



Invasive Plant Management in Kenai Fjords National Park

2022 Summary Report

Natural Resource Report NPS/KEFJ—2023





ON THIS PAGE

Native plant dwarf fireweed (*Chamerion latifolium*) blooming on the Kenai Fjords National Park coast.

Photograph by Claire Visconti/NPS

ON THE COVER

Top left: KEFJ IPMT applying herbicide to common dandelions on Herman Leirer Road. Top right: IPMT crew crossing Exit Creek. Lower left: Biological science technician and YCC crew members filling out data sheets before applying herbicide

Lower right: Biological science technician and SCA intern stop to cross a creek during an invasive plant survey on the coast.

Photography by (Top left and right) Claire Visconti/NPS and (Bottom left and right) Christina Kriedeman/NPS

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2022 Summary Report

Natural Resource Report NPS/KEFJ/2023

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Abstract

This report is an overview of the Kenai Fjords National Park's (KEFJ) Invasive Plant Management Team's (IPMT) 2022 field season. The KEFJ IPMT has been surveying for and treating invasive plants since 2004. This year's team was composed of one biologist, one biological science technician, an SCA intern and two Youth Conservation Corps members. The IPMT successfully surveyed and treated high priority invasive plant populations in the Exit Glacier Area, along the Coast and in Seward. We surveyed a total of 73.8 acres, manually treated 0.6 acres, and chemically treated 0.55 acres with herbicide. This season we spot sprayed a total of 9.26 gallons of Milestone herbicide mix at a rate of 6 ounces per acre and applied 4.26 gallons of AquaMaster herbicide mix at a rate of 48 ounces per acre. We identified a total of 14 invasive plant species in the park and on park properties. We discovered common peppergrass (*Lepidium densiflorum*) in the Maintenance Facility for the first time this summer. We coordinated the Seward community weed pull for the 17th year in cooperation with Kenai Peninsula Cooperative Invasive Species Management Area (KP-CISMA) partners. We had 17 adult volunteers and hand pulled 106 pounds of bird vetch (*Vicia cracca*) at the Seward Middle School. We participated in the Alaska Division of Agriculture invasive spongy moth (*Lymantria disparasiatica*) monitoring program for the 11th year. We deployed four pheromone traps at the Exit Glacier Developed Area, and no invasive moths were detected.

Acknowledgments

The Kenai Fjords National Park Invasive Plant Management Team would like to sincerely thank the following people who helped to make out 2022 season a success: Alaska Regional IPMT Coordinator Anna O'Brien, who helped provide us with the training and answered questions as they arose throughout the summer; Student Conservation Association (SCA) Intern Morgan Valone and Youth Conservation Corps (YCC) employees Ava Pullins and Van Shank for their help in the field and the office; Nathaniel Charbonneau and Brandon Russell for their support on the M/V Serac; Nathan Bawtinheimer for support on the M/V Couloir and logistics coordination. Thank you!

List of Terms

AKEPIC Alaska Exotic Plants Information Clearinghouse

AKISP Alaska Invasive Species Partnership

AKNHP Alaska Natural Heritage Program

ACCS Alaska Center for Conservation Science

AK- DNR Alaska Department of Natural Resources

EPMT Exotic Plant Management Team (historic name, used interchangeably with EPMT)

GIS Geospatial Information System

GPS Global Positioning System

IPMT Invasive Plant Management Team (new name replacing EPMT)

KEFJ Kenai Fjords National Park

KP-CISMA Kenai Peninsula Cooperative Invasive Species Management Area

M/V Motor Vessel

NISIMS National Invasive Species Information Management System

NPS National Park Service

PUC Public Use Cabin

PUPS Pesticide Use Proposal System

SCA Student Conservation Association

SDS Safety Data Sheet

SNOTEL Snow Telemetry Automated Weather and Climate Data Collection Station

VRP Visitor and Resource Protection

YCC Youth Conservation Corp

Introduction

The KEFJ Invasive Plant Management Team (IPMT) has monitored, mapped, and treated invasive plants in the park since 2004. A strategy of early detection rapid response (EDRR) is used to detect and control invasive plants. Invasive plant management within the park is divided into three primary areas: Exit Glacier Area, the Coast, and the Seward area, which includes park property outside the park's boundary (Figure 1). The Exit Glacier Area is a high priority for the park since it includes the only road and established trails in the park and has the highest number of visitors each summer. This area has the largest populations and highest diversity of invasive plants found in the park. The primary goal in the Exit Glacier Area is to reduce and contain invasive plant populations in the more developed areas and stop the spread down trails and into undisturbed areas. The Coast receives fewer visitors and has no developed areas or trails but remains a high priority for the KEFJ EMPT. Access to coastal areas of the park is limited to aircraft and boats, but despite the remote location, small and isolated invasive plant populations are found in areas used by visitors, highlighting the need for continued monitoring in the coastal areas of KEFJ. The Seward area includes the Maintenance Facility, Shea Parking Lot, and Visitor Center. These sites are found near roads and properties that are infested with invasive plants and are staging areas for park vehicles and equipment. We focus control efforts on these areas to prevent park vehicles and employees from becoming vectors for the spread of invasive plants into the park.

Kenai Fjords National Park

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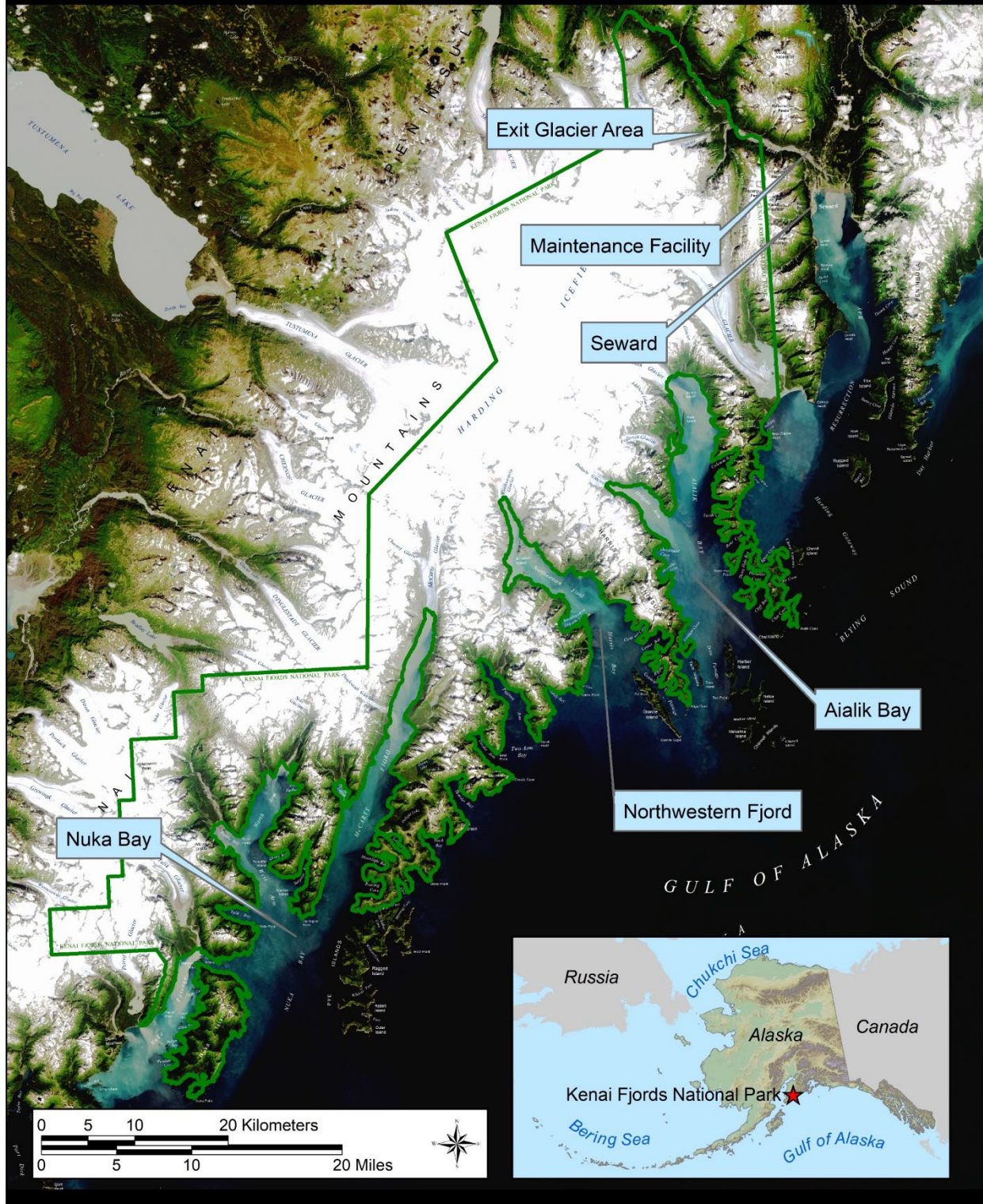


Figure 1. Overview of Kenai Fjords National Park.

Methods

Methods for data collection and processing followed the Alaska Invasive Plant Management Team 2022 Field Protocol (O'Brien, 2022) and the Alaska Invasive Plant Management Team 2022 Office Protocol (O'Brien, 2022) developed by the Alaska Regional IPMT program. These protocols outline methods for data collection and processing. We created a schedule for survey and treatment efforts for the season based on recommendations from the previous year's final summary report and from weekly field reports completed in 2021. See Table 1 for a list of project areas included in the 2022 field season schedule.

Table 1. KEFJ 2023 Project Areas

Areas	Field Sites
Exit Glacier	Herman Leirer Road, Exit Glacier Parking Area, Campground, SNOTEL, Nature Center Plaza, Glacier View Loop Trail, Glacier Overlook Loop Trail, Harding Icefield Trail, Nike Stripe, Outwash Plain, Employee Housing, Pump House
Coastal	Resurrection Bay, Aialik Bay, Northwestern Fjord, Nuka Bay
Seward	Maintenance Facility, Visitor Center

Prioritizing Treatment

Because resources and staffing are limited for managing invasive plants, planning and prioritizing invasive plant treatment is guided by a variety of factors including population size, invasiveness ranking, geographic location, and ease of access. The Alaska Center for Conservation Science (ACCS) in collaboration with land managers, biologists, and weed scientists across the state, developed an invasiveness ranking system including at least 170 known invasive plants within the state. This ranking system is based on a scale of 0 to 100, with a plant ranked as 0 presenting no threat to native ecosystems and a plant ranked at 100 presenting a very high threat to native ecosystems. The invasiveness ranking system for invasive plants in Alaska is based on an initial climate screening and an evaluation of ecological impacts, biological characteristics and dispersal ability, ecological amplitude and distribution, and feasibility of control (Carlson et al. 2008). Invasive plants with a medium to high invasiveness ranking (50 to 100) are a high priority for control efforts for KEFJ IPMT across the park. In the Exit Glacier Area, the primary goal is to reduce the populations of invasive plants in the developed areas and to prevent their spread down trails and into the undeveloped areas which have been naturally disturbed by glacier-fed hydrology. These types of areas commonly have little native vegetative cover and invasive plants do not have to compete with native plants for space. Invasive plant populations in coastal and remote areas of the park are also a high priority for treatment. Currently there are few known invasive plant populations in coastal areas of the park and these populations are still small. If invasive plant populations can be discovered while they are still small and easy to treat, there is a greater chance that they can be contained to reduce spread or completely eradicated.

Our goal is to treat all coastal invasive plant populations at least once during the summer and as the opportunity arises and conditions allow, sites will be resurveyed and retreated.

Control Methods

Manual Treatment

Manual treatment involved removing a plant or plant parts by either hand pulling or by using hand tools to dig up the plant. We used this method on invasive plant populations that were small and were easily hand pulled, and on species that did not have rhizomatous roots. Flower heads were removed before herbicide was applied to prevent plants from developing viable seeds after treatment. We put all plant parts that we manually controlled into compostable bags and disposed of them at the Seward Waste Transfer Facility.



YCC employee hand pulling invasive plants at the Visitor Center (NPS/Morgan Valone).

Chemical Treatment

We used two types of herbicides to chemically treat invasive plants in 2022. Milestone (Aminopyralid) was applied to broadleaf plants at a rate of 6 ounces per acre and AquaMaster (Glyphosate) was applied to grasses and some broadleaf plants at a rate of 48 ounces per acre. Two additional adjuvants were added to both herbicide mixtures. We added Spreader 90, a surfactant used to improve herbicide coverage and adhesion to a plants surface, at a rate of 0.08 ounces per gallon, and Turf Trax Blue, a blue dye colorant used to indicate where herbicide was sprayed, at a rate of 0.5

ounces per gallon. We applied the herbicide mixture using backpack sprayers calibrated to a rate of 32 gallons per acre and used a spot spray method to apply herbicide. The biological science technician and SCA intern applied herbicide under the Alaska pesticide applicator license of the KEFJ biologist. All herbicide use was approved and reported using the National Park Service (NPS) Pesticide Use Proposal System (PUPS).



Biological science technician adding chemical to create the herbicide mix (NPS/Morgan Valone).

We used laminated herbicide labels for each backpack sprayer that included the product name of the chemical (both common name and active ingredient), and risk associated with health, flammability, and reactivity. The risk numbers were found on products label and in safety datasheets (SDS).

Data Collection and Analysis

Data collection and processing methods followed guidelines provided in the Alaska IPMT Field and Office Protocols. We collected data using a Trimble 7X and Trimble XT6000 Global Positioning System (GPS) using TerraSync software. We post-processed data using Pathfinder Office software and submitted it to the Alaska Region IPMT throughout the summer. Finalized data was post-processed into a Geospatial Information System (GIS) geodatabase by the Alaska Regional GIS Specialist and Alaska Region IPMT Liaison. The AK Regional IPMT submitted the data to both the Alaska Exotic Plants Information Clearinghouse (AKEPIC) and the National Park Services' National Invasive Species Information Management System (NISMS) databases.

We also documented all herbicide use in an Excel spreadsheet and with Herbicide Data Sheets. Weekly field reports were completed to document invasive plant work and timing of control activities. All field notebook pages were scanned and stored on the KEFJ network drive.

The KEFJ IPMT utilized standardized polygons to collect herbicide treatment data on Herman Leirer Road, in the Exit Glacier Parking Lot, the Outwash Plain, and at the Maintenance Facility. This data

collection method utilizes a standard boundary for a given treatment area that remains constant from year to year. The use of standardized polygons allows for the collection of a single GPS point with herbicide use information for each standardized polygon, instead of having to remap the entire perimeter of a population every year. This method allows for efficient data collection in the field. The amount of herbicide used each season within the standardized polygons can be compared to the previous years' data to determine efficacy of treatments and to track herbicide use more accurately over time.

The KEFJ IPMT used handheld tally counters to calculate the amount of herbicide used when we applied small amounts of herbicide in standardized polygons or treated small populations. We used a standard herbicide amount per squirt applied to each plant to calculate the number of gallons sprayed. Each squirt is equivalent to 0.001 gallons of herbicide mix. This number multiplied by the tally count gave us our total gallons of herbicide used.

Personnel

The KEFJ IPMT had five members in 2022. The KEFJ biologist managed the invasive program in the park including completing planning and herbicide applications, compliance requirements, and supervising the biological science technician, SCA intern and two Youth Conservation Corps (YCC) employees. The biological science technician served as the field crew lead, planned field activities throughout the season, applied herbicide and hand pulled invasive plants, recorded, and processed data, kept track of herbicide use totals, and completed weekly field reports. The SCA intern assisted in herbicide application and hand pulling as well as data collection and processing. There were two YCC employees hired in 2022, after two years without these positions in 2020 and 2021 due to COVID-19 health and safety concerns.



2022 KEFJ IPMT crew (NPS/Joe Rodriguez)

Results

2022 Season Overview

The KEFJ IPMT completed a variety of projects this summer including manual and herbicide treatment of invasive plants, native seed collection, and monitoring for invasive defoliating moths (*Lymantria disparasiatica*). This was the first season since 2019 when the COVID-19 pandemic began that we had a full team which was composed of one biologist, one biological science technician, an SCA intern and two YCC employees.

A total of 18 invasive plant species were identified on all park properties in 2022. KEFJ IPMT used manual and chemical methods to treat a total of 9 invasive plant species within the park boundary and 8 species on other park properties (Table 3). We treated a total of 0.29 acres with 9.26 gallons of Milestone mix and 0.14 acres with 4.4 gallons of Roundup Custom mix. We also treated 0.11 acres using manual control efforts. Overall, we treated a total of 0.55 acres of invasive plants using chemical and manual treatment.

Table 2. Summary of Kenai Fjords National Park Invasive Plant Work in 2022.

Invasive Plant GPS Data			
Year	Species Acres Surveyed ¹	Species Acres Infested ²	Acres Treated ³
2022	73.8	0.63	0.60

The January 2018 NPS Land Status geodatabase was used to delineate NPS lands in acreage calculations.

¹Acres surveyed represent the total area mapped.

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

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

Our invasive plant management survey and treatment activities were focused on priority sites identified in the three main areas of the park: Exit Glacier Area, the Coast, and Seward. The Exit Glacier Area received the most survey and control efforts because of easy access to the area via road. Early June was focused on chemical treatment of common dandelion (*Taraxacum officinales*) along Herman Leirer Road and in the Exit Glacier Parking Area. High water levels in Exit Creek in June reduced the amount of time we could access and apply herbicide to common dandelions found in the Outwash Plain. We were only able to treat populations inside two of the Outwash Plain standardized polygons found on the south side of Exit Creek this summer because water levels remained high and made it difficult to cross the creek safely. We surveyed and treated invasive plant populations numerous times around the Nature Center Plaza, along trails, in the Campground, in the Employee Housing area and at other know populations throughout the summer. We retreated invasive plant populations two times at the Maintenance Facility. Seven days were spent treating known populations and surveying coastal areas in Nuka Bay, McCarty Fjord, Northwestern Fjord and Aialik Bay over three trips.

One new common dandelion population was confirmed on the Coast in 2022. This population was confirmed to be inside the park boundary at Yalik Glacier Beach in Nuka Bay this summer.

A new satellite population of common dandelion was found beyond the population that we were already treating at the head of North Arm in Nuka Bay this summer.

For the second year in a row, there were no common dandelions detected at the SNOTEL site or at the Nike Stripe in the Exit Glacier area.

The IPMT found a population of common peppergrass (*Lepidium densiflorum*) at the Maintenance Facility. This was the first time this species was detected in the park.

Table 3. Invasive plant species and locations 2022

Species		AKNHP Ranking	Location			
Latin Name	Common Name		Exit Glacier	Coast	Shea Lot	Maintenance
<i>Alopecurus pratensis</i>	meadow foxtail	52	X	—	—	—
<i>Anthemis cotula</i>	stinking chamomile	41	H	—	—	—
<i>Bromus inermis</i>	smooth brome	62	H	—	—	—
<i>Capsella bursa-pastoris</i>	shepherd's purse	40	H	—	X	H
<i>Capsella rubella</i>	pink shepherd's purse	Not Ranked	—	—	—	H
<i>Chenopodium album</i>	lamb's quarters	37	H	—	—	—
<i>Cerastium fontanum</i>	mouse-ear chickweed	36	X	—	X	X
<i>Crepis tectorum</i>	narrowleaf hawksbeard	56	H	—	—	H
<i>Elymus repens</i>	quackgrass	59	—	—	X	—
<i>Galeopsis spp.</i>	hemp nettle	50	—	—	X	—
<i>Hordeum jubatum</i>	foxtail barley	63	X	—	—	—
<i>Leontodon autumnalis</i>	fall dandelion	51	X	—	—	—
<i>Lepidium densiflorum</i>	common peppergrass	25	—	—	—	X
<i>Leucanthemum vulgare</i>	oxeye daisy	61	H	—	X	H
<i>Linaria vulgaris</i>	yellow toadflax	69	H	—	—	—
<i>Matricaria discoidea</i>	pineapple weed	32	X	H	X	X
<i>Papaver croceum</i>	Icelandic poppy	39	H	—	—	—
<i>Phleum pratense</i>	common timothy	54	H	H	H	—
<i>Plantago major</i>	common plantain	44	X	H	X	X
<i>Poa annua</i>	annual bluegrass	46	X	X	X	X
<i>Poa pratensis</i>	Kentucky bluegrass	52	H	—	—	—
<i>Polygonum aviculare</i>	prostrate knotweed	45	H	—	X	H
<i>Ranunculus acris</i>	tall buttercup	54	H	—	—	—

Table 3 (Continued). Invasive plant species and locations 2022

Species	AKNHP Ranking	Location				
Latin Name	Common Name		Exit Glacier	Coast	Shea Lot	Maintenance
<i>Rumex acetosella</i>	common sheep sorrel	51	H	—	X	—
<i>Rumex crispis</i>	curly dock	48	H	H	X	—
<i>Stellaria media</i>	common chickweed	42	H	—	X	X
<i>Taraxacum officinale</i>	common dandelion	58	X	X	X	X
<i>Trifolium hybridum</i>	alsike clover	57	H	—	—	—
<i>Trifolium pratense</i>	red clover	53	H	—	—	—
<i>Trifolium repens</i>	white clover	59	X	—	X	X

Key: X=Present, H=Historically Present

No new restoration projects were completed in 2022, but native seeds from grasses and herbaceous plant species were collected from the Exit Glacier Area for use in future restoration projects.

We deployed four invasive defoliating moth traps around the Exit Glacier area as part of state-wide monitoring effort with the Alaska Division of Agriculture.

The Seward Community Weed Pull was held on June 24 for the 17th year at the Seward Middle School. This event was held in partnership with the Kenai Peninsula Cooperative Invasive Species Management Area (KP-CISMA). We had 17 participants that hand pulled 106 pounds of the invasive plant bird vetch. Other outreach and education activities included park social media posts, formal talks during the park's Interpretive staff training, and maintenance of boot brushes to reduce the spread of invasive plants at trailheads in the Exit Glacier area and at the Seward boat harbor.

We also participated in various trainings including the 5-day Alaska Regional Invasive Plant Management Team training in Anchorage in May and a 1-day *Elodea* survey training in June hosted by the KP-CISMA in Kenai.

Notable Weather Conditions

The winter snowpack was above average when compared to the average snow depth over the past 14 years (Table 4). Even with a higher-than-average snowpack, snow melted quickly in low elevation areas and did not seem to slow plant phenology or the emergence of invasive plant in early June in the Exit Glacier Area valley floor. A combination of higher-than-average snowpack and warm temperatures in June may have kept water levels higher than we typically see in Exit Creek, which reduced the number of days that we could safely cross the creek to treat invasive plant populations located on the other side.

Table 4. 2022 Monthly snow depths at the Exit Glacier Area compared to the previous 14-year averages

Month	December	January	February	March	April	May
2021/2022 monthly snow depth (in)	18.1	#N/A	44.2	52.2	60.9	43.4
14-year monthly average snow depth (in) (2007-2021)	12.12	#N/A	33.35	44.76	46.24	22.58

Another notable weather condition was the high number of rainy days that occurred in late July and August, which limited our ability to complete some herbicide treatments later in the summer due to wet conditions.

Exit Glacier Area

Herman Leirer Road

Herman Leirer Road has eight standardized polygons located along the north and south sides of the road (Appendix A), which are routinely surveyed and treated each year. Initially we spent four days treating common dandelion with herbicide on June 1, 2, 6, and 8. We removed all flower heads before applying herbicide to keep herbicide stressed plants from going to seed. We applied a total of 1.27 gallons of Milestone herbicide mix using the eight standardized polygons to document herbicide use along the roadside. We only completed one herbicide treated for common dandelions along the road this year.



KEFJ biological science technician and SCA intern use herbicide treatment on common dandelions along Herman Leirer Road (NPS/Christina Kriedeman).

About once every two weeks, in June and July, we resurveyed the road and hand pulled any common dandelion flowers we found and looked for other invasive plants. We found one fall dandelion (*Leontodon autumnalis*) and hand pulled it. In 2021, we found mouse-ear chickweed (*Cerastium fontanum* spp. *vulgare*) and white clover (*Trifolium repens*) along the roadside, however, none was found this year.

On July 19 and 26, we surveyed the roadside for invasive grasses. We treated meadow foxtail (*Alopecurus pratensis*) populations using a total of 0.027 gallons of AquaMaster herbicide mix. We did not use the roadside standardized polygons to document the herbicide use on these populations because they were small and scattered. We mapped each of these small populations individually, so we can easily relocate them in future years to determine if retreatment is necessary. We manually treated two foxtail barley (*Hordeum jubatum*) plants. We did not find any *Bromus inermis* along the roadside for the first time since it was detected in 2014 (Kainrath, 2014).



Figure 2. The invasive grasses meadow foxtail (blue) and foxtail barely (pink) treated along Herman Leirer Road.

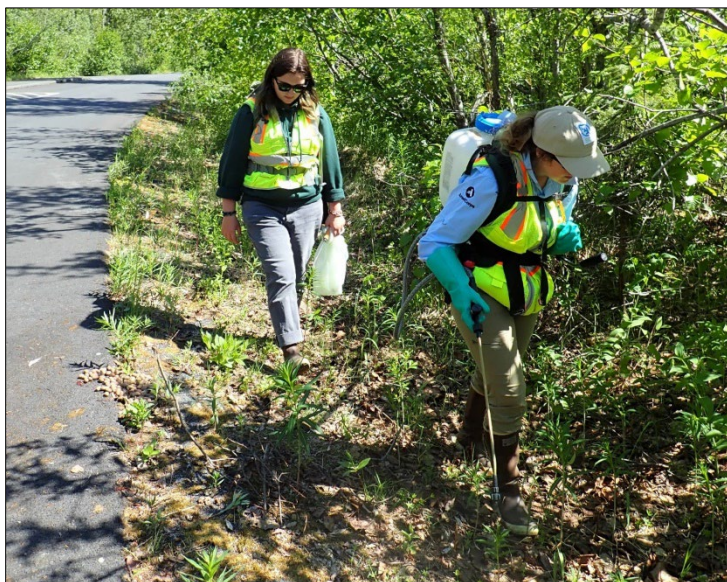
Exit Glacier Parking Area

The Exit Glacier parking lot has nine standardized polygons (Appendix B), which are divided by the different vegetative islands throughout the parking lot and along the edges of the entrance road. We surveyed and treated invasive plants found in the Exit Glacier parking lot standardized polygons on June 8 and again on August 2. We used a combination of herbicide and manual treatment. Invasive plants found in standardized polygons EG_3, EG_4 and EG_6, which are located near pedestrian walkways, were treated manually to avoid conflicts with visitor use in the area. We used a total of 0.209 gallons of Milestone herbicide mix to treat common dandelions in the rest of the standardized polygons in the parking lot.

We found one fall dandelion plant on the north side of the parking lot entrance road (Figure 3). It was mapped individually, hand pulled and removed.



Figure 3. Fall dandelion found on the north side the Exit Glacier parking lot entrance road



Herbicide application in the Exit Glacier parking lot (NPS/Christina Kriedeman).

Campground

We surveyed the Exit Glacier campground twice during the summer on June 14 and July 12. We hand pulled five common dandelions near the restrooms in the parking lot. We also found a small population of annual bluegrass in one of the campsites and one white clover (*Trifolium repens*) plant at a second campsite that we hand pulled (Figure 4).



Figure 4. Common dandelion (yellow), annual bluegrass (green) and white clover (red) found in the Exit Glacier campground.

SNOTEL Site

We surveyed the Snow Telemetry Automated Weather and Climate Data Collection Station (SNOTEL) site that is located west of the Employee Housing area once on July 12 and found no common dandelions for the second year in a row (Gage and Kriedeman, 2021).

Employee Housing

On August 2 and 9, we surveyed the parking lot, the Trail Builder's Camp, and the area around the four cabins for common dandelions and annual bluegrass (Figure 5). We found annual bluegrass near Alder Cabin and in the parking lot. There was also Common plantain found scattered in the parking lot. We manually treated all populations. We did not detect common dandelions in the housing area,

but we did treat a known population found along Exit Creek between the housing area and the Glacier View Loop Trail and treated 15 plants with 2 ounces of Milestone herbicide solution.



Figure 5. Location of annual bluegrass (green), common plantain (purple) and common dandelion (yellow) in and around the Employee Housing area.

Nature Center Plaza

The Nature Center Plaza is divided into four different areas: Nature Center, pump house, picnic area behind the Nature Center and the Pavilion (Figure 6). We surveyed and manually treated common dandelion, common plantain, and mouse-ear chickweed around the Nature Center Plaza on June 8. We treated annual bluegrass at the pump house and picnic area behind that Nature Center on July 26 using 0.3451 gallons of AquaMaster herbicide mix. We retreated annual bluegrass at the pump house again on September 7 using 0.500 gallons of AquaMaster herbicide mix. We manually treated a dense patch of annual bluegrass in front of the Pavilion on July 26.

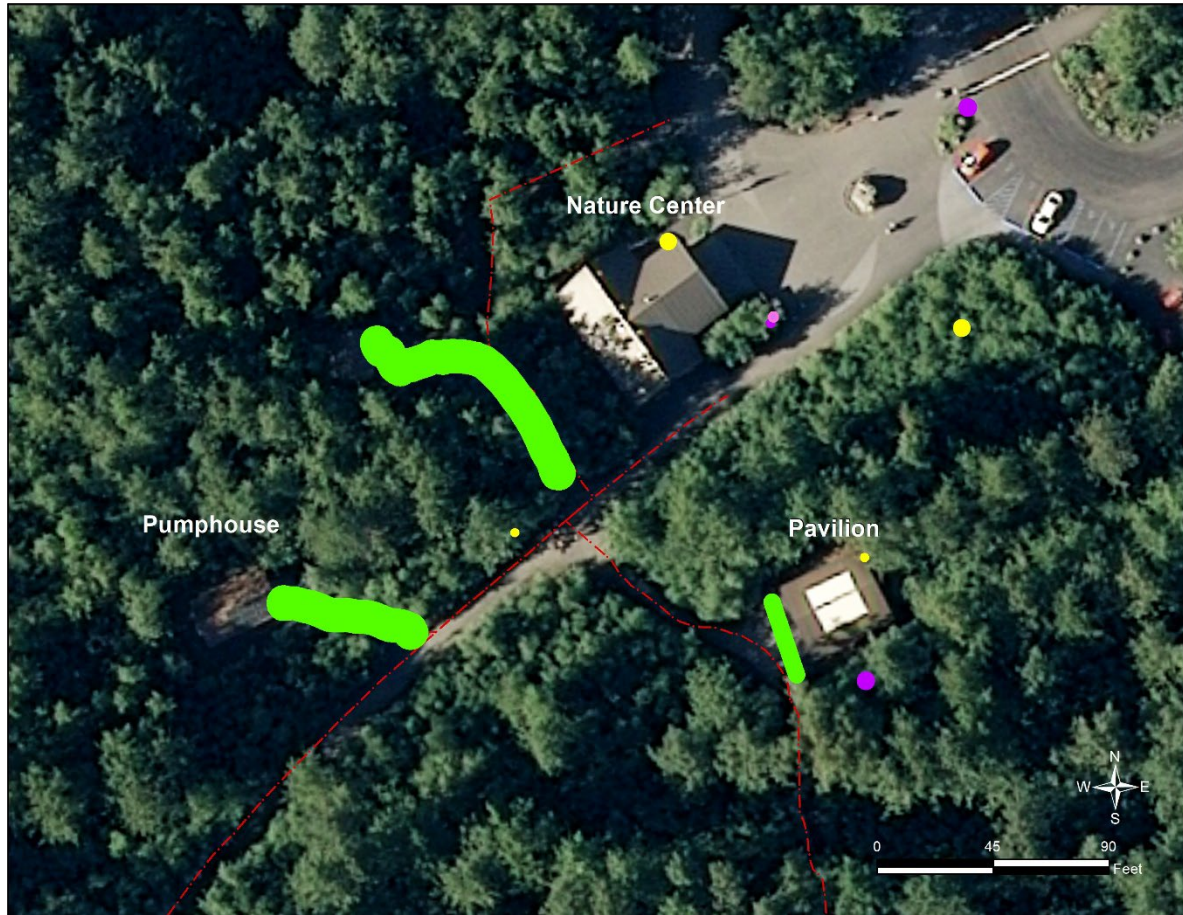


Figure 6. Annual bluegrass (green), common dandelion (yellow), common plantain (purple) and mouse-ear chickweed (pink) treated around the Nature Center Plaza.

Glacier View Loop Trail

We surveyed the Glacier View Loop Trail eight times throughout the summer (Figure 7). We manually treated and mapped common dandelions and common plantain scattered along the trail.



Figure 7. Invasive plants treated along the Glacier View Loop Trail included common dandelion (yellow) and common plantain (orange).

We found a small population of common dandelions when we surveyed the open area in the center of the Glacier View Loop Trail on July 29. We used a total of 0.012 gallons of Milestone herbicide mix to treat 11 plants.

In 2020, we found three common dandelion populations on the north side of the Pump House. This year we only found one population of common dandelion (Figure 8) and we treated six plants using 0.006 gallons of Milestone herbicide mix.

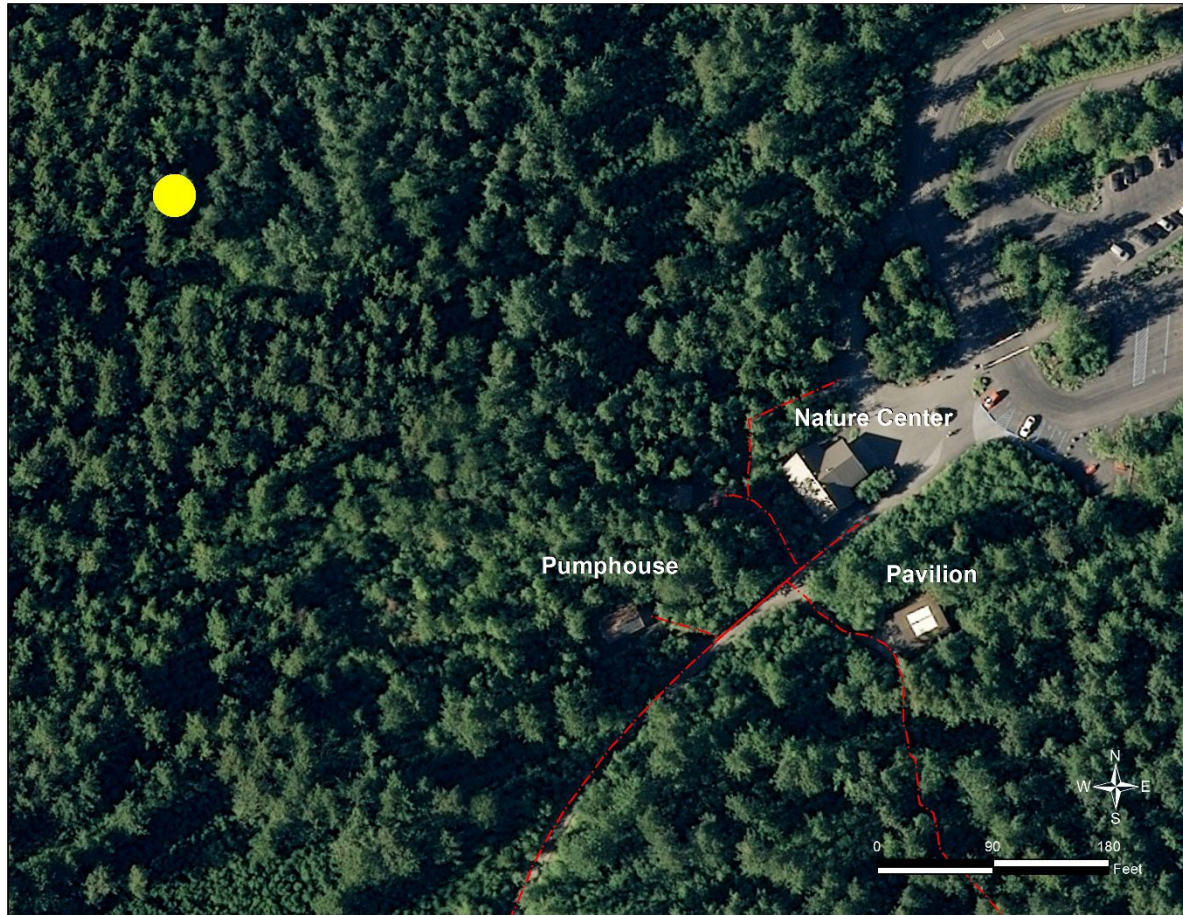


Figure 8. Common dandelion (yellow) population northwest of the Pumphouse and Glacier View Loop Trail.

Glacier Overlook Loop Trail

We surveyed the Glacier Overlook Loop Trail four times throughout the summer (Figure 9). On August 4, we mapped and manually removed two common dandelions and several common plantain populations along the trail.

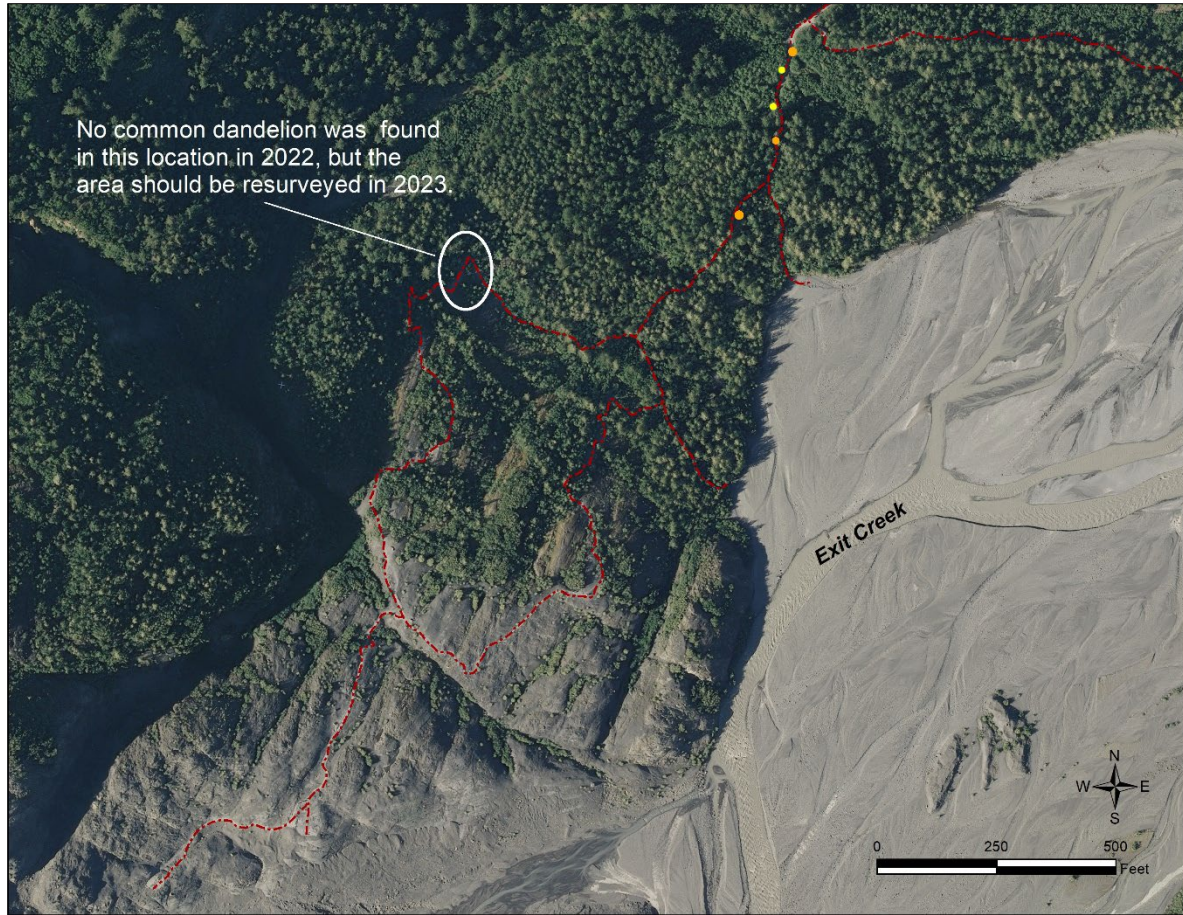


Figure 9. Common dandelion (yellow) and common plantain (orange) hand pulled on the Glacier Overlook Loop Trail.

Harding Icefield Trail

The IPMT treated common dandelion populations on the Harding Icefield Trail on June 14 and again on July 28 (Figure 10). There are three known populations, however we only found common dandelions at two of the sites. The two populations are located at a site on the southside of the trail between the bridge and Marmot Meadows at mile 1.1 and at the beginning of Marmot Meadows at mile 1.4. We used a total of .129 gallons of Milestone herbicide mix. No invasive plants were found at an abandoned section of trail at mile 0.25 this year, but this area should continue to be resurvey over the next few years to confirm that treatments have been successful.

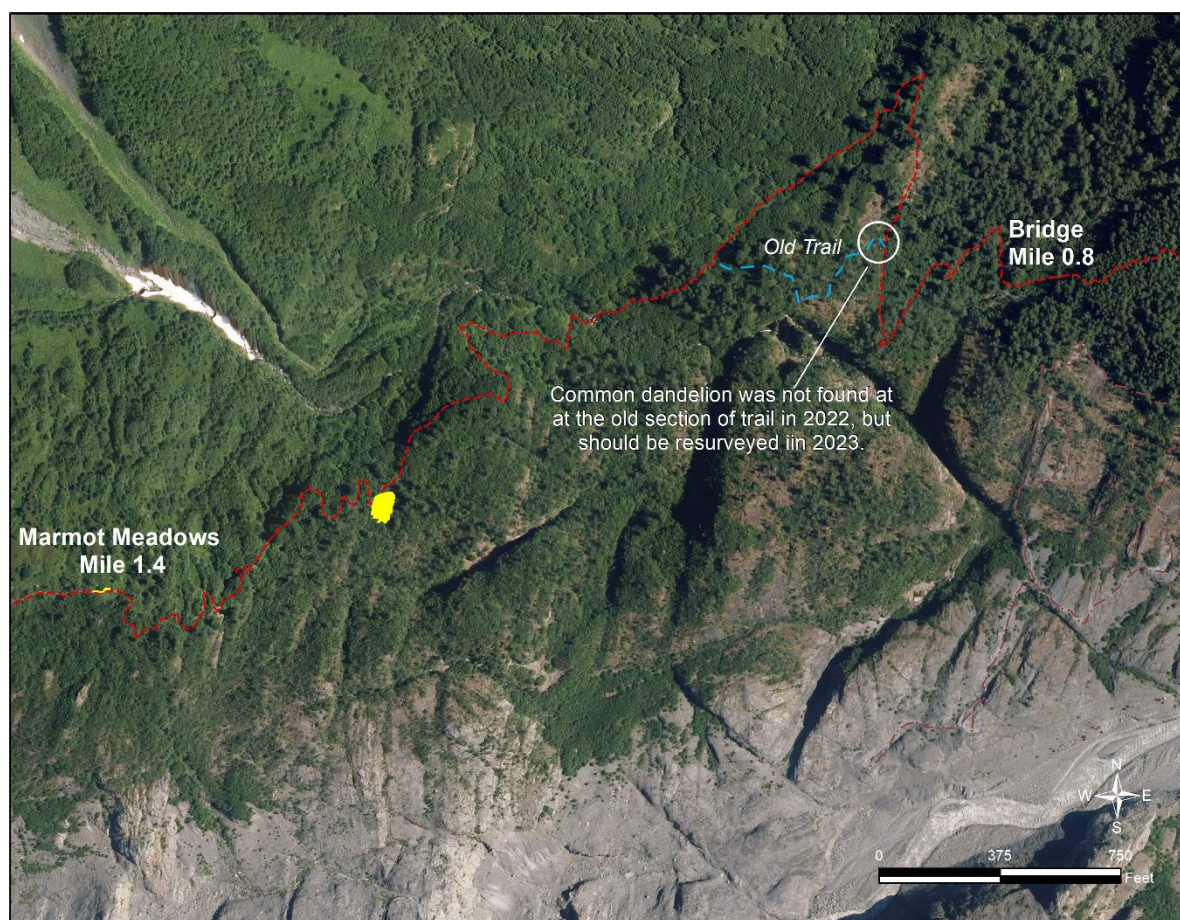


Figure 10. Common dandelion (yellow) populations treated along the Harding Icefield Trail.

Nike Stripe

We surveyed the area locally known as the Nike Stripe once during the summer on July 27. For the second year in a row no common dandelions were found (Gage and Kriedeman, 2021). This previously dense population was hand pulled for seven years from 2004-2010 and then treated with herbicide for eight years from 2011-2018.



Biological science technician using a map on a tablet to locate where previous years common dandelion populations were located at the Nike Stripe (NPS/Morgan Valone).

Outwash Plain

The Outwash Plain common dandelion populations are primarily divided into ten standardized polygons (Appendix C). There are also additional scattered populations that are mapped individually (Figure 11). The Outwash Plain can be a challenge to get to because we must cross Exit Creek to access the population. Water levels can fluctuate and at times can be unsafe to cross. Because of high water conditions in Exit Creek in June, we could not cross the creek where we typically do behind the Trail Builders Camp. Instead, we crossed the creek closer to the terminus of Exit Glacier where the creek was more braided, and the water levels were lower and safer to cross. Although we could cross the creek at this location, it was time consuming finding a safe place to cross the silty braids of the creek. The objective this summer was to treat common dandelions located in standardized polygons that were retreated the least number of times over previous years. We treated standardized polygon Outwash_10 on June 16 and 21 using a total of 1.698 gallons of Milestone herbicide mix. On June 21-22, and 29, we used 2.8 gallons of herbicide to treat Outwash_9. We were only able to treat about 85% of the Outwash_9 because high creek levels prevented us from crossing in late June. In total, we sprayed 4.5 gallons of Milestone herbicide mix in the Outwash Plain.



Biological science technician explaining the plan for herbicide treatment to the two YCC employees and the SCA intern (NPS/Christina Kriedeman).

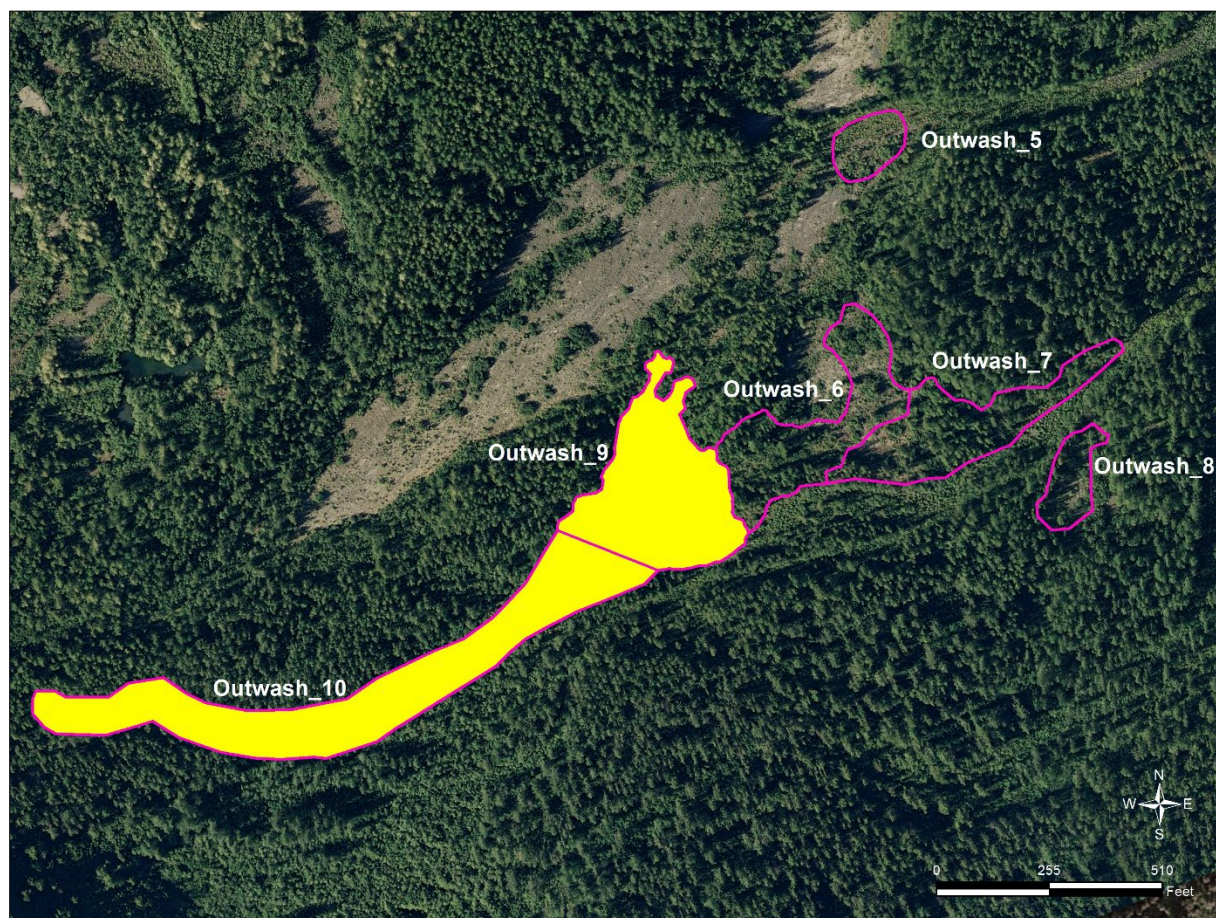


Figure 11. Outwash Plain standardized polygons where common dandelion where treated (yellow).

We surveyed and treated common dandelion populations found on the south side of the park road near the Resurrection River Bridge on June 23 and August 2 (Figure 12). In total, we sprayed 0.089 gallons of Milestone herbicide mix. During our second treatment, we surveyed beyond the known populations in the area and found two new populations.

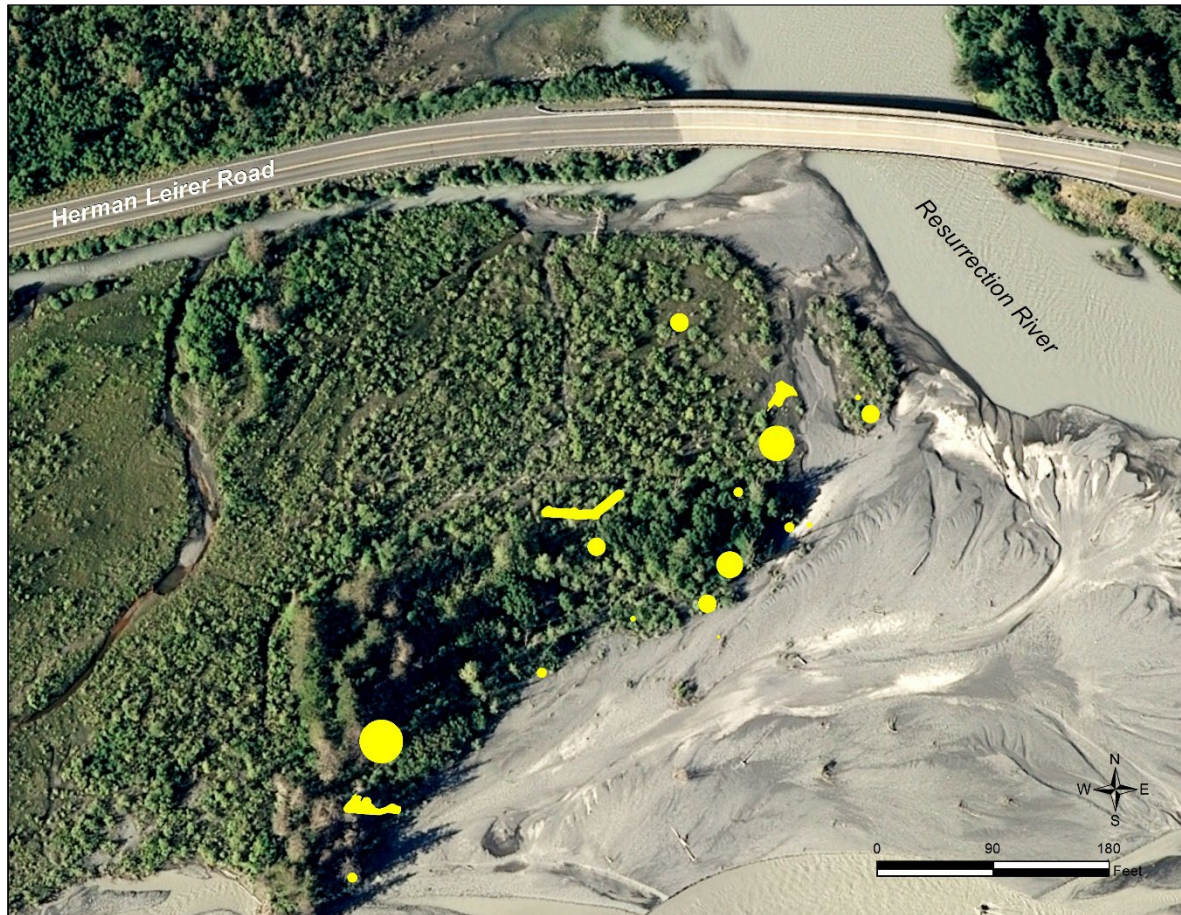


Figure 12. Common dandelion (yellow) populations south of the park road.

Coastal Areas

The IPMT completed three trips to survey and treat invasive plants in coastal areas of the park this summer on July 5-7, July 13-14, and August 23-24.

Resurrection Bay

The IPMT surveyed the beach at Bulldog Cove in Resurrection Bay on August 24 for invasive plants and none were detected.

Aialik Bay

On July 7, we surveyed the campsite at Verdant Cove and found no invasive plants. This was the only stop we made in Aialik Bay during our trip on the M/V Serac because of time constraints and because we already had plans to return to Aialik Bay on the M/V Couloir during the next week.

During our first trip to Aialik Bay on July 13-14, we hand pulled annual bluegrass found around the cabin and along the trail to the outhouse at the Holgate Public Use Cabin (PUC). At the Aialik PUC, we hand pulled annual blue grass found along the sides of the trail that lead to the cabin as well as in disturbed areas around the cabin (Figure 13).

At Abra Cove, we manually removed 20 stems of annual bluegrass found along the trails between campsites and the bear food storage locker.

We surveyed the camping easement at Pederson Lagoon and did not find any invasive plants. In 2021, a small population of annual bluegrass was detected on the east side of the camping area near the lagoon, but it was not rediscovered during the survey this year.

With permission from the Kenai Fjords Glacier Lodge, we surveyed the outer beach at Pederson Lagoon where the lodge stores kayaks and along the road that leads to the lodge. It is important to note that this area is not park property, however we have surveyed the area and manually treated pineapple weed (*Matricaria discoidea*) and annual bluegrass as a curtesy since 2011. This is an effort to help prevent the spread of invasive plants onto park lands near the upper lagoon where the lodge often guides clients. We hand pulled 11 stems of annual bluegrass at the top of the beach in front of the area where kayaks are stored. We did not find any annual bluegrass along the road leading to the lodge this year.



Biological science technician and biologist surveying the outer beach at Pederson Lagoon for annual bluegrass on Kenai Fjords Glacier Lodge property (NPS/Morgan Valone).

We also surveyed the campsites at Quicksand Cove and Bear Cove, and we did not find any invasive plants at these locations.

During our second trip to Aialik Bay on August 23-24, we retreated annual bluegrass at the two PUCs and Abra Cove. Overall, it appeared that the annual bluegrass population was smaller in size between the first and second treatments at the Public Use Cabins.



Manual removal of annual bluegrass using a digging tool (NPS/Claire Visconti).

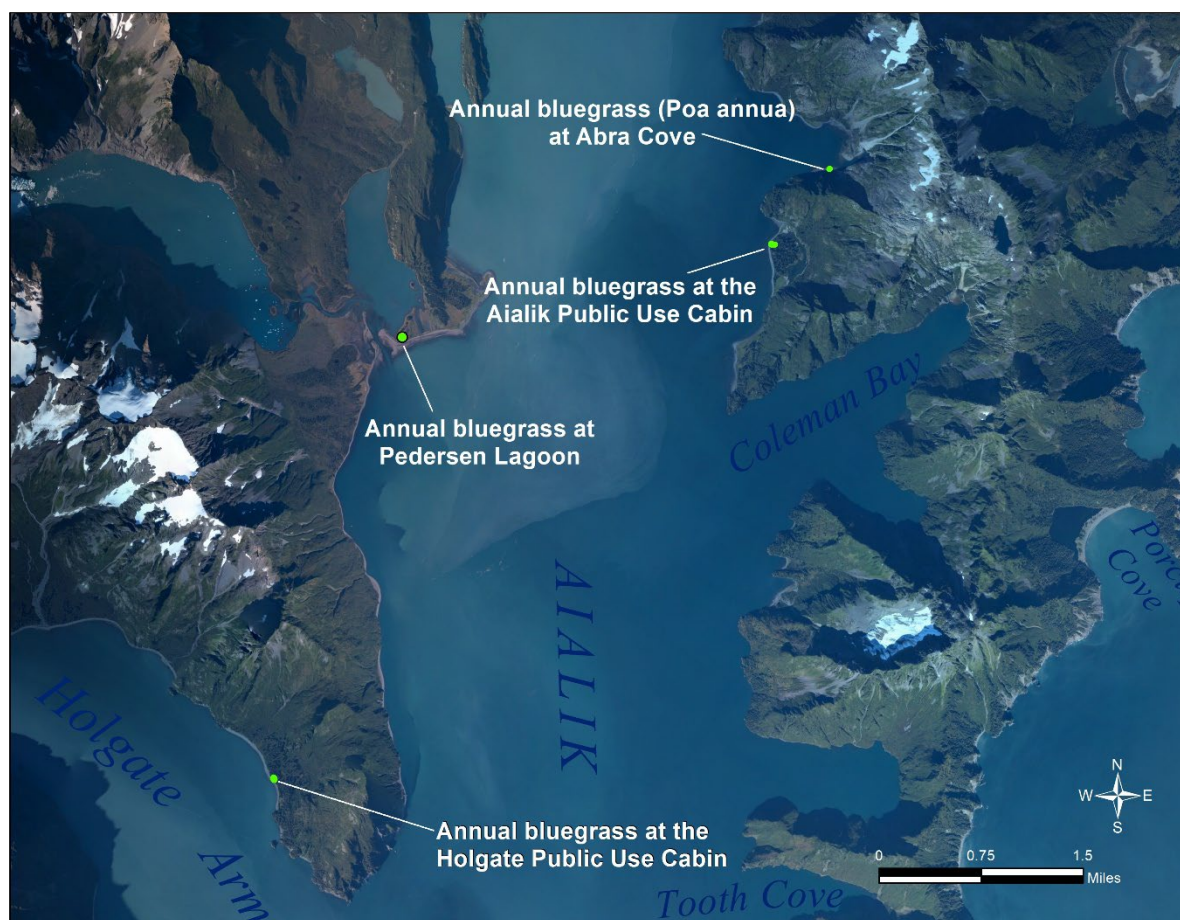


Figure 13. Locations of annual bluegrass populations in Aialik Bay and Holgate Arm.

Northwestern Fjord

On July 7, we surveyed the camping spit north of the moraine in Northwestern Fjord for annual bluegrass (Figure 14). We manually treated 302 plants in an area of about 0.26 square feet. We saw a decrease in the density of this population from previous years when the data was compared.



Figure 14. Annual bluegrass (green) populations at the camping spit in Northwestern Fjord.

We surveyed for invasive plants at the campsites at Sunlight Beach and Northeastern Beach on July 13, and we did not find any invasive plants on either of these beaches.

McCarty Fjord

On July 6, we surveyed for invasive plants at James Lagoon outer beach. No invasive plants were found. Since the trip was cut short by two days due to inclement weather, we were unable to apply herbicide to the common dandelion populations on the south side of Dinglestad Glacier.

Nuka Bay

On July 5, we treated a known population of common dandelions on the beach at the head of North Arm (Figure 15). During a survey of the larger area, we detected three new populations of common dandelion and treated them with herbicide. We applied a total of 0.516 gallons of Milestone herbicide mix.



Figure 15. Common dandelion (yellow) populations found on the beach at the head of North Arm in Nuka Bay.

We surveyed Yalik Glacier Beach on July 6 to look for a common dandelion population that had been discovered in previous years (Figure 16). It was unclear whether the population was within the park boundary or in Kachemak Bay State Park, which shares a border at this location. We rediscovered the population and found that it was inside the park boundary. We mapped 105 plants and pulled all flowers and seed heads from the plants we found. We plan to apply herbicide to this population in 2023.



Biological science technician and SCA intern mapping a new common dandelion population in a meadow at Yalik Glacier Beach (NPS/Christina Kriedeman).

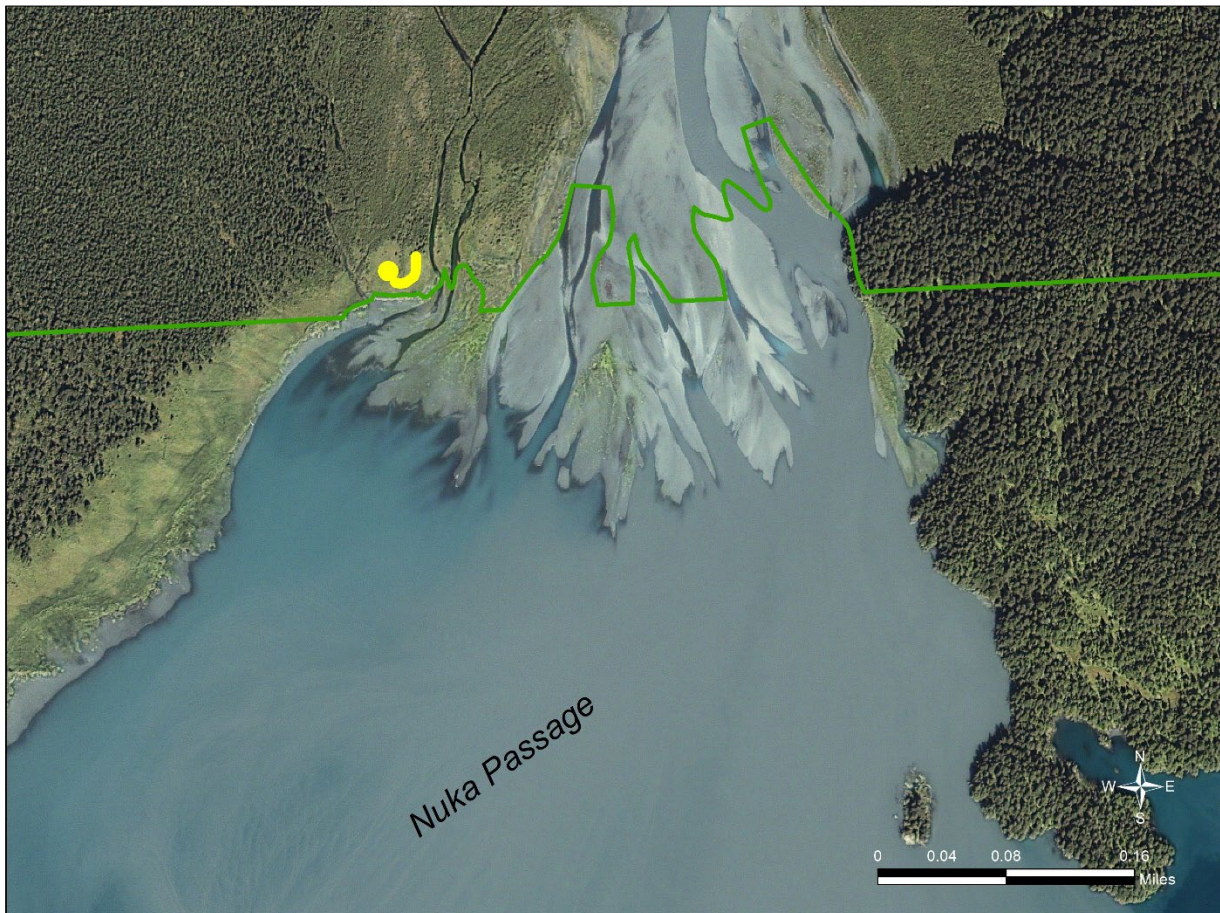


Figure 16. A new population of common dandelion (yellow) was found north off the park boundary (green) at Yalik Glacier Beach.

Seward

Visitor Center

We surveyed and manually treated the area around the Visitor Center on July 25. We hand pulled yellow toadflax (*Linaria vulgaris*), common dandelion, white clover (*Trifolium repens*), pineapple weed (*Matricaria discoidea*), chickweed (*Stellaria media*), common plantain (*Plantago major*), bird vetch and common sheep sorrel (*Rumex acetosella*). The building was recently renovated and as part of this project the grounds around the building were landscaped. Gravel was brought in as part of the project and may have been contaminated with invasive plant seeds which could be the source for some of the species identified. However, the surrounding properties are infested with a variety of invasive plant species and have been a seed source for invasive plant infestations around the building in the past.



Two YCC employees hand pulling invasive plants outside of the Visitor Center (NPS/Morgan Valone).

Shea Parking Lot

This year we did not survey or treat invasive plants at the Shea parking lot located in downtown Seward near the Park Headquarters building.

Maintenance Facility

We surveyed and treated invasive plants with herbicide in the Maintenance Facility three times during the summer. A standardized polygon (Appendix D) was used to track herbicide use for all invasive plants treated within the fenced area of the yard. Any invasive plants found outside of the standardized polygon boundary, but within park property, were mapped individually (Figure 17).



Biological science technician and SCA intern apply herbicide to invasive plants at the Maintenance Facility (NPS/Van Shank).

During each treatment, one person applied Milestone and another applied AquaMaster. We used Milestone to treat common dandelion, common chickweed, mouse-ear chickweed, and pineapple weed and used AquaMaster to treat annual bluegrass and common plantain.

Herbicide treatments in the Maintenance Facility using both Milestone and AquaMaster occurred on June 30, July 27, and August 30.

In June, we applied 0.228 gallons of Milestone mix. During our second treatment in July, we applied 0.176 gallons of Milestone mix. During our last treatment with Milestone in August, we applied 2.41 gallons of herbicide mix. We applied a total of 3.814 gallons of Milestone herbicide mix.

We sprayed 0.283 gallons of AquaMaster mix in June. In July, we applied 0.272 gallons of AquaMaster mix. In August, we applied 3.00 gallons of AquaMaster herbicide mix. We applied a total of 3.555 gallons of AquaMaster herbicide mix.

A small population of common peppergrass (*Lepidium densiflorum*) was found for the first time in the Maintenance Facility during our June 30 survey and was hand pulled. We did not find any common peppergrass again during July and August treatments.

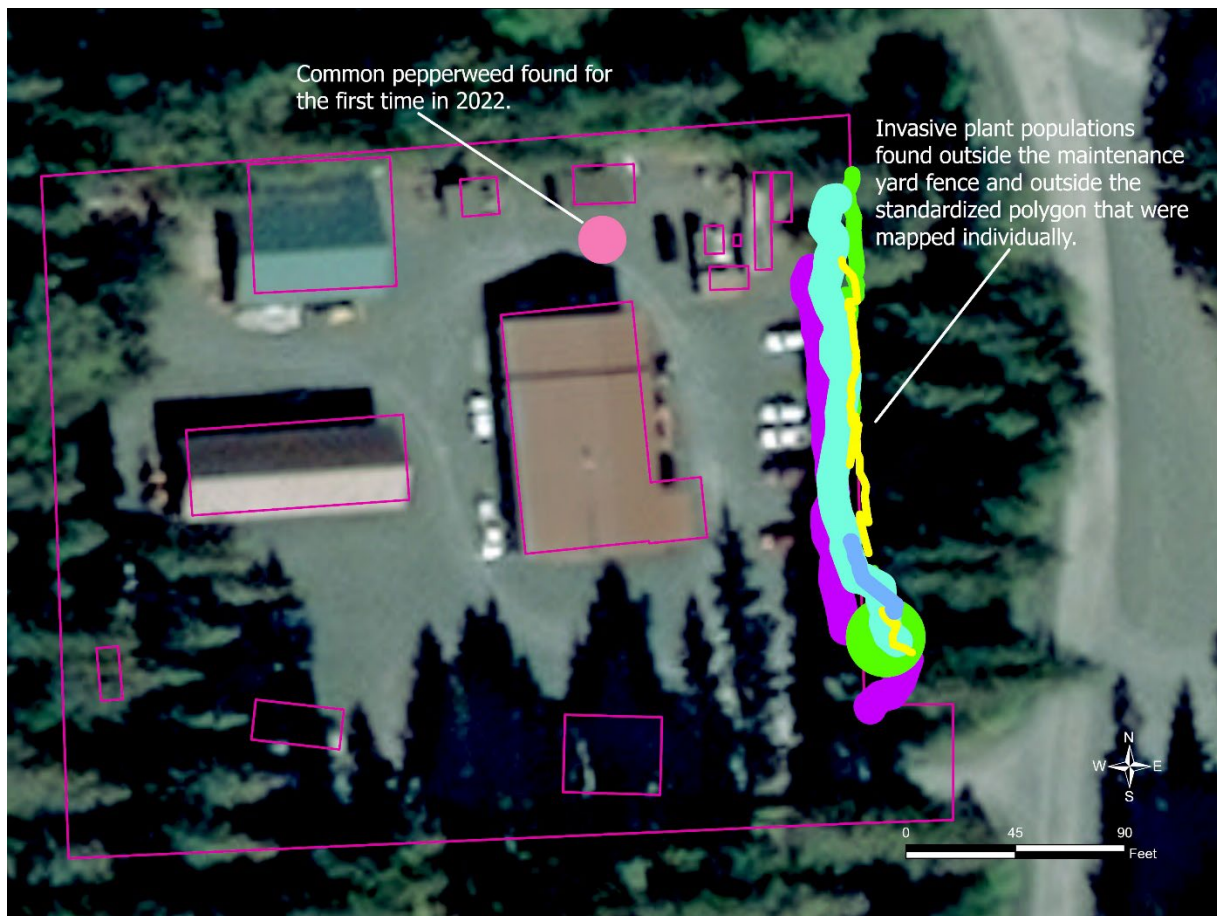


Figure 17. Populations of common dandelion (yellow), annual bluegrass (green), common plantain (purple), mouse-ear chickweed (aqua), and common chickweed (blue) mapped outside the Maintenance Facility standardized polygon boundary (dark pink). Common pepperweed (pink) found for the first time.

Prevention

We continued to maintain two boot brushes in the Exit Glacier Area. One boot brush is located at the orientation panel in front of the Nature Center and the second boot brush is at the Harding Icefield Trail register. Boot brushes are used to help minimize the spread of invasive plants onto trails as well as providing an opportunity to educate the public about invasive plants through interpretive information.

In 2021, the KEFJ IPMT worked with KP-CISMA partners to install two boot brushes at the Seward Harbor. This was part of a Peninsula-wide effort to install boot brushes along with interpretive signs to educate the public about how to reduce the spread of invasive plants into natural areas accessed from boat harbors. We checked the boot brushes and signs twice during the summer to insure they were clean and not damaged. One boot brush is located near the park's Visitor Center next to the south boat ramp and the other boot brush is located at the north boat ramp next to the area where many water taxis load and unload passengers and gear.



Biological science technician using the boot brush in front of the Exit Glacier Nature Center (NPS/Morgan Valone).

Using handheld boot brushes on a daily basis before heading out into the field continues to be a priority for the KEFJ IPMT. We carry hand-held boot brushes in our park vehicle, and everyone brushes their shoes before heading out to work in the park and when moving between invasive plant populations. This remains an important daily routine to reduce the chances that we become a vector for the spread of invasive plants. We also distributed small hand-held brushes to the park's resource management and interpretive teams.

Restoration

We collected native plant seeds in the Exit Glacier area to add to the park's seed bank for future restoration projects. We collected seeds from meadow barley (*Hordueum brachyantherum*) and lupine (*Lupinus nootkatensis*) along Herman Leirer Road on July 19 and 26, and August 9. Due to extensive periods of rain in August, we did not collect any additional seeds. We sent the seeds to the Alaska Department of Agriculture Plant Material Center in Palmer for cleaning. No restoration projects were completed this summer.



YCC employee and SCA intern collecting grass seedlings (NPS/Claire Visconti).

Outreach and Education

Outreach and education continue to be an important part of the invasive plant management program at the park. We shared information about the invasive plant program with park staff and the public through presentations to park staff, social media, and informal talks. We provided a presentation about the invasive plant program goals and accomplishments to interpretation staff during their spring training. We shared information with the public throughout the summer through three Facebooks posts.

The KEFJ IPMT shared accomplishments from the summer's field work with NPS Alaska Regional staff through a submission to the summer edition of High Latitude Highlights, an Alaska NPS region quarterly publication with natural and cultural resource project updates from parks around the state.

We hosted the 17th Seward Community Weed Pull at the Seward Middle School on June 26 from 1-4pm. This event was held in cooperation with our KP-CISMA partners, which included the Chugach National Forest, Kenai Watershed Forum, and Homer Soil and Water Conservation District. We had a total of 17 adult volunteers. The target species was bird vetch (*Vicia cracca*), and we pulled a total of 106 pounds.



NPS staff, partners, and volunteers at the Seward Community Weed Pull (NPS/McKenzie Shubnell).

Partnerships

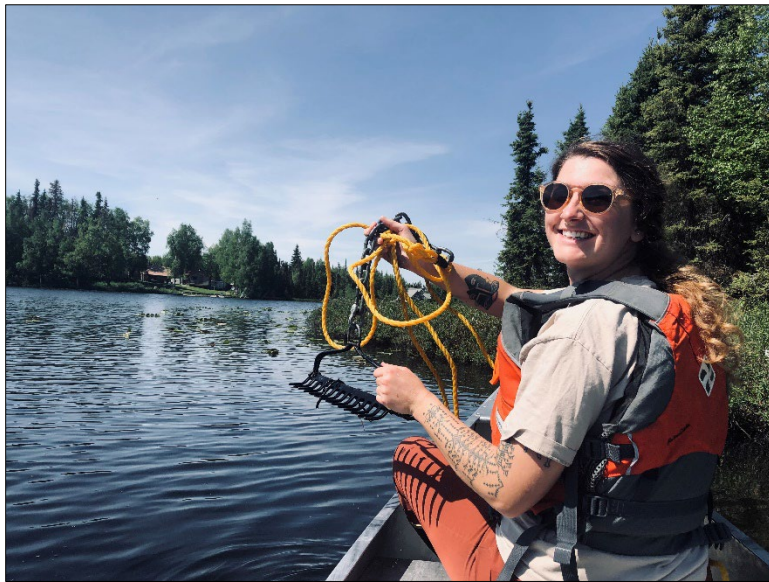
Partnerships are an important way to share information, learn from other's work and pool resources. We participated in a number of Kenai Peninsula Cooperative Invasive Species Management Area (KP-CISMA) partner projects during the summer. This organization includes a variety of federal agencies and non-governmental organizations that work together across boundaries to control invasive plants on the Kenai Peninsula and is an important collaborator across the peninsula.

We coordinated with Chugach National Forest staff to hand pull white sweetclover (*melilotus albus*) on Alaska Railroad property at the Seward cruise ship terminal to prevent it from going to seed. The railroad staff intends to apply herbicide to this population, but had not completed the treatment yet, so we hand pulled plants as a preventative measure in July.

We mapped and photographed invasive bird cherry trees (*Prunus padus*) in Seward's Two Lakes Park which had been identified by a local Seward resident. Bird cherry trees are an ornamental tree that have become one of the most harmful invasive plants across Alaska. Bird cherry seeds are easily spread by birds and animals into natural areas. They crowd out native plants, take over forests and riparian areas, and can be toxic to moose. They are difficult to remove and can resprout from branches and stumps left in contact with the soil when cut. If the entire plant cannot be removed, herbicide application is necessary to kill the plant (KP-CISMA 2022). The KP-CISMA was awarded funding to control bird cherry trees across the Kenai Peninsula and they are working with the City of Seward to treat trees on city property. Homer Soil and Water Conservation District employees used the data to locate the trees and treat them with herbicide.

KEFJ IPMT seasonal staff attended the KP-CISMA plant identification class and *Elodea* survey training in May at the Kenai National Wildlife Refuge headquarters in Soldotna, Alaska. They had an

opportunity to get on the water and practice the new skills they learned in the class. We also participated in KP-CISMA quarterly meetings with partners throughout the year.



SCA intern practicing rake-throw surveys for aquatic invasive plants during the KP-CISMA training.

We participate in the Alaska Invasive Species Partnership (AKISP) monthly calls and attended their four-day workshop in Anchorage on November 1-3. This is an organization that includes federal agencies and non-governmental organizations that work together to address invasive species issues at a state-wide level.

Defoliating Moth Monitoring

For the 12th year, we deployed four traps to monitor for invasive spongy moths around the developed areas of Exit Glacier from June through September. We placed traps near the entrance to the campground, in the employee housing parking lot, at the entrance to the parking lot, and near the Nature Center. We checked traps monthly to look for invasive moths and to check that the trap had not become damaged or waterlogged and was no longer effective. This project was part of a state-wide monitoring program managed through the Alaska Division of Agriculture. They supplied the moth traps and datasheets, and we submitted all datasheets to them at the end of the summer. We did not detect any spongy moths.



Defoliating moth trap deployed in the Exit Glacier parking lot (NPS).

Discussion and Recommendations

Annual Bluegrass

Annual bluegrass has a relatively low ranking of forty-six in the Invasiveness ranking system for non-native plants of Alaska (Carlson et al. 2008). It is found both in the Exit Glacier Developed Area along trails, parking lots and developed areas, and in coastal areas at campsites and at the two PUCs. We have not seen it spread into areas that have intact native vegetation, but it has spread farther up trails and into disturbed areas where we have not seen it before. We recommend continuing to prioritize treating annual bluegrass populations that are found in more remote locations in the park and in high use areas that provide a seed source that can easily be spread on visitor and employees' shoes. Populations in front of the pump house and behind the Exit Glacier Nature Center, Employee Housing Area parking lot, and the campground parking lot should continue to be treated with herbicide. Annual bluegrass at the Maintenance Facility should also be a priority for treatment since vehicles and people travel to and from the park from this location.

Coastal populations at the Abra Cove campsite and at a campsite in Northwestern Fjord should be treated each summer. These populations are still very small and have been reduced in size and density by hand pulling efforts. In the past we have hand pulled annual bluegrass populations at the coastal Public Use Cabins because herbicide use would require the cabins to be closed to visitor use. During the summers of 2020 and 2021, we took the opportunity to apply herbicide to these populations when the cabins were closed to the public for COVID-19 safety and for maintenance work. We hoped that two years of herbicide treatment with the herbicide Roundup Custom would reduce the population down to a level that would be manageable to hand pull, but when we surveyed the populations this summer, the size and density did not appear smaller than in previous years. We are working with the Alaska IPMT regional liaison to select a different type of herbicide that will be more effective at controlling annual bluegrass so we will apply less herbicide over time, and it will be effective. We are also planning to block out the PUCs from availability for public rental for a week in July to apply herbicide. We will only need a few hours to apply herbicide to the annual bluegrass populations, but we need dry weather, and a week will give us more opportunity to find a dry day.

Standardized Polygons

Standardized polygons are an efficient way to track herbicide use and determine the efficacy of herbicide treatments. We recommend the continued use of standardized polygons established for the Herman Leirer Road, Exit Glacier Parking Area, Outwash Plain, and at the Maintenance Facility when herbicide is being applied in these areas. Additionally, new standardized polygons should be created when it is beneficial. It may be useful to create more standardized polygons in the Outwash Plain as time is available. Outlier populations that are currently mapped individually each time they are treated should be considered for new standardized polygons to increase the efficiency of treatment efforts in this area. Previous years data should be analyzed, and sites prioritized for consideration based on size and density of invasive plant populations.

The Maintenance Facility standardized polygon does not reflect the entire invasive plant populations found in the area. There is a large area outside the fence near the entrance to the yard infested with invasive plants that is a good candidate to establish as a standardized polygon.

There is a standardized polygon for the Harding Icefield Trail, but currently it does not make sense to use it since it is comprised of the entire trail. Currently there are only small discrete populations of common dandelion along the trail, and it is useful to map them individually so the KEFJ IPMT can navigate back to their exact locations to retreat them.

As a reminder, standardized polygons should not be used for manual treatment efforts even if populations are inside an existing standardized polygon. Any invasive plant population that is manually treated must be mapped individually. Also, any new invasive plant species or any invasive plants that we want to be able to relocate over time should be mapped individually.

Retreatment

Retreating invasive plant populations with herbicide within the same season is a useful tool to improve the success rate of applications. We recommend prioritizing herbicide retreatment at the Harding Icefield Trail, Herman Leirer Road, Exit Glacier Parking Lot, Maintenance Facility, and the Public Use Cabins on the coast. Other populations should be retreated as time allows.

All areas that are easily accessed should be re-surveyed throughout the summer to look for invasive plants that were missed during initial surveys and to identify invasive plants species that sprout and mature later in the season.

The Nike Stripe and SNOTEL Successes

For the second year in a row no common dandelions were detected at the Nike Stripe or the SNOTEL sites. We recommended continuing to monitor these sites for the next few years to make sure that the seed bank has been completely depleted, so that we can avoid the potential for re-establishment of common dandelions.

Roadside Brushing

Communication with maintenance staff needs to occur in early July to avoid conflicts between roadside brushing, and invasive grass control efforts and seed collection. Coordinating early is essential to ensure that there is time to identify and flag both native plants that we will collect seed from and invasive grasses that will be treated with herbicide later in the summer. Maintenance staff can still complete brushing operations and avoid cutting down plants that we identify with flagging.

Coastal Priorities

Although most of our time is spent working in the Exit Glacier Area, the coastal area of the park is a high priority for invasive plant survey and control work. Most of the populations found on the coast are still small and manageable, but they are more difficult to access and are often only treated once a summer. Places with high visitor use are often the areas where invasive plants are found, but it is also important to survey areas with less visitation because invasive plant populations have showed up in some unexpected places in the park.

Returning to and treating all documented coastal invasive plant populations should continue to be a priority for the IPMT. A new population of common dandelion was mapped at Yalik Glacier beach and was not treated this summer because it was unclear whether or not the population was inside the park boundary. We did determine that the site was in the park, and it is a priority to treat this population with herbicide next summer. We found additional populations of common dandelion near an established site that we have been treating for several years at the head of North Arm in Nuka Bay. This was a surprise since we have been surveying these areas each summer. We plan to spend more time surveying this area to confirm that we found the total extent of this population. We also recommend making it a priority to retreat a common dandelion population found on the hillside south of Dinglestadt Glacier. We did not have time to treat this population this summer because our trip was cut short due to poor marine weather.

This summer non-historic buildings and mining equipment were removed from two abandoned mines in Nuka Bay. Both the Waterfield-Goyne mine in Surprise Bay and Kenny mine in Palisades Lagoon were part of this project. Although the contract required all heavy equipment to be cleaned by the contractor and inspected before it was transported into the park, there is still a chance that invasive seeds or plant parts could have been introduced to these sites on equipment. Surveying for invasive plants in areas disturbed by the cleanup should be a priority. Even if no invasive plant populations are detected next season, we recommend that the mine sites continue to be surveyed over the next few years to ensure that no invasive plant populations become established.

In 2023, contaminated soil will be removed by a contractor from the Glass and Heifner Mine in Beauty Bay. This site should also be a priority for regular surveys over the next few years after this project is completed.

Shea Parking Lot

Both gravel parking areas in the Shea Parking Lot in Seward are becoming covered with a mix of invasive plant species. Both park vehicles and employees are exposed to invasive plant seeds and plant parts, and they could easily be carried into the park on tires and shoes. The best way to prevent the growth of invasive plants would be to pave the parking lot surface, but this option would include long-term maintenance costs. Herbicide use has been considered, but it would require a yearly application to try to reduce invasive plant populations. There is an endless source of invasive plant seeds on the surrounding properties that would continue to reinfest the parking lot and the need to apply herbicide would never end. There is no easy solution to this problem, but it is worth the time to consider other possible solutions. Maintenance staff mowed the property again this summer and should continue to mow the area on a regular basis to keep invasive plants growing on the property from going to seed.

Planning

The KEFJ IPMT plans to write a five-year invasive plant management plan with the assistance of the Alaska region IPMT liaison. Past treatment methods will be compiled and compared over time to determine efficacy of treatment strategies and to help guide future work plans. This plan will include goals, priorities, and objectives for the coming years in a written document.

Prevention

Including prevention measures into all park activities and administrative actions should continue to be an important strategy to reduce the spread of invasive plants into the park. The cost of removing invasive plants can be time consuming and costly, and sometimes impossible. Trying to stop introductions before they occur is well worth the long-term effort.

Boot brushes with interpretive messaging are a great way to educate the public and help reduce the spread of invasive plants along trails in the park. The IPMT maintains boot brushes in the park in front of the Exit Glacier Nature Center and at the Harding Icefield Trail register. In 2021 we assisted KP-CISMA partners with installing boot brushes and interpretive signs at the north and south ramps at the Seward harbor. Since we are the only partners on this side of the Kenai Peninsula, the KEFJ IPMT checks the condition of these boot brushes twice during the summer to ensure that they are in working order and that they have not been damaged.

Because we were concerned that we might be spreading invasive plants to new areas on our shoes, the KEFJ IPMT began incorporating bushing our boots before we started work in the field each day in 2022. We think this is a simple, but important mitigation measure that should be continued from year to year. During spring training, we also encouraged Interpreters to including messaging about invasive plants in their walks and to add a stop at the park's boot brush before leading visitors on the trail. We also shared hand-held boot brushes with the entire resource management team as well as the backcountry rangers since these are the park employees that hike off trail as a part of their work duties.

Including mitigation measures for construction projects occurring in the park, we should continue to be a standard for contracts. Requiring weed free certification for straw products and gravel sources, and equipment cleaning and inspection before use in the park are a few examples of mitigation measures that can be included.

Partners

Partnerships continue to be an important component of outreach and community engagement and should remain a priority. Attending monthly conference calls with the state-wide Alaska Invasive Species Partnership (AKISP) provides opportunities to network and learn about invasive species issues across the state. As a member of the Kenai Peninsula Cooperative Invasive Species Management Area (KP-CISMA) we participated in quarterly meetings, assisted with updating strategic plans and priorities, partnered in hosting the Seward community weed pull, and participated in invasive plant control efforts on partner agency lands, Partnerships are a great opportunity to learn from other agencies and organizations and it gives us an opportunity to share resources, as well as participate in state-wide planning efforts.

Defoliating Moth Monitoring

We have been partnering with the Alaska Department of Natural Resources Division of Agriculture for twelve years to complete defoliating moth monitoring in the Exit Glacier Developed Area. This project should continue to be a priority since it takes little extra effort and contributes to a state-wide early detection monitoring program.

Safety

Safety is the highest priority for the KEFJ IPMT. We held daily safety tailgate sessions to discuss potential hazards and mitigation measures for the work we were conducting that day. Developing a work environment where everyone feels empowered to speak up when they feel unsafe or have questions should continue to be developed each year. KEFJ has a dynamic landscape and can be a dangerous place to work. Exit Glacier is melting and changing rapidly and with that change comes additional hazards associated with flooding and landslides. There is no way to mitigate these types of risks by our actions. In June of 2021, a new hazard occurred when there was an outburst flood caused by dammed water coming from the terminus of Exit Glacier. A wall of water traveled down Exit Creek carrying large pieces of ice and temporarily raising water levels. The KEFJ IPMT was working on the south side of Exit Creek when this occurred and did not see the flood, but we did see large pieces of ice deposited on the bank above the level that the creek was flowing. We cannot plan for this type of event, but it is important to keep these types of hazards in mind when planning future work near Exit Creek.

Personnel

This summer we had a full operating crew, which is the first summer in two years due to COVID-19 pandemic health and safety concerns. The team included a biologist, biological science technician, a SCA intern and two YCC employees. We recommend continuing to find funding to hire a biological science technician as a crew lead, an SCA intern, and two YCCs to round out the team as well as providing the resources needed for a successful invasive plant program. We need a minimum of five people to successfully treat the large population of common dandelion across Exit Creek in the area known as the Outwash Plain and complete other invasive plant survey and control projects.



The KEFJ IPMT jumping for joy after a successful summer of controlling invasive plants (NPS/Jeremy Anderson).

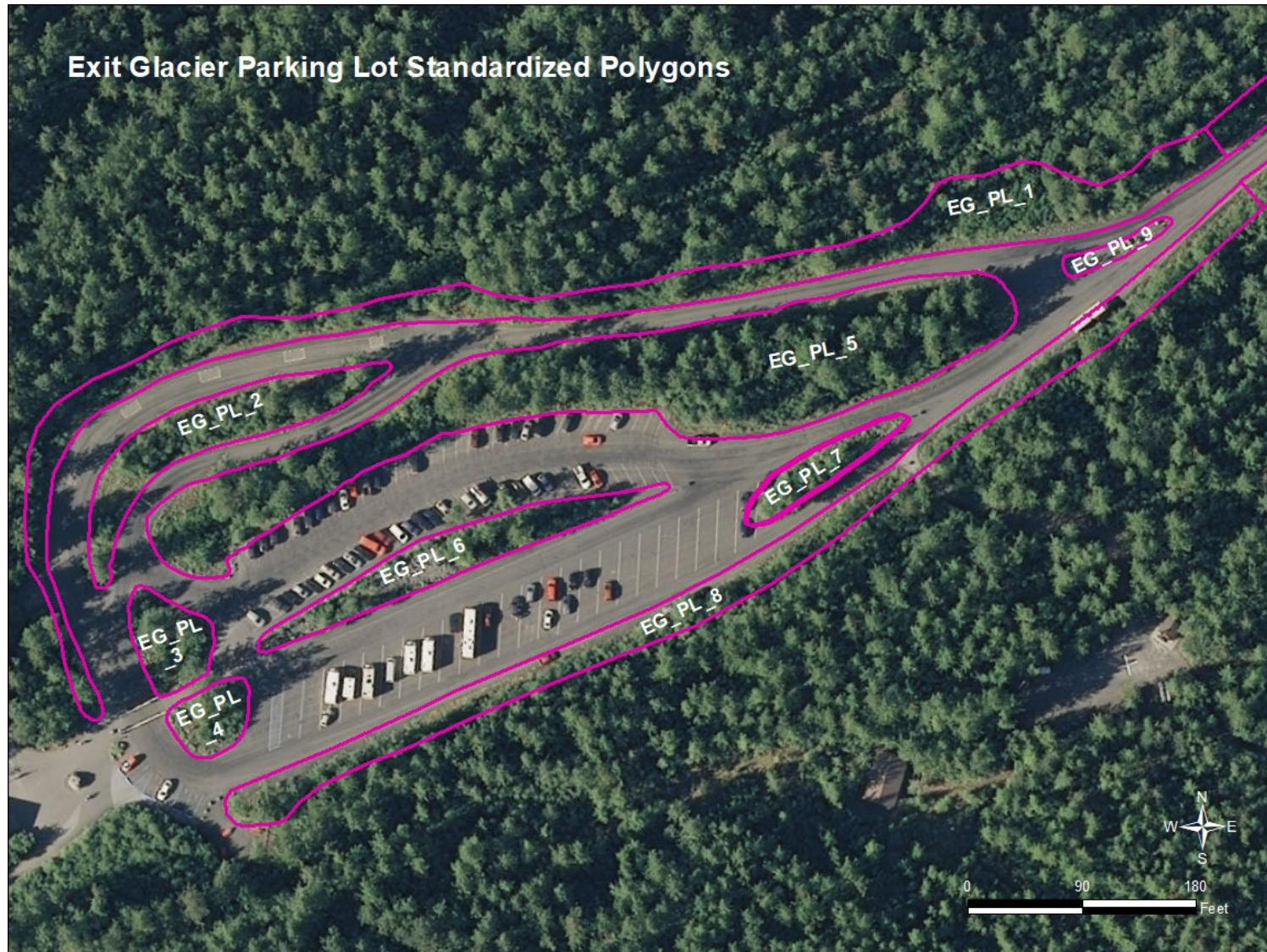
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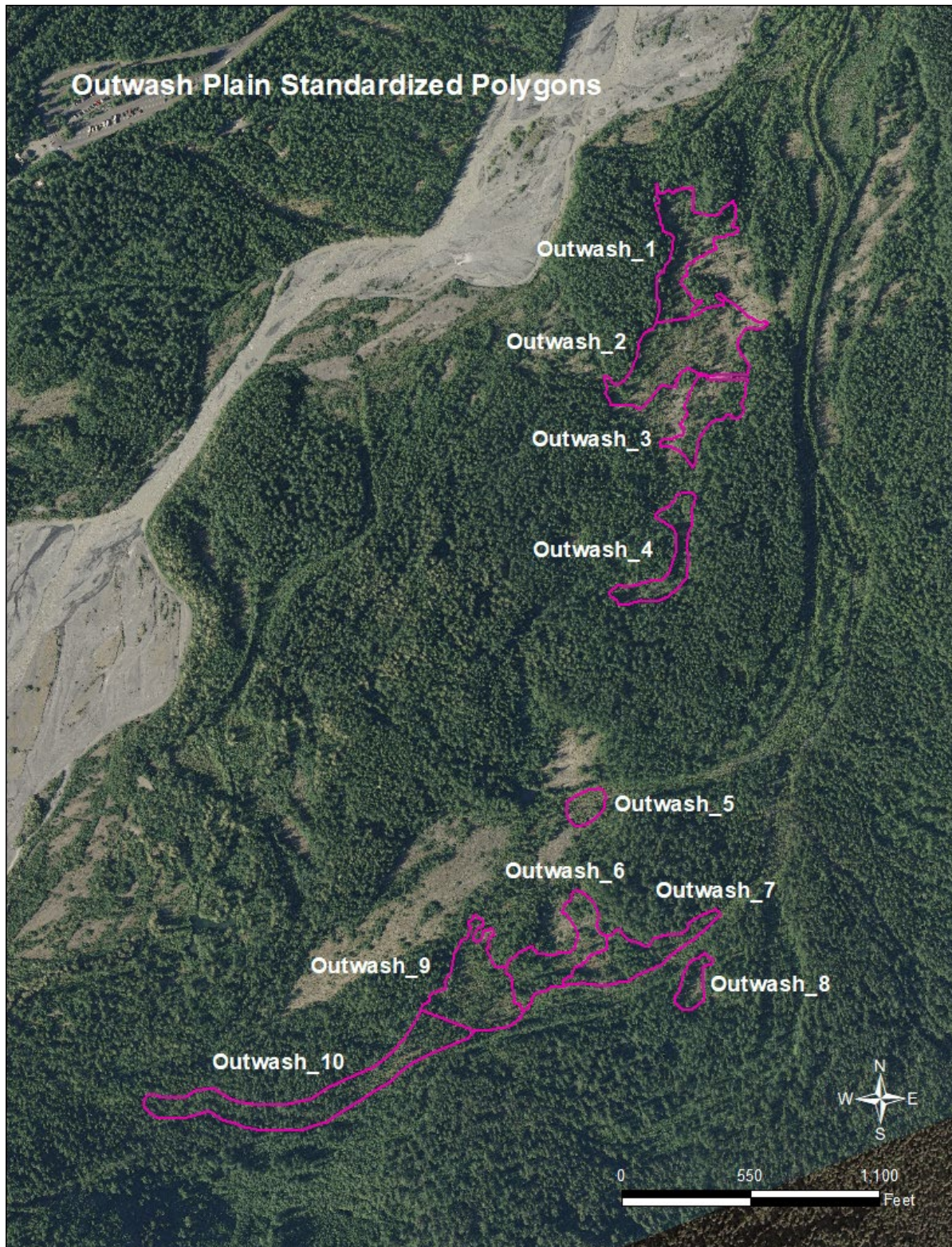
Appendix A: Herman Leirer Road Standardized Polygons



Appendix B: Exit Glacier Parking Lot Standardized Polygons



Appendix C: Outwash Plain Standardized Polygons



Appendix D: Maintenance Facility Standardized Polygon



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

NPS KEFJ, April 2023

National Park Service
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