		XO	X		XO	
<i>Rosa rugosa</i>	rugosa rose					XO	
<i>Rumex acetosella</i>	sheep sorrel	XO	XO	XO	XO	XO	XO
<i>Rumex crispus</i>	curled dock		XO	X		XO	
<i>Senecio viscosus</i>	sticky ragwort		X	XO	XO	XO	
<i>Senecio vulgaris</i>	common groundsel		X	X	XO	X	X
<i>Silene cucubalus</i>	bladder campion		X	X			
<i>Silene noctiflora</i>	nightflowering catchflys			XO	XO	XO	
<i>Sonchus arvensis</i>	perennial sowthistle					X	
<i>Sorbus aucuparia</i>	sorbus aucuparia		XO	XO		XO	
<i>Stellaria media</i>	common chickweed		X	X	X	XO	XO
<i>Tanacetum vulgare</i>	common tansy			X	XO	XO	
<i>Taraxacum officinale</i>	common dandelion	XO	XO	XO	XO	XO	XO
<i>Thlaspi arvense</i>	field pennycress		XO		XO		
<i>Trifolium hybridum</i>	alsike clover		XO	XO	XO	XO	
<i>Trifolium pratense</i>	red clover		XO	XO	XO	XO	
<i>Trifolium repens</i>	white clover	XO	XO	XO	XO	XO	XO
<i>Tripleurospermum inodorum</i>	Scentless false mayweed			XO		XO	
<i>Vicia cracca</i>	bird vetch					XO	
<i>Viola tricolor</i>	johnny-jump-up violet		XO			XO	

Notes	
X	Recorded in previous years
O	Recorded in 2012
*	Newly Documented as of 2013
	Not found in within past two years, eradicated

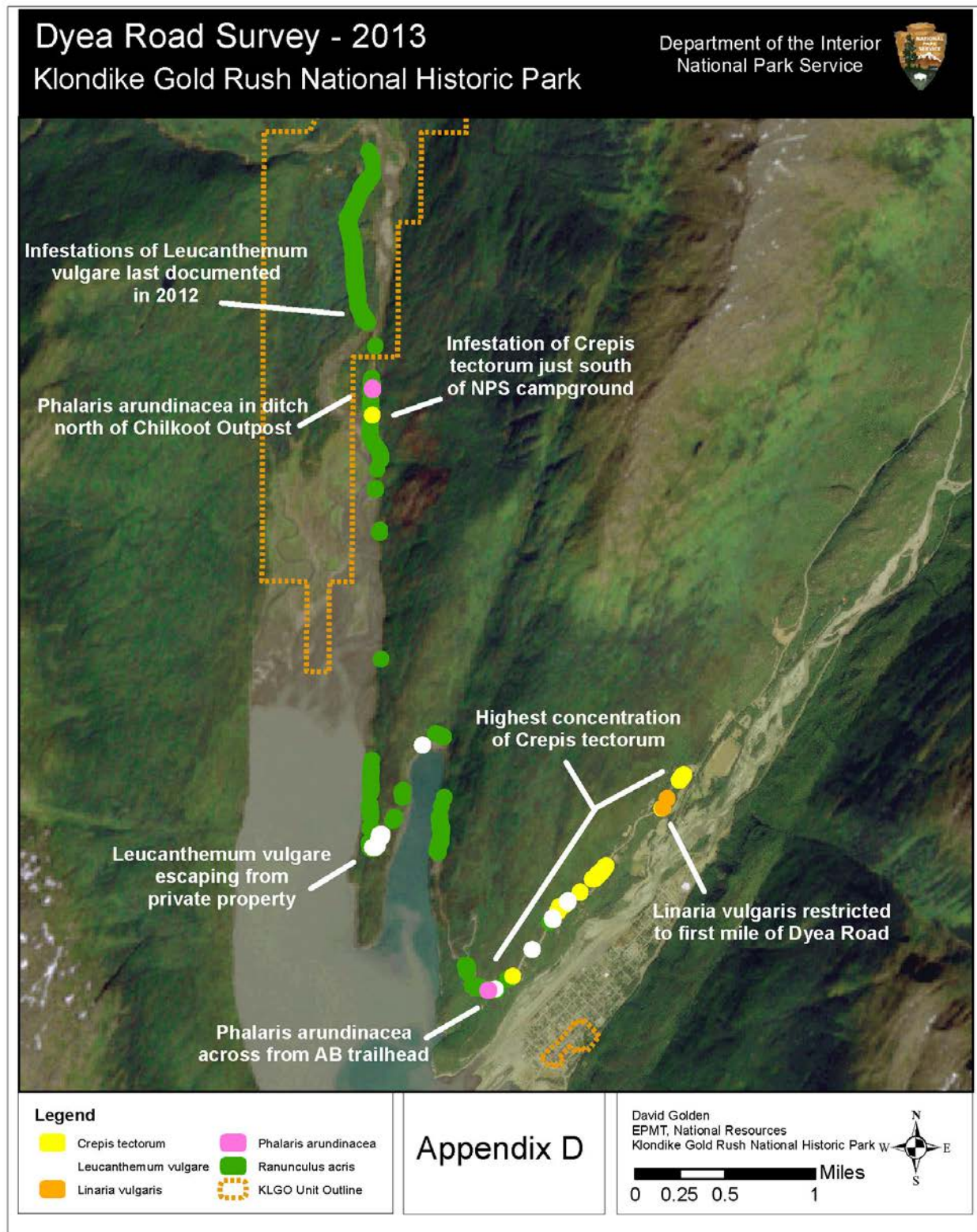
Appendix B: Surveyed Areas and Work Zones – 2013 Map



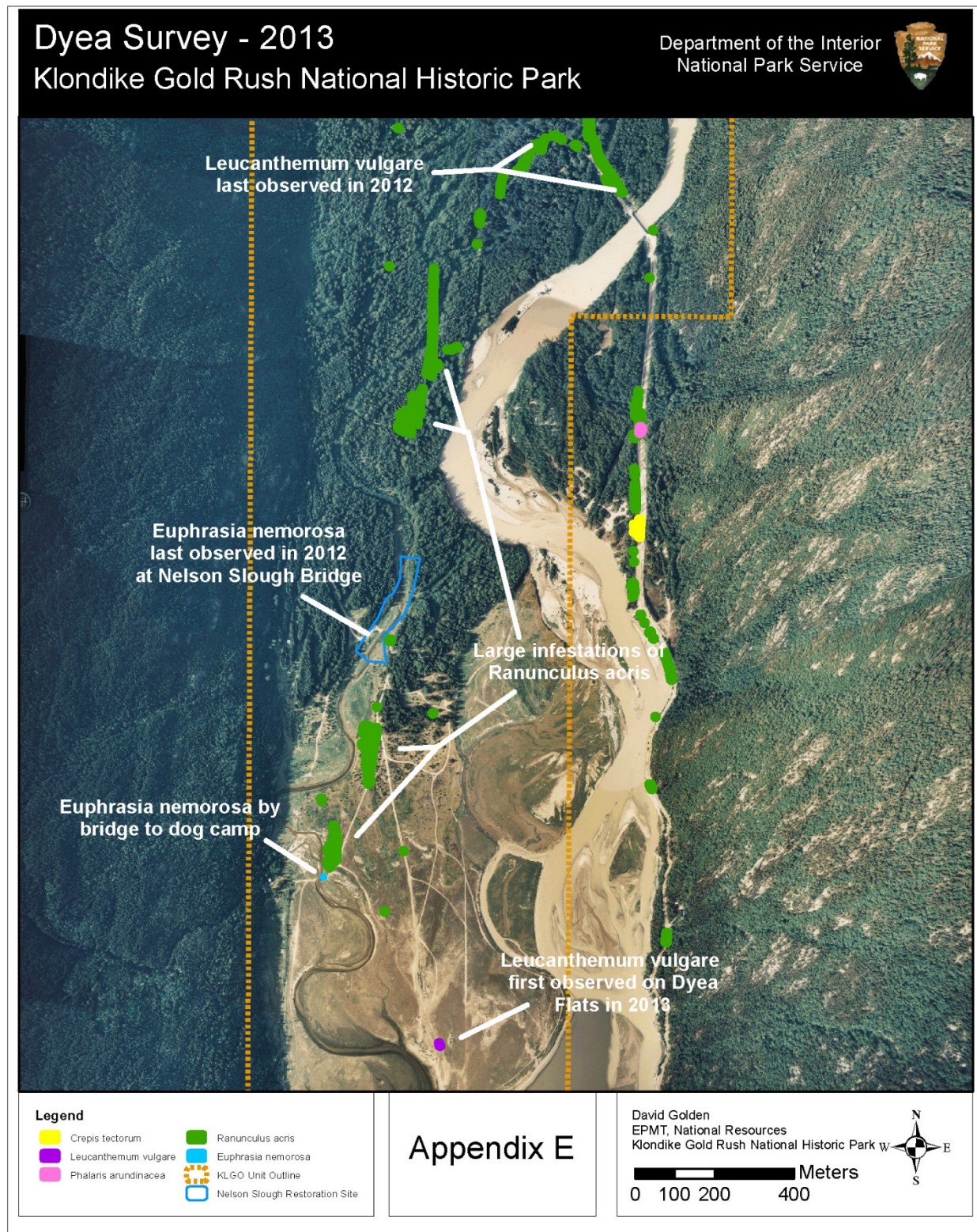
Appendix C: Skagway Survey – 2013 Map



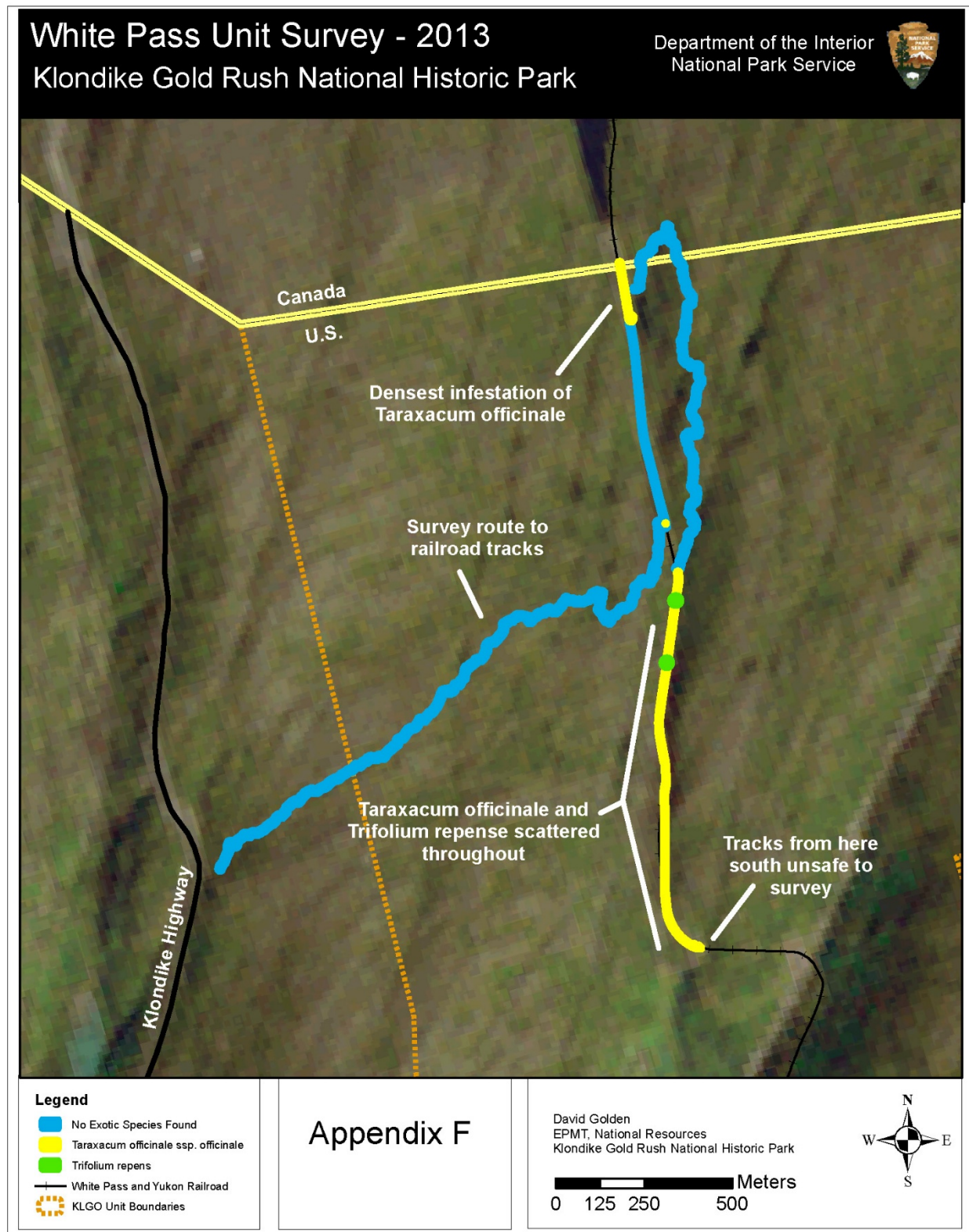
Appendix D: Dyea Road Survey – 2013 Map



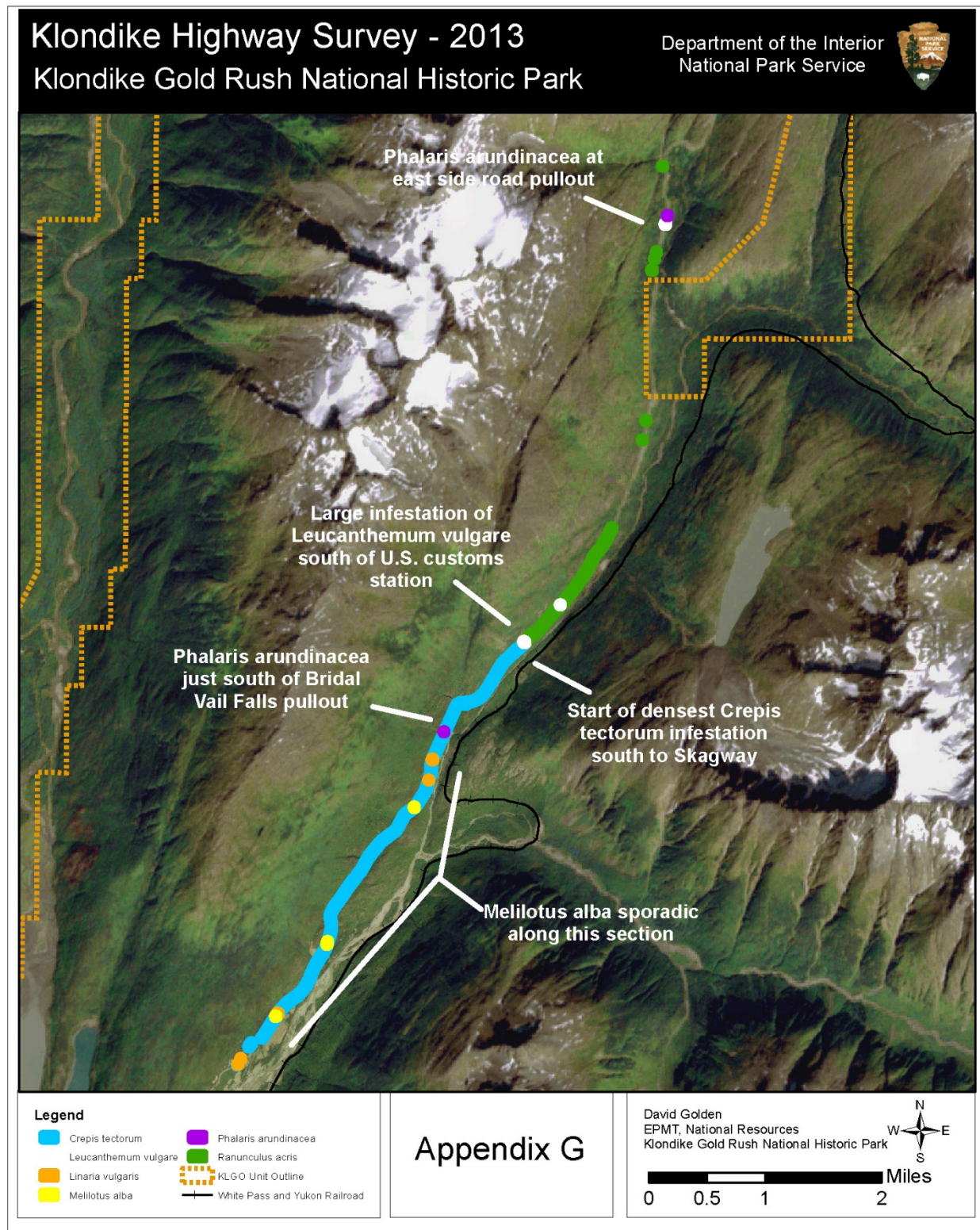
Appendix E: Dyea Survey – 2013 Map



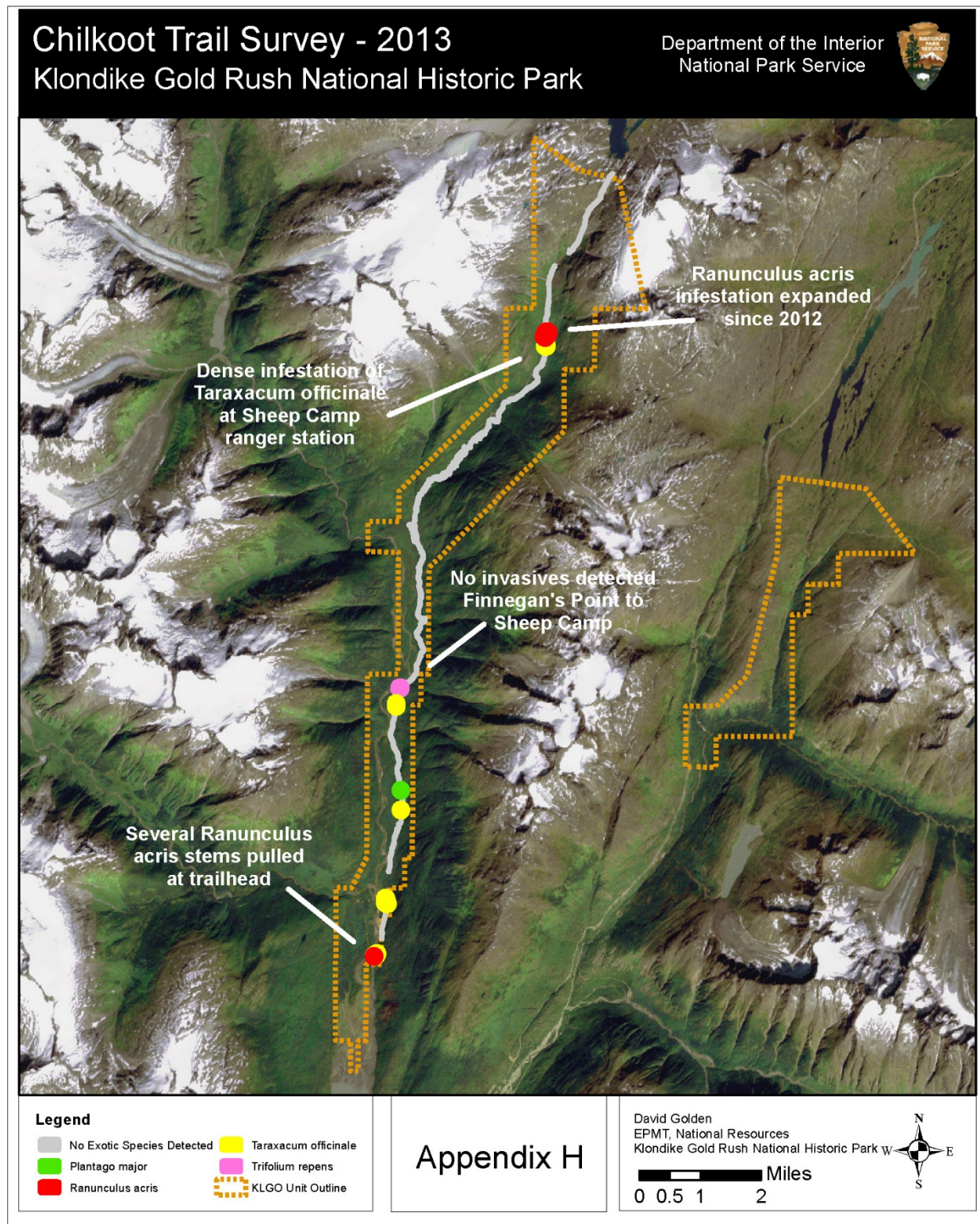
Appendix F: White Pass Unit Survey – 2013 Map



Appendix G: Klondike Highway Survey – 2013 Map



Appendix H: Chilkoot Trail Survey – 2013 Map



Appendix I: Gypsy Moth Monitoring – 2013 Map

