



Invasive Plant Management in Kenai Fjords National Park

2019 Summary Report

Natural Resource Report NPS/KEFJ/NRR—2020/2208





ON THIS PAGE

KEFJ EPMT with glacial ice in Exit Creek.

Photograph by Christina Kriedeman/NPS

ON THE COVER

Clockwise from top left: Biological Science Technician collecting data at Pedersen Lagoon, *Elodea* rake throw survey in Addison Lake, native horned dandelion (*Taraxacum ceratophorum*), Biologist hand pulling annual bluegrass on the coast, KEFJ EPMT applying herbicide on the Outwash Plain

Photographs by Christina Kriedeman, Sierra Sampson, and Airk Furseth/NPS

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Abstract

This report is an overview of the Kenai Fjords National Park's (KEFJ) Exotic Plant Management Team's (EPMT) 2019 season. This season, all known invasive plant populations were surveyed and retreated. In total, 64.85 acres were surveyed, 1.61 acres were treated with herbicide, and 0.10 acres were treated manually. This season, 43.43 gallons of Milestone herbicide solution and 5.78 gallons of AquaMaster herbicide solution were used to chemically treat invasive plant populations in the Exit Glacier area, Maintenance Facility and coastal areas of the park. Seventeen invasive plant species were documented in the park and on park properties outside the park boundary. The KEFJ EPMT coordinated the Seward Community Weed Pull in partnership with Kenai Peninsula Cooperative Weed Management Area (KP-CWMA) members and a total of 573 pounds of invasive plants were hand pulled. Addison Lake was surveyed for the aquatic invasive plant Elodea (*Elodea spp.*) for the first time this August. Both rake throw surveys and environmental DNA (eDNA) surveys were conducted to sample for *Elodea*. No *Elodea* was found during rake throw surveys and eDNA water samples have been sent to a laboratory for analysis. A total of 1.58 pounds of native seed were collected from 7 species in the Exit Glacier area to add to the park's seed bank. The area around a newly constructed cabin in the Exit Glacier area was reseeded in August. Gypsy moth (*Lymantria dispar*) pheromone traps were deployed around the Exit Glacier Developed area as part of the Alaska Division of Agriculture state-wide monitoring program. No gypsy moths were detected in the five traps deployed. The KEFJ EPMT continued outreach and education efforts through presentations, informal talks, social media and interpretive information. The KEFJ EPMT was made up of a Biological Science Technician, a Student Conservation Association (SCA) Intern and 2 Youth Conservation Corps (YCC) employees.

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List of Terms

ABRS Aialik Bay Ranger Station

ANICLA Alaska National Interest Lands Conservation Act

AISP Alaska Invasive Species Partnership

eDNA Environmental DNA

EDRR Early Detection Rapid Response

EPMT Exotic Plant Management Team

GIS Geospatial Information System

GPS Global Positioning System

HIT Harding Icefield Trail

KEFJ Kenai Fjords National Park

KP-CWMA Kenai Peninsula Cooperative Weed Management Area

PUC Public Use Cabin

SCA Student Conservation Association

SNOTEL Snowpack Telemetry Station

YCC Youth Conservation Corps

Introduction

Kenai Fjords National Park is located on the eastern side of Kenai Peninsula in south-central Alaska. The park was established in 1980 by the Alaska National Interest Lands Conservation Act (ANILCA) and includes over 670,000 acres and is recognized for its rugged coastline, temperate rainforest, jagged mountain peaks, and the Harding Icefield with its outflowing glaciers (Figure 1).

The KEFJ Exotic Plant Management Team (EPMT) has monitored and treated invasive plants in the park since 2004. A strategy of early detection and rapid response is used to detect and control invasive plants in the park. 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. The Exit Glacier area is a high priority for the park since it includes the only road and established trails found in the park and has the highest number of visitors each summer. This area has the largest populations and the highest diversity of invasive plant species in the park. The Coast receives fewer visitors and has no developed areas or trails but remains a high priority for the KEFJ EPMT. 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 those areas. The Seward area includes the Maintenance Facility, Shea Parking Lot and Visitor Center. These sites are located near roads and properties that are infested with invasive plants and are staging areas for park vehicles. These park properties are a focus of control efforts to prevent park vehicles from becoming vectors for the spread of invasive plants into the park.

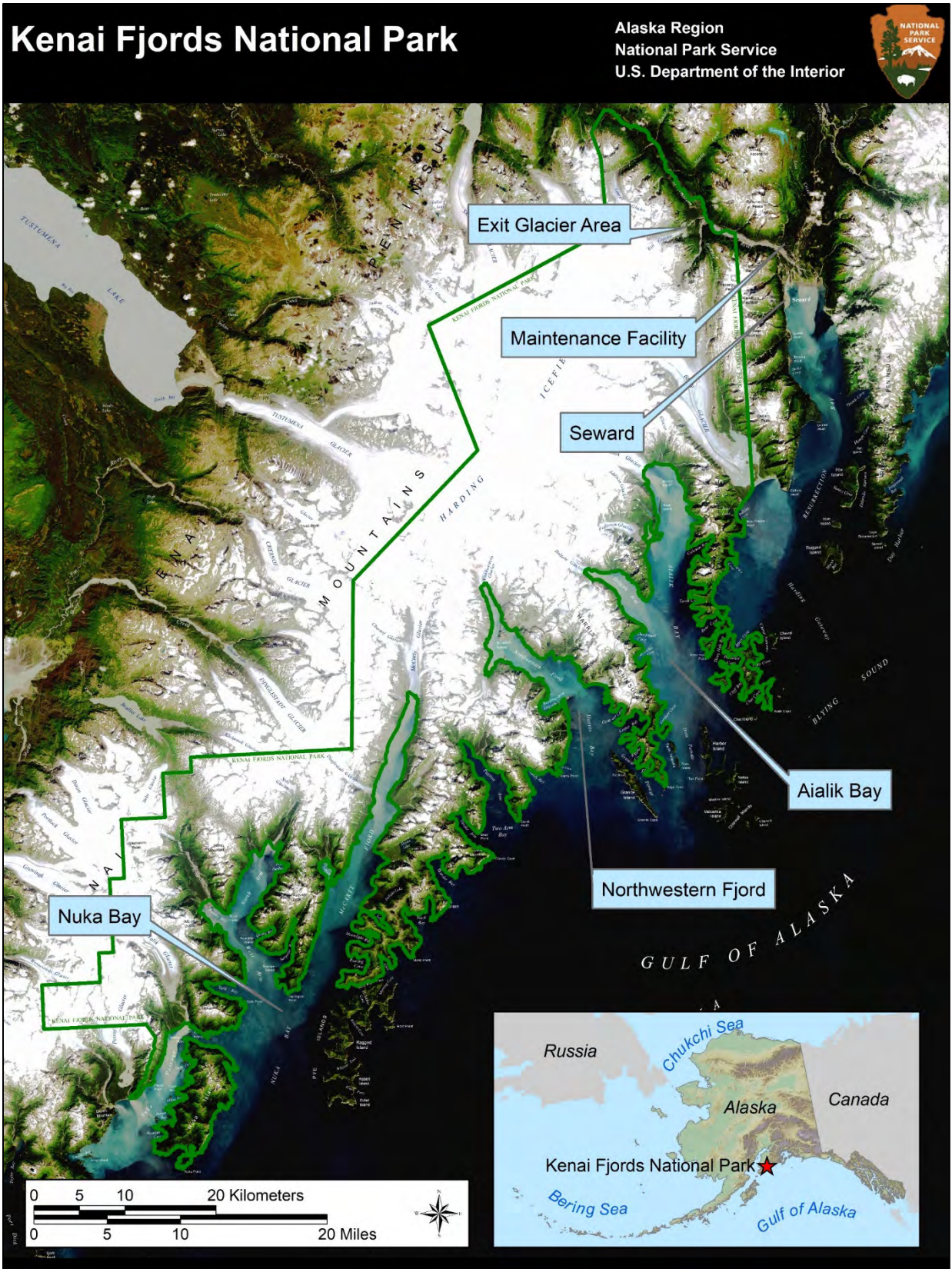


Figure 1. Overview of Kenai Fjords National Park.

Methods

Methods for data collection and processing followed the Alaska EPMT Field Protocol and the Alaska EPMT Office Protocol (Overbaugh and Frank 2019) developed by the Alaska Regional EPMT program. These protocols outline methods for data collection and processing, and control work. A schedule for survey and treatment was created for the season based on recommendations from the previous year's final report and on a timeline based on previous year's weekly field work summaries. Priority was given to revisiting all known invasive plant populations, and surveying for new populations in areas with high visitor use and proximity to known infestations. The park is divided into three primary management areas: Exit Glacier area, the coast, and Seward (Table 1).

Table 1. 2019 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, McCarty Fjord
Seward	Maintenance Facility, Visitor Center, Park Headquarters Building, Shea Parking Lot

Prioritizing Treatment

Because resources for managing invasive plants are limited, planning and prioritizing invasive plant treatment is guided by a variety of factors including population size, invasiveness ranking, geographic location, and ease of access. Invasiveness ranking is based on a 0 to 100 scale, with a plant ranked as 0 being no threat to native ecosystems and a plant ranked of 100 having a very high threat to native ecosystems. The invasiveness ranking system for non-native plants in Alaska was based on an initial climate screening and an evaluation of ecologic 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 are a high priority for control efforts for KEFJ EPMT across the park. In the Exit Glacier area, the primary goal is to reduce the populations of invasive plants in the developed areas and prevent their spread out to undeveloped areas. Invasive plant populations found away from trails and development are a high priority for control and containment to reduce their spread across areas that have been naturally disturbed by the dynamic, glacier-fed hydrology in the area. These 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 other remote areas of the park are also a high priority for treatment. If invasive plants populations can be identified while they are small and easy to treat, there is a good chance that they can be completely eradicated or contained to reduce their spread.

Control Methods

Manual Treatment

Manual treatment involved removing a plant or plant parts by hand pulling or by digging up the plant using hand tools. This method was used on invasive plant populations that were small and could be removed relatively easily or on species that were easy to pull or dig and didn't have rhizomatous roots. Flower heads were removed from invasive plants before herbicide applications to prevent plants from developing viable seeds after they were treated. All plant parts that were manually controlled were put in bags and disposed of in the park dumpster at the Maintenance Facility which was taken to the Seward Waste Transfer Facility. Biodegradable bags were used as much as possible to reduce the amount of plastic going into the landfill.

Chemical Treatment

Two herbicides were used to chemically treat invasive plants in the park in 2019. Milestone (Aminopyralid) was applied to broadleaf plants at a rate of 6 ounces per acre. AquaMaster (Glyphosate) was applied to grasses at a rate of 478 ounces per acre. Herbicide was spot sprayed using backpack sprayers. A calibration rate of 30 gallons per acre was used to calculate the area treated for each herbicide. The Biological Science Technician and the SCA Intern applied herbicide under the Alaska pesticide applicator license of the KEFJ Biologist. Herbicide use was documented using the National Park Service (NPS) Pesticide Use Proposal System (PUPS).



KEFJ EPMT mixing herbicide on the Outwash Plain.

Data Collection and Analysis

Data collection and processing methods followed guidelines provided in the 2019 Alaska Exotic Plant Management Team Field and Office Protocols (Overbaugh and Frank 2019a and b). Data was collected using a Trimble 7X and Trimble XT6000 Global Positioning System (GPS) using TerraSync software. Data was post-processed using Pathfinder Office software and submitted to the Alaska Region EPMT weekly. Finalized data was post-processed by the AK EPMT Regional Data Manager into a Geospatial Information System (GIS) geodatabase. KEFJ EPMT data was submitted

to both the Alaska Exotic Plants Information Clearinghouse (AKEPIC) and the National Invasive Species Information Management System (NISIMS) databases.

Herbicide applications were also documented through herbicide treatment data sheets and in an herbicide treatment spreadsheet. Weekly field reports were completed to document invasive plant work and timing of control activities. All paper copy datasheets were scanned and stored on the KEFJ network drive.

Standardized polygons were utilized to collect herbicide treatment data on Herman Leirer Road, Exit Glacier parking area, the Outwash Plain, Dinglestad Glacier and the Maintenance Facility. This data collection method utilizes a standardized boundary for a given treatment area that remains constant from year to year. The amount of herbicide used each season within the standardized polygon can be compared to the previous years' data to determine efficacy of treatments and to track herbicide use more accurately over time. Only a single GPS point along with herbicide use information is taken for each standardized polygon, allowing for efficient data collection in the field.

Personnel

The KEFJ EPMT included four crew members in 2019. The Alaska Region EPMT Data Manager was housed out of the KEFJ office for the second summer. He provided technical assistance to all parks and assisted with herbicide application at KEFJ. The KEFJ Biologist managed the invasive plant program at the park and completed all compliance and planning, supervised the EPMT crew, and performed herbicide applications. The KEFJ EPMT field crew consisted of Biological Science Technician Sierra Sampson, SCA Intern Airk Furseth, and Youth Conservation Corps (YCC) employees Marisa Phasomsap and Clay Petersen. An SCA crew assisted with hand pulling invasive plants on trails in the Exit Glacier area.

Results

2019 Season Overview

The KEFJ EPMT resurveyed and treated all known invasive plant populations in 2019. Chemical and manual control methods were used to control the spread of invasive plants in the park. In total this season 64.85 acres were surveyed; 1.61 acres were treated with herbicide and 0.10 acres were treated manually (Table 2). This season 43.43 gallons of Milestone herbicide solution and 5.78 gallons of AquaMaster herbicide solution were used in treatments.

Table 2. Summary of Kenai Fjords National Park Invasive Plant Work in 2019. The January 2018 NPS Land Status geodatabase was used to delineate NPS lands in acreage calculations.

Year	Invasive Plant GPS Data – NPS Lands		
	Species Acres Surveyed ¹	Species Acres Infested ²	Acres Treated ³
2019	64.85	1.71	1.71

¹ Acres surveyed represent the total area mapped.

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

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

Seventeen invasive plant species were documented in the park and on park properties outside the park boundary (Table 3). Tall buttercup (*Ranunculus acris*) was discovered next to the Exit Glacier parking area this summer. This species was last identified in the Exit Glacier area in 2008. Oxeye daisy (*Leucanthemum vulgare*) was discovered in the Exit Glacier parking area for the first time since 2012. The KEFJ EPMT was successful this year in applying herbicide to all the known invasive plant populations in the Outwash Plain located south of the park road. Eleven new small populations were mapped and treated as well. The area known as the “Nike Stripe” was surveyed once and only one common dandelion was found in 2019. An SCA crew assisted with manual treatment of annual bluegrass on the trails at Exit Glacier and participated in native seed collection during a week in August.

Table 3. Invasive plant species and locations in 2019.

Species		AKNHP Ranking	Location			
Latin Name	Common Name		Exit Glacier	Coast	Shea Parking Lot	Maintenance Facility
<i>Alopecurus pratensis</i>	meadow foxtail	52	X	–	–	–
<i>Anthemis cotula</i>	stinking chamomile	41	H	–	–	–
<i>Bromis inermis</i>	smooth brome	62	X	–	–	–
<i>Capsella bursa-pastoris</i>	shepherd's purse	40	H	–	H	H
<i>Cerastium fontanum</i>	big chickweed	36	X	–	X	X
<i>Crepis tectorum</i>	narrowleaf hawksbeard	56	H	–	–	–
<i>Elymus repens</i>	quackgrass	59	–	–	X	–
<i>Galeopsis</i> spp.	hemp nettle	50	–	–	X	–
<i>Hordeum jubatum</i>	foxtail barley	63	H	–	–	–
<i>Leucanthemum vulgare</i>	oxeye daisy	61	X	–	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	X	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	–	–	X	X
<i>Ranunculus acris</i>	tall buttercup	54	X	–	–	–
<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.

Addison Lake was surveyed for the first time for the invasive aquatic plant *Elodea* on September 4. No *Elodea* was detected during the rake throw surveys, and eDNA samples were sent to a lab for analysis.

A revegetation project was completed adjacent to the park's newly constructed employee housing, Spruce Cabin, in the Exit Glacier area. The roadside revegetation projects from 2017 were monitored

using photo points for the third year. A total of 1.58 pounds of native seed was collected from 7 native plant species to add to the park's seed bank.

The KEFJ EPMT participated in the Alaska Department of Agriculture gypsy moth monitoring project again this season. Five traps were deployed in the Exit Glacier area and no gypsy moths were detected.

Outreach and education continued to be a priority this season. The 16th annual Seward community weed pull was organized in conjunction with the Kenai Peninsula Cooperative Weed Management Area (KP-CWMA) at the Seward Middle School. A total of 573 pounds of bird vetch (*Vicia cracca*) and yellow toadflax (*Linaria vulgare*) were hand pulled. Two boot brushes with interpretive information on how to reduce the spread of invasive plants were maintained at the Exit Glacier Nature Center Orientation Panel and at the Harding Icefield Trail register.

Notable Weather Conditions

Uncharacteristic weather conditions this season had implications for invasive plant control work in KEFJ. Lower than average snow depths in May caused early snow melt and invasive plants were able to start growing earlier in the spring (Table 4). Common dandelion populations that are typically treated in early June because the plants are still in rosette form, were already flowering.

Table 4. 2019 monthly snow depth at Exit Glacier compared to the last 15-year averages.

Measurement *	December	January	February	March	April	May
2018/2019 monthly snow depth (in)	0	N/A	17.4	24.5	25.5	3.8
15-year monthly (2003/04–2018/19) average (in)	12.88	25.50	36.04	47.80	52.14	30.93

* (Monthly snow depth measured at the Exit Glacier snow course)

Higher than average temperatures and lower than average precipitation in June, July and August had impacts on plant phenology. Many plants became drought stressed, desiccated and died before they matured. Plants that were growing in mostly mineral soils with very little organic matter to hold moisture were impacted the most. This made identification and treatment of some invasive plant populations difficult or impossible this season. Table 5 and 6 show the higher than average temperatures and lower than average precipitation in June, July and August compared to the average for the last 30 years.

Table 5. 2019 monthly average temperature in F° compared to the last 30-year averages. Temperatures measured at the Seward airport.

Measurement	October	November	December	January	February	March	April	May	June	July	August
2019 Average (F°)	44.9	36.8	30.4	28.6	30.9	37.8	40.6	46.5	54.8	59.5	60.2
30-yr Average	39.6	30.9	28.9	27.1	28.3	32.1	38.7	46.4	52.2	56	55.7

Table 6. 2019 monthly average precipitation in inches compared to the last 30-year averages. Precipitation measured at the Seward airport.

Measurement	October	November	December	January	February	March	April	May	June	July	August
2019 Average (in)	14.47	7.68	8.63	3.08	1.48	11.68	2.64	4.55	0.02	2.01	0.32
30-yr Average	9.35	7.31	9.54	8.07	6.05	4.42	4.52	3.37	2.42	2.8	5.61



Examples of the effects of dry and hot weather in mid-July in some coastal areas where invasive plant populations are located.

High temperatures and low precipitation impacted the entire Kenai Peninsula causing fires on the western side. The Swan Lake Fire on the Kenai National Wildlife Refuge was ignited by a lightning strike on June 5 and burned 167,164 acres and was an active fire until the end of September. When winds turned the smoke from the fire towards the eastern side of the peninsula, there were days when the air quality was poor enough to impact field work. To avoid the impacts of the smoke, the KEFJ EPMT either limited field work to areas that required less strenuous activity or stayed in the office to work on data management tasks. Some treatment plans were altered or not carried out due to the unhealthy air quality created by the smoke in July and August.

Exit Glacier Area

Herman Leirer Road

In 2019 Herman Leirer Road was treated with herbicide twice during the summer. The roadsides were treated from June 20 through 24 and treated a second time on July 30 through 31. Eight standardized polygons along the roadside were used to track herbicide use for the second year (Geier and Kriedeman 2018). During the first treatment, 3.36 gallons of Milestone herbicide solution were applied to 3,189 common dandelions. During the retreatment of the road in July, an additional 566 common dandelions were treated with 0.61 gallons of Milestone herbicide solution.

Nine white clover (*Trifolium repens*) plants were treated on the south side of the road near the Resurrection River Bridge. Three common timothy (*Phleum pratense*) plants was found along the roadside and were hand pulled on June 10. Additionally, 0.03 gallons of AquaMaster herbicide solution were used to treat 24 smooth brome (*Bromis inermis*) plants and 21 meadow foxtail (*Alopecurus pratensis*). In 2018, the KEFJ EPMT found the first population of stinking chamomile (*Anthemis cotula*) in the park on the south side of the road across from the entrance sign. No plants were found during surveys in 2019.



The KEFJ EPMT applying herbicide along Herman Leirer Road.

Exit Glacier Parking Area

The Exit Glacier parking area was surveyed and treated 8 times throughout the season. A mixture of chemical and manual control methods were used to treat 6 invasive plant species including common dandelion, common plantain, pineapple weed, white clover, oxeye daisy, and tall buttercup. Small invasive plant populations in the parking area that were close to areas with high visitor use were hand pulled. Common dandelion in the parking area was treated on June 10th with 0.97 gallons of Milestone herbicide solution. On June 20, 0.09 gallons of Milestone herbicide solution was used to treat 322 common dandelions. Six standardized polygons around the parking area were utilized to track herbicide use. Common plantain and pineapple weed found scattered around the parking area were hand pulled. White clover was found along the entrance road to the parking lot and was chemically treated. Two tall buttercup plants were found on the south side of the RV parking area for the first time since 2008 (Kurtz 2008) and were manually pulled. One oxeye daisy was discovered in the parking area for the first time since 2012.



KEFJ EPMT hand pulling invasive plants in the Exit Glacier parking area.

Campground

Annual blue grass (*Poa annua*) was treated in the campground parking lot on the July 30 and 0.5 gallons of AquaMaster herbicide solution was applied. Three common dandelions were found near the bathrooms in the parking lot and were manually pulled. A survey of the campground and the trails around the sites found no invasive plants.

SNOTEL Site

Common dandelion has been documented at the Snow Telemetry (SNOTEL) automated weather and climate data collection station site since 2013 (Frank 2013). This year the site was surveyed on June 6 and then again on August 23. No common dandelions were found on either visit. This site has the potential to be completely eradicated of invasive plants, although surveys of this site should continue annually to assure that seed bank has been expended.

Employee Housing

The employee housing area continues to have small populations of common dandelion. This area was surveyed and treated on July 26. Six common dandelions were found near the Alder Cabin and were treated with .017 gallons of Milestone herbicide solution. Eleven common dandelions were treated with .011 gallons of Milestone herbicide solution along a social trail from the employee housing area to the east end of the parking lot. Two common dandelions were treated with .002 gallons of Milestone herbicide solution in the Trail Builders Camp. Annual bluegrass in the employee housing parking lot was hand pulled by the SCA crew on August 7.

Nature Center Plaza

The Nature Center Plaza includes the area around the Nature Center, the picnic area behind the Nature Center, the pump house, and the Pavilion. These areas were surveyed regularly throughout the season. Annual blue grass, common plantain, common dandelion, and pineapple weed were hand pulled in these areas. In the picnic area behind the Nature Center, 0.5 gallons of AquaMaster herbicide solution was applied to 0.016 acre of annual blue grass. This was the first time this area has

been treated with herbicide. One gallon of AquaMaster herbicide solution was applied to 0.033 acre of annual blue grass at the pump house for the second year.

Glacier View Loop Trail

This was the first year that the Glacier View Loop Trail was chemically treated. Herbicide was applied early in the morning when there were fewer visitors using the trail. On June 25, 0.031 gallons of Milestone herbicide solution was sprayed on 20 common plantains and 10 common dandelions. Next to the bridge on the east side of the trail, 172 common dandelions were sprayed with .182 gallons of Milestone herbicide solution. This trail was also surveyed additional times throughout the season and common plantain, common dandelion, and annual bluegrass were hand pulled. On August 6, an SCA crew assisted with the manual removal of 62 pounds of annual bluegrass on the paved portion of the trail.

Twenty-five common dandelions were treated with 0.026 gallons of Milestone herbicide solution in the open area in the middle of the Glacier View Loop Trail. This site was not resurveyed during the summer due to trail closures in response to bear-human conflicts in the area.



The SCA crew hand pulling annual bluegrass along the Glacier View Loop Trail.

Glacier Overlook Loop Trail

This was the first year that the Glacier Overlook Loop Trail was chemically treated. On June 25, .028 gallons of Milestone herbicide solution was applied to 18 common plantain and 6 common dandelions. Herbicide was applied early in the morning when relatively few hikers were on the trail. This reduced potential impacts to visitors using the trail. The trail was routinely surveyed throughout the summer and common plantain and common dandelion plants were hand pulled in July and August. Oxeye daisy (*Leucanthemum vulgare*) was found on the trail in 2018 (Geier and Kriedeman 2018), but none was found this year.

Harding Icefield Trail

On the Harding Icefield Trail, there is a persistent population of common dandelion approximately $\frac{1}{4}$ mile up the trail. It is located on an old section of trail that was abandoned. In 2019, this site was surveyed on June 25 and only 6 common dandelions were found and treated with .006 gallons of Milestone herbicide solution. A common dandelion and 2 common plantains were also found at Marmot Meadows on August 5 and they were hand pulled. On August 5, an SCA crew assisted with hand pulling 45.5 pounds of annual bluegrass on the trail. The area treated extended from above the bridge at mile 0.8 to the second switch back above Marmot Meadows at mile 1.7.

Nike Stripe

The area locally known as the “Nike Stripe” is located about .4 miles north of Herman Leirer Road from the park entrance sign. On June 26, only one common dandelion was found on the survey and .001 gallons of Milestone herbicide solution was applied.



KEFJ EPMT hiking to the Nike Stripe.

This site was not resurveyed later in the summer due to the large number of wasp nests found in vegetation around the Exit Glacier area and the poor air quality from the Swan Lake Fire. This site has a high probability of complete eradication in the future.

Outwash Plain

Twelve days in June were spent surveying and applying herbicide in the Outwash Plain. Exit Creek’s low water levels and dry weather conditions made it possible to access and treat all know populations of the common dandelion in this area. All 10 standardized polygons were treated, and 35.48 gallons of Milestone was applied to 1.18 acres (Table 7). Thirty-one small outlier populations were also treated with 2.09 gallons of herbicide solution in this area. Nineteen of these sites were new in 2019.

Each individual common dandelion plant that was sprayed was counted using a hand tally counter in standardized polygons 4, 5, and 11. The populations in these standardized polygons had decreased

enough to make it a reasonable effort to count individual plants. Counting the exact number of plants treated provided a more accurate calculation of herbicide mix applied.

Table 7. Acres infested with common dandelion on the Outwash Plain calculated by the amount of herbicide mix applied in each standardized polygon.

Standardized Polygon Name	Infested Area (acres)			
	2016	2017	2018	2019
Outwash 1	0.16	0.05	0.04	0.06
Outwash 2	0.25	0.06	0.03	0.07
Outwash 3	0.10	0.06	0.01	0.03
Outwash 4	0.03	0.02	0.03	0.003
Outwash 5	0.03	0.02	0.01	0.01
Outwash 6	0.29	0.25	0.10	0.10
Outwash 7	0.18	0.13	0.07	0.10
Outwash 8	0.05	0.02	0.01	0.01
Outwash 9	N/A	N/A	0.83	0.48
Outwash 10	N/A	N/A	0.11	0.25



KEFJ EPMT hiking across the Outwash Plain.

Coastal Areas

Aialik Bay

In 2019, 10 sites were surveyed in Aialik Bay from July 17 to 19. Annual bluegrass populations at the Aialik Bay Public Use Cabin (PUC), Holgate Public Use Cabin (PUC), and the Pedersen Lagoon outer beach were hand pulled. This year no annual bluegrass was found at Abra Cove. At Holgate PUC, 1.82 square feet of annual bluegrass was hand pulled. The populations were primarily found around the PUC and on the trail leading to the outhouse. 5.2 square feet of annual bluegrass was hand

pulled at the Aialik PUC. The largest portion of the population was in front of the PUC and scattered down the access trail. Fewer plants were found at the Pedersen Lagoon outer beach and many of the plants that were hand pulled were dried and had shriveled leaves which made them difficult to identify. Hot, dry weather conditions may have caused the grass's leaves to die back early in the summer. Fifty plants were hand pulled around the kayak storage area and, on the trail leading to the lodge. This site is on private land owned by Port Graham Corporation and leased by Kenai Fjords Glacier Lodge. Control work on this land is performed as a courtesy and with permission to ensure invasive plants at this site do not spread to surrounding park lands.



Hand pulling annual bluegrass at the Aialik Public Use Cabin.

Quicksand Cove, the Pedersen Lagoon camping easement, Tooth Cove, McMullen Cove, Aialik Bay Ranger Station, Pocket Cove and Bear Cove were all surveyed for invasive plants and none were found.



Biological Science Technician collecting data at the Pedersen Lagoon camping easement.

Northwestern Fjord

Three beaches were surveyed for invasive plants in Northwestern Fjord on June 11. Surveys were focused on beaches with food storage lockers and popular with visitors for camping. No invasive plants were found at the beaches at Northeastern Glacier and Sunlight Glacier. The population of annual blue grass at the camping spit north of the moraine was resurveyed and treated. The population was small and appeared to be impacted by the hot and dry weather during the summer. In total 11.4 square feet of annual blue grass was hand pulled.



KEFJ EPMT hand pulls annual bluegrass in Northwestern Fjord.

McCarty Fjord

On July 9–10, two sites were surveyed in McCarty Fjord—a rocky outcrop located south of Dinglestadt Glacier and James Lagoon outer beach. The population of common dandelion located south of Dinglestadt Glacier was first discovered in 2006 (Wetherbee 2006) and was treated with herbicide for the 7th time this summer. Hot and dry weather conditions during the summer impacted the ability to treat this population this summer. The soil in most of this area is made up of a thin layer of organic material covering bedrock and it does not hold moisture during long periods of hot and dry conditions. Many of the native plant communities showed signs of stress and had brown and shriveled leaves. Invasive common dandelions were also impacted by the dry conditions in areas where soil was thin. Many of the plants had already turned brown and died and could not be treated with herbicide. Only 18 common dandelions were treated in 2019, as compared to 151 plants treated in 2018. A standardized polygon was used to track herbicide use at this site and 0.02 gallons of Milestone herbicide solution was applied. Each individual population inside the standardized polygon was mapped to make navigating back to specific populations easier in the future. James Lagoon outer beach was surveyed for invasive plants in conjunction with a bird mortality survey and no invasive plants were found.



Brown plant leaves showing the effects of hot and dry conditions on the vegetation on the hillside near at Dinglestadt Glacier.

Nuka Bay

Sites in both Beauty Bay and North Arm were surveyed in 2019. An old airstrip located in Beauty Bay was resurveyed on July 8, but no invasive plants were found. Common timothy (*Phleum pratense*) and common dandelion were last treated here in 2017 and were not detected during a survey in 2018 (Geier and Kriedeman 2018).

On July 9, three populations of common dandelion were treated with herbicide for the 7th year at the head of North Arm. A total of 14 common dandelions were treated in these sites. A new population was discovered in the same area in 2019, and 27 plants were treated with herbicide. In total, 41 common dandelion plants were treated with 0.04 gallons of Milestone herbicide solution. Invasive plant populations in this area were not stressed by the hot and dry conditions because this area has a deep organic soil layer that holds more moisture.

Maintenance Facility

The Maintenance Facility was surveyed and treated four times this season. Herbicide treatments occurred on June 26, June 27, July 30, and August 22. Annual bluegrass, common chickweed, big chickweed, common dandelion, pineapple weed, and common plantain were all chemically treated. A total of 2.86 gallons of Milestone herbicide solution and 3.53 gallons of AquaMaster herbicide solution were applied. A standardized polygon was used to track herbicide use in the Maintenance Facility for the third year.

Seward

On August 9, with the help of an SCA crew, over 93 pounds of invasive plants were hand pulled around the Visitor Center located in the Seward Boat Harbor. Species controlled included common dandelion, common plantain, annual bluegrass, common chickweed, and pineapple weed.

The SCA crew also assisted with hand-pulling invasive plants at the Shea Parking Lot. This parking lot is where NPS vehicles are staged for use by employees working in the Headquarters building.

Eighty-two pounds of common plantain, annual bluegrass, pineapple weed, and common chickweed were pulled on August 8. The focus of this work was to remove invasive plants from the gravel parking area to reduce the spread of seeds into the park on staff shoes, clothing, and vehicle tires.



SCA crew manually treating the Shea Parking Lot.

***Elodea* Monitoring**

Addison Lake was surveyed for the invasive aquatic plant *Elodea* for the first time in 2019. Addison Lake drains into Pedersen Lagoon in Aialik Bay. The lake was accessed via Pedersen Lagoon by pack rafting across and then hiking on a trail on Kenai Fjords Glacier Lodge property to the lake with their permission. Addison Lake was surveyed on September 4, via pack raft, using an s-shaped “intuitive meander” pattern across the south end of the lake. Rake throw surveys were completed randomly along the survey line. Native aquatic plants, including muck grass (*Chara sp.*), white water-crowfoot (*Ranunculus aquatilis*), and an unidentified macroscopic algae species, were detected during the survey. It was not possible to do visual surveys because of the turbidity of the water. No *Elodea* was detected.

Three eDNA samples were taken on the east end of the lake following the Central Alaska Network eDNA Field Sample Collection Protocol for the Mityvac hand pump (Simmons 2016). Originally the sampling plan included taking 4 water samples around the edge of the lake with three replicate samples per sample site, but because of the turbidity of the water each water sample took about 40 minutes to draw through the filter using the vacuum hand pump. We had limited time to complete the survey, so only 3 eDNA samples were taken with only 1 replicate sample for the first site and no replicate samples for other 2 sites. eDNA samples were sent to the USGS Molecular Laboratory in Anchorage for analysis.



eDNA samples being collected at Addison Lake.

Prevention

This year it was a priority of the KEFJ EPMT to diligently use handheld boot brushes to clean shoes and clothing before working in the field and after working in infested areas. This was to reduce the likelihood of the team becoming a vector of the spread of invasive plants throughout the park.

Boot brushes were maintained at the information panel in front of the Nature Center as well as in front of the Harding Icefield Trail register. Interpretive information next to the boot brushes encourage hikers to brush their boots before hiking trails to reduce the spread of invasive plant seeds and propagules.

Restoration

In late July and early August, 1.58 pounds of native seed were collected along the road and trails in the Exit Glacier area. Seeds were collected from western columbine (*Aquilegia formosa*), alpine bluegrass (*Poa alpina*), alpine timothy (*Phleum alpinum*), spiked trisetum (*Trisetum spicatum*), meadow barley (*Hordeum brachyantherum*), bluejoint reed grass (*Calamagrostis canadensis*), and Merten's sedge (*Carex mertensii*). The native seed sent to the Alaska Department of Agriculture Plant Material Center for cleaning.



The SCA crew with bags of native seed they collected.

A third year of monitoring was completed on three revegetation projects on Herman Leirer Road in late August. Photo points for monitoring the success of the reseeding project over time were established in 2017 when the projects were completed. Photos taken from the same location each year are used to monitor the plant recruitment from seeds and inventory all the plants growing in the sites.

During the construction of new employee housing, Spruce Cabin, vegetation was cut, and the surrounding soil was disturbed. To speed up the revegetation of the area and reduce the risk of invasive plants populating the area, this area was reseeded with a seed mix of blue joint reed grass, western columbine, Merten's sedge, red fescue (*Festuca rubra*), meadow barley, lupine, alpine timothy, alpine poa, and spiked trisetum. The seed was mixed with sand and then raked into the mix of gravel fill and soil beside the cabin. Two photos were taken of the revegetation project for future monitoring along with spatial data so the photo can be taken from the same location from year to year. A revegetation sign was installed in front of the revegetation project to discourage trampling.

Outreach and Education

Outreach and education continue to be an important component in the park's invasive plant program. It was a priority to communicate goals and accomplishments of the invasive plant program to park staff, as well as provide information about what individuals can do to reduce the likelihood that they will be a vector to the spread of invasive plants while they work and recreate in the park.

Presentations, informal talks, and social media posts were all utilized to educate the public and park staff about invasive plants control efforts and awareness, and restoration projects taking place in the park. Facebook posts topics included an announcement for the community weed pull, community weed pull results, shed moose antlers, micro photography of insects found in the park, wildflowers, and invasive plant projects in coastal areas of the park. A presentation was given to interpretive staff during spring training about control efforts and results of the invasive plant management program. An informational talk was given to the SCA crew about how to reduce the spread of invasive plants

while living and working in the park. Questions from park visitors provided the opportunity to have informal discussions about invasive plant work being completed and the impacts of invasive plants on the environment.

The KEFJ EPMT coordinated the 15th Seward Community Weed pull on June 28 at the Seward Middle School. This event was held in partnership with the Kenai Peninsula Cooperative Weed Management Area, including the Chugach National Forest, Homer Soil and Water Conservation District, and the Kenai Watershed Forum. We had a total of 22 participants who helped hand pull 573 pounds of yellow toadflax (*Linaria vulgare*) and bird vetch (*Vicia cracca*). With a grant awarded to the Kenai Watershed Forum from the Seward Community Foundation, we were able to provide free pizza and drinks to participants this year.



Participants in the Seward Community Weed Pull.

Gypsy Moth Monitoring

The KEFJ EPMT continued to participate in the Alaska Division of Agriculture's invasive gypsy moth (*Lymantria dispar dispar*) monitoring program.



Gypsy moth monitoring pheromone trap.

Five gypsy moth pheromone traps were placed in the Exit Glacier area. Traps were located behind the Nature Center, in the Exit Glacier parking area, in the picnic area near the parking lot, in the employee parking lot, and near the campground parking lot. These traps were installed in May, checked twice during the summer and taken down in September. No gypsy moths were found in any of the five traps in 2019.

Discussion and Recommendations

Exit Glacier Area

The KEFJ EPMT should continue to make the Exit Glacier area a high priority for monitoring and treatment since this is the most visited area in the park. Resurveying all known invasive plant populations should continue to be a goal, with time allotted to survey for potential new sites. A strategy of early detection and rapid response should continue to be a priority for efficient management and treatment of invasive plant populations.

This season we also employed the use of a hand tally counter to help count individual plants that were treated when populations were small. This allowed for counting the exact number of plants treated to compare the population size from year to year and to more accurately calculate herbicide use. Using a hand tally counter to count plants treated should continue to be used to track the efficacy of treatment when it is practical.

Herman Leirer Road

Standardized polygons were used to collect herbicide treatment data along the roadside again this year. This data collection strategy is less time consuming than remapping the area every year and provides data that can be used to determine the efficacy of treatment from year to year. It is also more efficient and allows staff to spend time applying herbicide instead of remapping the area treated with the GPS. Continued use of this efficient strategy for data collection is recommended.

With low snow depth and early melt, as well as warmer than average temperatures this summer, common dandelion along the road flowered earlier than is typical this year. While other populations of invasive plants were being treated, common dandelion along the road flowered or went to seed. It is recommended in the future to check the phenology of the roadside carefully in the spring and move from other treatment sites to the roadside if plants are in flower during the same time period. The road is a primary vector for invasive plants into the Exit Glacier area and it is important to reduce the spread of seed from the roadsides into undeveloped areas. Retreatment of the roadside throughout the summer is also recommended to control any new plants that sprout later in the growing season.

Each summer a maintenance crew brushes the roadsides in late-July. It is necessary to communicate with maintenance staff early in the season to coordinate invasive plant control efforts with the brushing project. The roadside should be surveyed for invasive grasses and any populations identified should be marked with flagging in mid-July before the maintenance crew starts brushing. Brushing can still be completed while avoiding flagged invasive plant populations that will be treated later in July.

The number of invasive plant species moving down Herman Leirer Road from the Seward Highway leading to the park is expanding. Although this part of the road is outside the park boundary, this area should continue to be surveyed throughout the season. Small populations of priority invasive plant species can be hand pulled as they are detected. The KEFJ EPMT should also continue to partner with the Kenai Peninsula Cooperative Weed Management Area (CWMA) to identify high priority species along this corridor and to support their efforts to control them.

Exit Glacier Parking Area

Standardized polygons were used to collect herbicide treatment data in the parking lot islands for the first time this season. This method proved to be a more efficient way to apply herbicide and track herbicide use. This data collection method should continue to be used for future treatment. Herbicide was applied early in the morning when visitation was lowest and fewer visitors were in the parking lot. The EPMT should continue to apply herbicide during the early morning hours when treatment sites are close to areas used by visitor. This will reduce the impacts of closing areas while herbicides dry and reduce possible exposure to the public.

Campground

Invasive plant populations in the Campground were located primarily in the parking lot. Annual bluegrass has been treated here since 2017 along with a few scattered common plantain and common dandelion. Herbicide treatments to annual bluegrass and other scattered species should continue in the parking lot. Small scattered populations of common dandelion were hand pulled in 2018 along the trails to the campsites. Although they were not documented in 2019, these sites should be resurveyed in 2020.

SNOTEL Site

Although this is the first year since 2013 that no common dandelions were found in the Snow Telemetry (SNOTEL) automated weather and climate data collection site, this area should continue to be surveyed regularly in the next few years to confirm that the population has been eradicated.

Employee Housing

Annual bluegrass was found scattered around the parking lot and trails leading to the three cabins used for employee housing. A few common dandelions were found in the trail builders camp. This area has been relatively free of invasive plants but should continue to be surveyed and treated each year.

Nature Center Plaza

Annual bluegrass was chemically treated around the pump house and in the picnic area behind the Nature Center. These areas are relatively small, and the populations have not responded to manual treatment in the past. It is recommended that these areas continue to be chemically treated and monitored to determine the efficacy of herbicide treatment of these populations. These populations should be monitored and retreated throughout the season as new plants sprout.

Glacier View Loop Trail

The Glacier View Loop trail should continue to be resurveyed throughout the summer. Different invasive plant species mature during different times over the summer season, so surveying throughout the summer provides more opportunities to detect new species and populations along the trail.

Only 25 common dandelions were treated in the forest clearing found in the middle of the Glacier View Loop Trail this season. With continued use of herbicide and retreatments throughout the summer as needed, this population should be able to be eliminated in the next few years.

The annual bluegrass infestation along the paved portion of the trail was manually treated again this season with the help of an SCA crew. This population has been hand pulled since 2010 and has not been reduced in size or density over that time. Chemical treatment should be considered for this population if reducing the extent along the trail is the goal. To reduce impacts to visitors hiking the trail, the trail should be treated with herbicide early in the morning when fewer visitors are in the area.

Glacier Overlook Loop Trail

The Glacier Overlook Loop Trail should continue to be resurveyed throughout the summer to detect invasive plant species that mature at different times throughout the summer.

In 2018 oxeye daisy (*Leucanthemum vulgare*) and red clover (*Trifolium pratense*) were discovered along the trail (Geier and Kriedeman 2018). This was the first time these species were found on the trail system in the Exit Glacier area. These species were not detected in 2019, however, the area where they were discovered should continue to be surveyed over the next few summers.

Harding Icefield Trail

Common dandelion populations along the trail have responded to herbicide treatment and should continue to be treated to keep these populations from spreading up the trail.

There were plans to test herbicide treatment of annual bluegrass on a portion of the trail in 2019, but with hot and dry conditions, many of the plants were dead by late July when treatment was planned. Annual bluegrass has been hand pulled along the trail since 2010 and has not been reduced in density or extent. It is recommended that herbicide should be applied in test areas to determine if this treatment is feasible along this narrow and heavily used trail.

Nike Stripe

This site is a major success for the KEFJ EPMT. Only one common dandelion plant was treated this summer. This site was originally documented in 2004 and has been treated with herbicide over the last 7 years. While this site may be nearly free of invasive plants, follow up surveys should still be completed in the following years to ensure continual success.

Outwash Plain

The use of standardized polygons should continue to be utilized as a method to track herbicide use over time in the Outwash Plain. This method streamlined data collection and provided a more accurate way to track efficacy of herbicide treatment over time. It has worked well in the past for 2 or 3 members of the team to be responsible for flagging the outline of the standardized polygons and to pull flower heads before plants are sprayed with herbicide. Large standardized polygons were divided into smaller sections with flagging to make it easier for herbicide applicators to keep track of the area they have treated.

Herbicide treatment has been very effective at reducing the populations size and density in the standardized polygons. Herbicide applicators now must spend more time looking for individual plants to spray within large brushy areas within the standardized polygons. An iPad mini using the Avenza Maps application and a map of the standardized polygon boundary was used to help sprayers

navigate systematically through the polygon. This method was helpful for keeping herbicide applicators oriented in the polygon and to ensure all areas were surveyed and treated. This tool should continue to be utilized for navigation and surveying in the Outwash Plain.

It is important to continue to survey new areas where common dandelions may have spread from existing populations. As populations that are being treated now are reduced in size, more time will be available for surveying new areas.

The strategy of using dry bags to refill the backpack sprayers from a clear stream near treatment sites to mix herbicide solution worked well again this season. It reduced the risk of injury by it not being necessary for staff to carry a backpack filled with heavy extra containers of water across Exit Creek and out to treatment areas.

Coastal Areas

Surveying and monitoring coastal areas of the park should continue to be a priority for the KEFJ EPMT. Regularly used campsites and known infestations should be resurveyed and treated each year. Areas with lower levels of use should be surveyed on a systematic basis. Many of the populations found in coastal areas have been discovered when they were small and have been easy to treat. Experience has shown that invasive plants can be found in unlikely locations, so spending time surveying remote areas that may be accessed by visitors less frequently is worth the effort.

Annual bluegrass has been hand pulled around two of the park's PUCs since 2009 with little effect on the extent of these populations. The use of herbicide on these populations of annual bluegrass should be considered if the goal is to eradicate these populations rather than just containing them.

Maintenance Facility

The Maintenance Facility should continue to be a priority for the KEFJ EPMT. Park vehicles, tools and employees can act as a vector for the spread of invasive plants into the park from the Maintenance Facility. Herbicide treatment should occur early in the season before plants go to seed and reapplied as new plants sprout throughout the summer. Multiple herbicide applications during a season has helped reduce the populations of invasive plants in the yard around the Maintenance Facility. A standardized polygon should continue to be used to track herbicide use and efficacy. This season hand tally counters were used to count individual invasive plants with small populations as they were treated. Populations of common chickweed and annual bluegrass were dense and not practical to count.

Shea Parking Lot

Populations of invasive plants in the Shea Parking Lot continue to increase around the margins of the lot and are covering much of the gravel parking lot surface. SCA crews have been recruited to hand pull plants here over the last few years, but the population and density has continued to increase. Park maintenance workers weed wack the vegetation growing around the parking lot throughout the summer, but this only reduces the spread of seed and does not reduce the population of invasive plants. NPS vehicles are parked here and could be vectors for the spread of invasive plants into the park by carrying seeds and plant parts. Feasible control measures should be considered. Herbicide

treatment could be a viable option, although the populations of invasive plants surrounding the parking lot could provide a never-ending source of invasive plants seeds. Paving the parking lot is another option to consider, but it will be costly to complete and maintain into the future.

***Elodea* Monitoring**

All three of the freshwater lakes in the park have now been surveyed for *Elodea* as of 2019. None of the lakes appear to have a high risk of *Elodea* infestation based on their current uses by visitors. Currently float planes, the primary vector for the spread of *Elodea* around the state, are not landing on the lakes regularly. Because of the low risk, a monitoring schedule should be developed that ensures that lakes are surveyed on five-year cycle or more often if use changes at the lakes and the risk of infestation increases.

Prevention

Educating park staff about invasive plants and how to prevent the spread should continue to be a priority. The KEFJ EPMT has been using handheld boot brushes to ensure they are not spreading invasive plants as they move from one area to another. The KEFJ EPMT would like to work with park interpretive staff and ask them to use the boot brush before they leave on an interpretive hike and to encourage visitors to use the boot brush and explain the importance of their actions.

SCA crews should continue to be given an informal talk about how to reduce the spread of invasive plants while they are living and working in the park. SCA crews should be reminded that weed wackers or other tools brought into the park by the crew will need to be cleaned before they are used.

Contracts for future construction projects in the park should include language requiring equipment, machinery and tools to be cleaned before they are brought into the park and include strategies for treating new invasive plant populations that occur due to the project. Invasive plant surveys should be a priority at construction sites with ground disturbance because they are at a higher risk for introduction of invasive plants.

Restoration

Restoration projects should be completed as the need arises and monitored to determine the success of the project. One new restoration project was completed in 2019. Currently there are three restoration projects in the Exit Glacier area that are being monitored using photo points. Plant cover and plant species growing in monitoring plots are compared with the previous year and plots are reseeded if necessary.

Native seed should continue to be collected to build up the park's native seed bank for use in future restoration projects. A small scale that measures grams should be purchased to weight seeds to document the amount used in seed mixes before planting. The Alaska Division of Agriculture, Alaska Plant Materials Center should continue to be utilized to process and clean native seeds collected in the park.

Outreach and Education

Developing partnerships with local groups and state organizations should continue to be a priority. Attending monthly teleconferences with the Alaska Invasive Species Partnership (AISP) provides a

state-wide perspective on issues occurring outside the National Park Service. Continuing to be a participating member of the Kenai Peninsula Cooperative Weed Management Area (KP-CWMA) should continue to be a priority. This organization aims to prioritize and coordinate invasive plant control work across the Kenai Peninsula.

The Seward Community Weed Pull continues to be an important part of outreach for the invasive plant program at KEFJ. Partnership with the KP-CWMA is essential to making this event a success every year. Early communication between the various partners provides for efficient planning. Advertisement for the event should include putting up flyers around the City of Seward, announcing the event in the local digital newspapers and on the park's Facebook page. Creating a Facebook event on the park's page that people could RSVP to, may encourage local people to participate.

The KEFJ EPMT should continue to use social media to educate the public about invasive species. Posts can be made to both the park's Facebook and Instagram page.

Gypsy Moth Monitoring

Partnering with the Alaska Division of Agriculture to monitor for the invasive gypsy moth should continue to be a priority. This project does not take much time or resources to complete and contributes to a state-wide program that provides for early detection across in the state.

Youth Involvement

Engaging youth in the EPMT program through the Student Conservation Association (SCA) and the Youth Conservation Corps (YCC) is a great way to introduce young people to the National Park Service. These programs help to expose college and high school students to a hands-on learning experience and introduces them to the National Park Service's mission. These positions also are an important part of the KEFJ EPMT program and pursuing funding for these positions should continue to be a priority.

Personnel

In 2019, the KEFJ EPMT crew consisted of a Biological Science Technician, an SCA Intern, and 2 YCC employees. The Alaska Regional EPMT Data Manager worked from KEFJ office for a second year this summer. The KEFJ EPMT Biological Science Technician, who started work in mid-April and ended on the 20th of September, should continue to start before the other crew members to allow time for orientation and preplanning for the summer field season. This crew size worked well and allowed for projects to get done quickly and efficiently.

The large herbicide application projects in the park were completed with the assistance of the EPMT Data Manager. Without his help there would have only been 2 herbicide applicators and it would have been more difficult to accomplish all the projects in the park. Assistance should continue to be requested from the Alaska Regional EPMT for additional staff to complete these projects.



The 2019 KEFJ EPMT

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