



Invasive Plant Management in Wrangell-St. Elias National Park and Preserve

2015 Summary Report

Natural Resource Report NPS/WRST/NRR—2016/1126



ON THE COVER

From the Top Left Clockwise: *Elymus repens* in anthesis along the Nizina Road; *Leucanthemum vulgare* blooming on the McCarthy Road; *Trifolium pratense* in bloom; *Linaria vulgaris* in McCarthy; Bushels of *Melilotus albus* removed by SCA and YCC crews in Slana; SCA crew controlling non-native species along the Jumbo Mine Trail in the Kennecott Mines NHL; Mt. Blackburn viewed during invasive plant surveys in Donoho Basin.

Photographs by Peter Frank

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Data in this report were collected and analyzed using methods based on established protocols and were analyzed and interpreted within the guidelines of the protocols. In addition, this report received informal peer review by subject-matter experts who were not directly involved in the collection, analysis, or reporting of the data.

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Contents

	Page
Figures.....	v
Tables.....	vi
Appendices.....	vi
Abstract.....	vii
Acknowledgments.....	ix
Acronyms.....	ix
Introduction.....	1
Methods.....	3
Defining Reporting Zones	3
Data Collection and Analysis	4
Prioritizing Fieldwork	4
Inventory and Monitoring.....	4
Control Work.....	5
Control Methods.....	5
Restoration and Prevention.....	6
Outreach, Education and Partnerships.....	7
Results.....	9
Big Volcanoes RZ	11
McCarthy Front Country RZ.....	12
McCarthy Road	12
Kennecott Mines National Historic Landmark.....	15
Nizina Road.....	16
May Creek NPS Operations Facilities.....	16
Nabesna Front Country RZ	17
Slana	17
Nabesna Road and Trail System.....	19
Upper Copper River Front Country RZ.....	20
WRST Headquarters.....	20

Contents (continued)

	Page
Glennallen Maintenance Yard.....	21
Chetaslina River	21
<i>Elodea</i> Surveys	22
Restoration and Prevention.....	23
Education/Outreach	24
Recommendations.....	26
Inventory and Monitoring.....	26
Elodea Surveys	26
Control Work.....	27
Manual Control.....	27
Chemical Control.....	28
Restoration and Prevention.....	28
Education and Outreach	29
Need for Seed	29
EPMT Informational Booths	29
Outreach and WRST Staff.....	30
Exotic Plant Herbarium Vouchers.....	30
Literature Cited	31

Figures

	Page
Figure 1. Map of Wrangell-St. Elias National Park and Preserve.....	x
Figure 2. A meadow of native wildflowers bloom above the Kennicott Glacier in Donoho Basin.....	2
Figure 3. WRST Reporting Zones	3
Figure 4. Successful use of vegetation mats along the Caribou Creek Trail.	6
Figure 5. EPMT Booth at the McCarthy Fourth of July Parade.	7
Figure 6. Dense infestations of field penny cress and pineapple weed in a corral along the Lakina River.....	12
Figure 7. Bike surveys on the McCarthy Road	12
Figure 8. Map of McCarthy Front Country Reporting Zone	13
Figure 9. Dense monotypic stands of smooth brome at the Kuskulana Bridge.	13
Figure 10. Mapping invasive species found around a newly constructed culvert at mile 38.....	14
Figure 11. Pulling dandelions on the Bonanza Mine Trail	15
Figure 12. A field of dandelions outside the employee cabins at May Creek.....	16
Figure 13. Common dandelion growing in the flood plain along Chititu Creek.	17
Figure 14. Before and after photo of control work on white sweetclover at the Tok Cutoff.....	17
Figure 15. Nabesna Front Country Reporting Zone.....	18
Figure 16. Common chickweed found along the Copper Lake Trail.....	19
Figure 17. Upper Copper River Front Country Reporting Zone.....	20
Figure 18. Narrowleaf hawksbeard growing along the Chetaslina River.	21
Figure 19. EPMT staff takes vegetation samples during <i>Elodea</i> surveys on Hanagita Lake.....	22
Figure 20. SCA crew collects seed along the Jumbo Mine Trail.....	24
Figure 21. Glennallen Weed Smackdown participants	25
Figure 22. SCA crew poses while pulling dandelions on the trails within the NHL but outside of the Mill Town.....	27
Figure 23. SCA crew collects seed in grassy meadows along the Jumbo Mine Trail.	29

Tables

	Page
Table 1. Variables used to prioritize invasive plant management.....	5
Table 2. Invasive plant management person hours for WRST EPMT staff, youth groups, and volunteers.	9
Table 3. Summary of WRST EPMT invasive plant management data collection	10
Table 4. Summary of infested acres documented in 2015 organized by species and reporting zone.	11
Table 5. Native seed collected for the Need for Seed within the Kennicott Valley.....	23

Appendices

	Page
Appendix A: List of park owned invasive plant vouchers.....	A-1
Appendix B: List of Maintained Trails and Survey Efforts.....	B-1
Appendix C: List of Float Plane Lakes and Elodea Surveys.	C-2
Appendix D: 2015 Herbicide Treatments Press Release	D-1
Appendix E: 2015 Weed Smackdown Press Release	E-1

Abstract

This report summarizes work conducted by the Exotic Plant Management Team (EPMT) in Wrangell-St. Elias National Park and Preserve (WRST) during the 2015 field season. This summer marked the eleventh consecutive year WRST staff have inventoried and controlled invasive plants in the park, preserve and adjoining gateway communities. The 2015 WRST EPMT consisted of one National Park Service (NPS) Biological Science Technician stationed at Park Headquarters in Copper Center. Field work was focused on the following objectives: Monitor and control known infestations; survey for and document new infestations; and prevent the spread of invasive species through NPS activities. EPMT staff devoted close to 400 field hours toward managing invasive species found in and around the park. A total of 193.95 acres were surveyed by EPMT staff during the 2015 field season, of which a total of 9.98 acres were found to be infested. Of the 9.98 infested acres, a total of 3.55 acres were treated by means of manual and chemical control resulting in 249 bags of plant material with a combined weight of 5,261 pounds. In total, 26 invasive species were documented by the WRST EPMT. Two new species, Siberian wildrye (*Elymus sibiricus*) and meadow foxtail (*Alopecurus pratense*), were documented for the first time on park lands in 2015. Throughout the season, seed from 30 native species was collected with a combined weight of 12.75 pounds. The collection efforts included 10 new species which were added to the parks seed bank for the first time. Seeds collected this season will be used for future restoration projects in the Kennecott National Historic Landmark.

Acknowledgments

The author would like to thank all the individuals who have dedicated their time and energy to make the 2015 Wrangell-St. Elias National Park and Preserve Exotic Plant Management Team's season a success. A special thanks to Miranda Terwilliger, whose guidance, support and extensive knowledge of WRST were invaluable over the course of the season; Chris Overbaugh for his overall expertise and assistance in all aspects of the EPMT program; as well as Andrea Kawagley and Morgan Gantz for their assistance in the field. I would like to acknowledge the Rowland Family in McCarthy and the Charley Family of Chistochina for permitting us to conduct invasive plant surveys and control work on their property. I would also like to recognize all the partners involved in the Copper Basin Community Weed Management Area for their assistance in monitoring and controlling infestations in the park's gateway communities.

The author would also like to acknowledge those who have so generously volunteered their time to benefit the EPMT this summer; the Student Conservation Association Interns and Youth Conservation Corps interns whose hard work helped to control some of our largest and most persistent infestations; all the volunteers who helped make the second annual Glennallen Weed Smackdown a huge success; and finally, a special thanks to Daniel Walsh, Alisha Newton and Lindsey Newhall for their assistance in the field this summer.

Acronyms

AKNHP Alaska Natural Heritage Program

CB-CWMA Copper Basin Cooperative Weed Management Area

CLM Chicago Botanic Garden's Conservation Land Management

CRWP Copper River Watershed Project

DOT Alaska Department of Transportation

EPMT Exotic Plant Management Team

GNSS Global Navigation Satellite System

NHL National Historic Landmark

NPS National Park Service

ORV Off-road vehicle

RZ Reporting zone

SCA Student Conservation Association

WISE Wrangell Institute for Science and Environment

WRST Wrangell-St. Elias National Park and Preserve

YCC Youth Conservation Corps

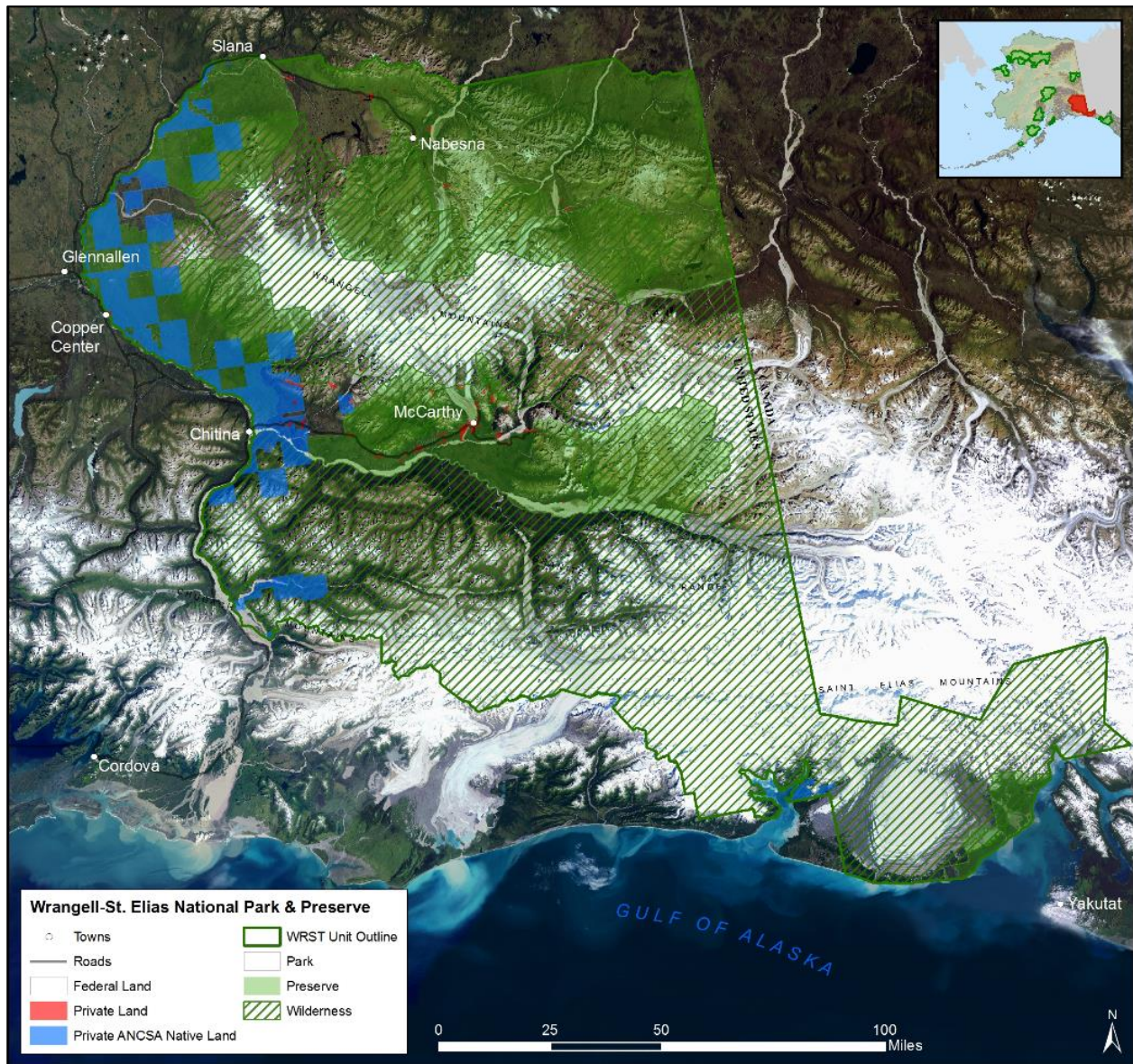


Figure 1. Map of Wrangell-St. Elias National Park and Preserve.

Introduction

Wrangell-St. Elias National Park and Preserve (WRST) spans over 13.3 million acres of south central Alaska, making it the largest U.S. National Park unit (Figure 1). The park encompasses four mountain ranges (Wrangell, St. Elias, Alaska, and Chugach), which contain North America's largest collections of glaciers and peaks above 16,000 feet. This remote and expansive wilderness covers three climate zones and eight distinct ecoregions, ranging from the coastal forests on the Gulf of Alaska to the vast taiga of the interior highlands. This broad array of ecosystems fosters a unique and diverse range of flora and fauna within the park (Figure 2). Despite its rugged environment, the park has supported a long and diverse history of human use. Over the past 100 years, human access to this region has greatly expanded, bringing with it an influx of non-native and invasive plant species. Over that time the number and frequency of invasive plant introductions to this region has increased steadily (Carlson and Shephard 2007).

The establishment and proliferation of invasive plant species can impact the composition, structure and function of natural ecosystems (U.S. Congress 1993). The mechanisms through which invasive species alter natural systems may include; compromising the genetic integrity of native flora through hybridization, out-competing resident plant species for limited resources, altering geochemical and geophysical processes, and damaging fish and wildlife habitat (Vitousek et al. 1996, Gordon 1998). An ecosystems susceptibility to invasion is directly correlated to its level of human or natural disturbance (Hobbs and Huenneke 1992). While most invasive plants in Alaska are limited to human-altered landscapes, several species have begun to threaten undisturbed ecosystems and influence ecological processes (Carlson et al. 2008). The potential for invasive species to disperse into areas of natural disturbance and benefit from climatic change presents a real ecological threat to Alaska's wildlands (Spellman and Wurtz 2010).

Several characteristics make WRST vulnerable to the introduction and spread of invasive plant species. Roads, trails, airstrips and developed areas as well as the ongoing maintenance activities associated with this infrastructure, disturb native plant communities and facilitate the introduction and establishment of invasive species. The land status within WRST is complex and continually changing, with over 800,000 acres of private, state, Native Corporation, and university lands inside the park boundaries (Figure 1). Access to these private inholdings over park lands as well as land uses such as commercial and residential development, logging, and mining add to the challenge of invasive species management in the park. The threat of invasive plant introduction to WRST is compounded by its naturally dynamic ecosystems. Glacial retreat, fluctuating river systems, wildfire and a host of other natural disturbances create ecological niches for invasive plants to establish and spread away from areas with anthropogenic disturbance.

To address the threats posed by invasive plants, the National Park Service (NPS) Alaska Exotic Plant Management Team (EPMT) employs an integrated approach to invasive plant management which includes; inventory and monitoring, control, outreach, education, prevention and restoration. Starting in 2000, baseline surveys were conducted for invasive plants on Alaska NPS lands (Densmore et al. 2001, McKee 2003, Bauder and Heys 2004). The NPS established the Alaska EPMT in 2003

(McKee 2003) and WRST established a park based EPMT program in 2005 (Gilmore 2005). Over the past eleven years the WRST EPMT have gathered baseline data on the extent of invasive plants in the park, conducted annual surveys, established partnerships and community outreach events, honed prevention methods and controlled infestations found in and around the park. Through these efforts the following four objectives have been identified: a) monitor known infestations of invasive plants; b) contain, control and where possible eradicate these infestations; c) inventory areas of known human disturbance where invasive plants are likely to appear and d) where possible, prevent the further spread of invasive species in and around WRST.

In 2015, the WRST EPMT continued annual inventory and monitoring efforts collecting high-quality geospatial data on the distribution, abundance and species composition of terrestrial and aquatic invasive plants in the park. Invasive plant control activities were focused on aggressively treating small and disjunctive infestations and containing large populations that threaten to expand their extent into or within the park. Education and outreach activities targeted park staff and visitors as well as local community members, and sought to better inform them of the threats non-native species pose to native ecosystems. Restoration and prevention efforts focused on building the parks native seed bank and improving cooperative relationships with maintenance staff. The data gathered in 2015 will be used to prioritize future work in the park and formulate long-term monitoring and control goals.

The following report details the work completed by the WRST EPMT in 2015 and provides recommendations for future invasive plant management in WRST.



Figure 2. A meadow of native wildflowers bloom above the Kennicott Glacier in Donoho Basin

Methods

Fieldwork at WRST was conducted between May 27th and September 15th, 2015. The core member of the 2015 WRST EPMT was; Peter Frank, NPS GS-7 Biological Science Technician. Assistance with survey work was provided by four park staff, one Student Conservation Association (SCA) intern and one community volunteer. Four Youth Conservation Corps (YCC) students worked a total of 184 person hours assisting the WRST EPMT with various projects. Two six-person SCA crews worked a total of 720 person hours over the course of three weeks on invasive plant control and native seed collection projects.

Defining Reporting Zones

To facilitate reporting efforts, the park and its environs have been divided into nine reporting zones (RZ) (Figure 3) based on the 2011 WRST Natural Resource Condition Assessment (Drazkowski et al. 2011). Given the parks size, these divisions allow for more meaningful and focused reporting. Therefore, the results in this report are structured around these RZs. This report only addresses the RZs that were visited in 2015.

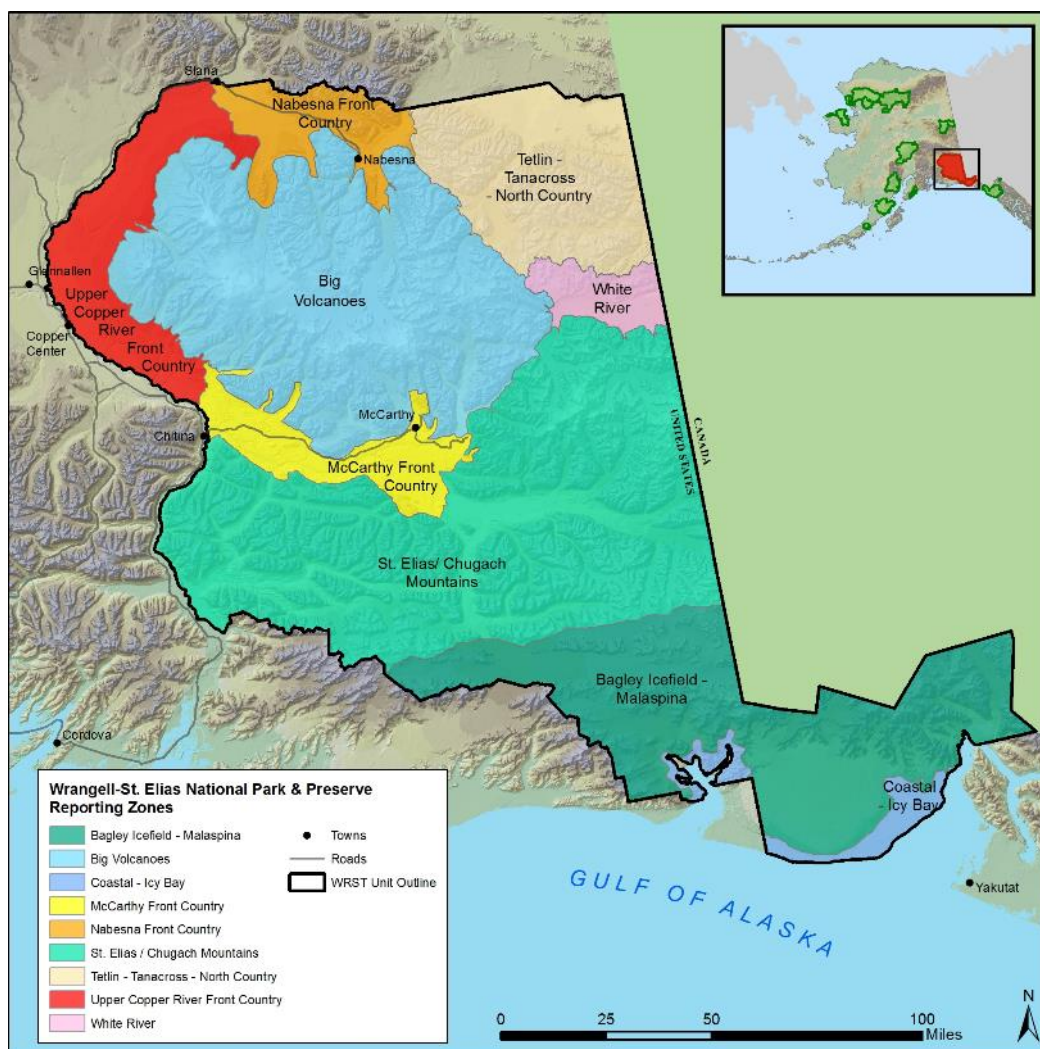


Figure 3. WRST Reporting Zones

Data Collection and Analysis

Methods of mapping and data collection followed the 2015 Alaska EPMT field protocol (Million et al. 2015). All inventory, control and restoration work were mapped using two Trimble GeoExplorer 2008 Series GeoXT data loggers equipped with a standardized Alaska EPMT data dictionary. These units were used to record both spatial and attribute data for geographic information system (GIS) analysis. GPS data were differentially corrected and edited by field personnel using Trimble GPS Pathfinder Office 5.70. Post-processed GPS data were sent to the Alaska Regional office every two weeks to be converted into GIS data and entered into two geodatabases: the National Park Service's National Invasive Species Information Management System (NISIMS) and the Alaska Natural Heritage Program's Alaska Exotic Plant Information Clearinghouse (AKEPIC). GIS data were used to calculate the number of acres surveyed, infested and treated during the 2015 field season. Acres surveyed represent the total area mapped. Acres infested represent the area of a mapped infestation multiplied by the percent cover of invasive plants in that mapped area. Acres treated represents 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. These acreage numbers are used in reporting by the Alaska EPMT and will be used throughout this report. This method of acreage calculation differs from methods used in the past, thus acreages reported in this report may differ from those presented in past reports.

Prioritizing Fieldwork

The WRST EPMT utilized existing data and recommendations from previous years to prioritize inventory and monitoring efforts, identify species for control and select appropriate control methods. In developing a course of action, this season's phenology, available work force and resources were also taken into account.

Inventory and Monitoring

Inventory and monitoring efforts focused transportation corridors and areas of high human activity. Invasive plant surveys within the park were focused in the McCarthy and Nabesna Front Country RZs. The roads, trails and airstrips in these areas receive the majority of the parks visitation and are therefore the primary targets for survey work. Survey efforts outside the park were focused on the park administered lands in Copper Center, Glennallen, Slana, and Chitina. The WRST EPMT used multiple modes of transportation including hiking, biking, Off-Road Vehicles (ORVs) and vehicles to complete surveys.

Inventories for aquatic invasive species, specifically *Elodea*, were focused on water bodies known to receive heavy float plane traffic from infested areas such as Cordova or Anchorage. Water bodies which also support spawning habitat for salmon were given the highest priority. Inventories are conducted by paddling the perimeter of the lake in an inflatable raft or canoe and visually surveying the littoral zone. Unknown plants were retrieved with a net or rake and identified in the boat. In 2015 EPMT staff surveyed aquatic plants in the following three lakes; Hanagita Lake, Summit Lake and Long Lake.

Control Work

Under direction of NPS Management Policy Section 4.4.4 (2006), high priority is given to managing invasive species which have or could have a substantial impact on park resources and that can reasonably be expected to be successfully controlled. Lower priority is given to invasive species that have very little impact on park resources or that cannot be successfully controlled. Where an invasive species cannot be successfully managed, EPMT seeks to monitor and contain the invasive species to prevent further spread or resource damage (NPS 2006). The WRST EPMT expands upon these national standards assessing additional variables (Table 1) to refine the prioritization of control work.

Table 1. Variables used to prioritize invasive plant management.

Variables	High Priority	Low Priority
Invasiveness Rank *	Greater than 55	Less than 55
Geographic Location	Backcountry	Frontcountry
Potential Impacts on Park Resources	Significant	Limited
Potential for Dispersal	Strong	Weak
Extent	Small Extent (<1 acre)	Large Extent (>1 acre)
Feasibility of Successful Control	High	Low

*The invasiveness rank is a 1 to 100 scale, developed by the Alaska Natural Heritage Program (AKNHP), in which higher scores denote greater invasiveness (Carlson et al. 2008).

Infestations given top priority for control in 2015 included: white sweetclover (*Melilotus albus*) at the intersection of the Nabesna Road and Tok Cutoff, common tansy (*Tanacetum vulgare*) at the Glennallen park maintenance yard, oxeye daisy (*Leucanthemum vulgare*) in Kennecott, yellow sweetclover (*Melilotus officinalis*) and yellow toadflax (*Linaria vulgaris*) in McCarthy, and scentless false mayweed (*Tripleurospermum inodorum*) at the Betty Freed property in Slana.

Control Methods

Manual control methods such as hand pulling or digging were the primary means of invasive plant removal employed by the 2015 WRST EPMT. These methods allowed for selective, albeit labor intensive, control. Mechanical control methods such as mowing or string trimming were utilized to a lesser extent on large infestations which have shown little response to manual control efforts. Though these methods do not directly reduce the size of infestations and are less selective, it may help curb the spread of species that propagate through seed dispersal.

All invasive plant material removed through manual or mechanical control was bagged and weighed using a hanging scale. Bags were stored and periodically transported to Anchorage for incineration at a commercial incinerator. This method minimizes the potential for propagule dispersal while disposing of the invasive plant material.

Chemical control was utilized by the 2015 EPMT staff in accordance with the 2010 NPS herbicide Environmental Assessment's (EA) Finding of No Significant Impact (FONSI) (NPS 2010). Chemical herbicides have been employed in WRST since 2011 to control infestations around park headquarters in Copper Center and park properties in Glennallen. In 2015 EPMT staff conducted the first herbicide applications at park service housing in Slana. The herbicide Milestone, a broadleaf specific

herbicide containing the active ingredient aminopyralid, was used for all treatments in 2015. During chemical treatments, an herbicide solution containing 0.16 fl.oz of Milestone per gallon of water was applied to individual plants by spot spraying. All herbicide operations were performed by crew members who had received training and earned certification as State of Alaska Licensed Pesticide Applicators.

Restoration and Prevention

The most efficient and cost effective strategy for managing invasive species is to prevent their introduction. NPS management policies state that park staff should strive to limit impacts on natural systems within the parks, such as introduction of invasive species (NPS 2006). Restoration of native plant communities not only precludes invasive species, but can accelerate the recovery of biological functions and physical components of the parks ecosystems.

In Kennecott, restoration efforts were identified in the Kennecott Operations Plan (NPS 2013) and involve collecting native seed for herbaceous re-vegetation around the NHL, planting grass in historic lawn sites and planting fast growing native shrubs (mainly willow and cottonwood) in select areas for screening and stabilization purposes. Prevention efforts have been focused mostly on equipment and fill brought in to the Kennecott Mill Town for the on-going stabilization work.



Figure 4. Successful use of vegetation mats along the Caribou Creek Trail.

cleaning and preparation is done in house, depending on the type of seed and the available work

For the rest of the park, restoration and prevention efforts have focused in areas with ongoing construction projects and continuing trail maintenance. Maintenance staff has incorporated vegetation mat salvage as part of new trail construction projects (Figure 3). Vegetation mats are harvested from sections of the new trail alignment, and transplanted on old trails or impacted trail margins. The transplanted mats provide living vegetation as well as a wealth of native plant propagules, which greatly increases the rate of native plant regeneration and precludes colonization by invasive plant species. The park has used vegetation mats successfully on the new Copper River Bluffs trail at headquarters (Upper Copper River RZ), in the Kendesnii Campground, the Copper Lake Trail and Caribou Creek Trail (Nabesna Front Country RZ).

The WRST EPMT manages the parks seed bank, which provides native plant material for park restoration projects. Seed collection is done in the fall and focuses on early successional species or species which are prevalent in the area. Seed

force. Seed needing further processing with specialized equipment, such as grasses, will be processed by the Alaska Plant Material Center in Palmer. Seeds are stored at the park headquarters in Copper Center in freezer, kept at 0°F, to prolong viability. Seeds are organized by species as well as the collection location and year.

In an effort to limit the spread of invasive plants through park related maintenance projects, the WRST EPMT attempts to inspect and clean machinery, equipment and ORVs before they enter the park. These efforts are accomplished through cooperation with park maintenance staff and contractors to determine when and where the equipment or UTV will be coming into the park and who will perform the inspections and cleanings.

Outreach, Education and Partnerships

The WRST EPMT seeks to inform employees, local residents, and park visitors about the threats and impacts caused by invasive plants and provide steps that individuals can take to minimize those impacts. For any management plan to be effective, the public must recognize the threats posed by invasive plant species and support the proposed management efforts (NPS 2006). Invasive plants do not recognize boundaries; focusing only on the invasive species within the park is not an effective management strategy as it does not address the root causes of invasive plant introduction and spread. Therefore, partnerships with other parks, agencies, tribal governments, community groups, and landowners must be a critical part of WRST's invasive plant management strategy.



Figure 5. EPMT Booth at the McCarthy Fourth of July Parade.

The WRST EPMT participated in 4 community events this season: the McCarthy 4th of July parade (Figure 4), the third annual Glennallen Weed Smackdown, the Kenny Lake Fair, and the third annual Need for Seed event in Kennicott. Public education booth, were set up at both the McCarthy parade and the Kenny Lake Fair and discussed the threat invasive plants pose to the ecosystem in the Copper Basin.

Two articles regarding invasive weeds, one on the Glennallen Weed Smackdown and the other on chemical treatments in WRST, were published in the Copper River Record to increase awareness of invasive species management occurring in the Copper Basin.

The WRST EPMT is one of the founding members of the Copper Basin – Cooperative Weed Management Area (CB-CWMA). This year marked the third year that the CB-CWMA organized a public weed removal event, the Glennallen Weed Smackdown, which focused on the removal of white sweetclover in Glennallen. The WRST EPMT also partnered with CB-CWMA to inventory and control invasive plants on private lands in and around the park and to apply for the necessary permits to use herbicides in state right-of-way.

Results

In 2015, the WRST EPMT and volunteers spent a total of 1,292 hours in the field surveying for, mapping and controlling invasive plant species (Table 2). Through these efforts 193.95 acres in and around the park and preserve were surveyed and mapped. These surveys resulted in the documentation of 26 invasive plant species covering 9.98 acres (Table 3). This included two previously undocumented species; Siberian wildrye (*Elymus sibiricus*) and meadow foxtail (*Alopecurus pratense*), which were found for the first time in WRST along the McCarthy Road (Table 4). The WRST EPMT treated a total of 3.55 infested acres; of which 2.47 acres were manually controlled and the remaining 1.08 acres were chemically controlled. These control efforts resulted in the removal 5,261 pound of invasive plant material and the application of 40 gallons of mixed herbicide containing 6.5 fluid ounces of Milestone (aminopyralid) concentrate. Seed collection efforts targeted 30 native plant species and resulted in 12.75 pounds of seed gathered. This collection included 10 species which were added to the WRST seed bank for the first time.

Table 2. Invasive plant management person hours for WRST EPMT staff, youth groups, and volunteers.

Year	EPMT Personnel				Youth Groups			Other Volunteers		Total Person Field Hours
	Hires	SCA	CLM	Field Hours	Group(s) Involved	Persons	Total hours	Persons	Total hours	
2005	1	0	0	240	DNR Forestry Intern Program	14	49	0	0	289
2006	1	0	0	260	SAGA, DNR Forestry Intern Program, AmeriCorps TCCC	7	126	2	870	1,256
2007	1	0	1	303	AmeriCorps TCCC	18	576	2	108	987
2008	2	0	0	315	SAGA, YPP	14	98	7	149	562
2009	2	1	1	948	SAGA	10	580	6	117	1,645
2010	2	4	0	1,680	SAGA, YCC	10, 4	3,808	1	120	5,608
2011	1	1	0	410	SAGA, YCC	8, 4	2,240	2	16	2,666
2012	1	2	0	302	SAGA	8, 8, 8	1,488	0	0	1,790
2013	1	1	1	1,009	SAGA, YCC	13, 7, 7	1,480	2	16	2,505
2014	1	0	1	554	SAGA, SCA, YCC	14, 6, 4	973	0	0	1,527
2015	1	0	0	326	SCA, YCC	12, 4	904	3	62	1,292

Table 3. Summary of WRST EPMT invasive plant management data collection

Fiscal Year	Invasive GPS Data ¹												New Invasive Plant Spp in Park
	NPS Managed Lands ²			Non-NPS Lands inside boundary			Non-NPS Lands outside boundary			Total Acreage			
	Acres Surveyed	Acres Infested	Acres Treated	Acres Surveyed	Acres Infested	Acres Treated	Acres Surveyed	Acres Infested	Acres Treated	Acres Surveyed	Acres Infested	Acres Treated	
2005 ^A	0.71	0.03	0.01	1.20	0.06	0.06	7.69	0.32	0.02	9.59	0.41	0.09	1
2006	287.58	0.37	0.24	13.43	0.43	0.01	30.84	0.55	0.00	331.85	1.35	0.25	9
2007	398.76	18.49	0.02	111.57	4.18	0.01	80.84	4.78	0.49	591.17	27.44	0.52	2
2008 ^B	535.87	0.04	0.04	279.54	1.66	0.04	1560.19	0.32	0.14	2375.60	2.17	0.21	4
2009	117.66	6.68	2.10	89.53	12.86	0.42	75.43	10.60	9.80	282.61	30.15	12.32	3
2010	830.09	41.54	3.65	375.20	24.88	1.70	251.58	15.45	3.49	1456.87	81.88	8.84	4
2011	61.89	4.46	1.51	1.55	0.47	0.07	9.01	1.79	1.60	72.45	6.73	3.18	1
2012	27.14	4.43	2.73	7.81	1.18	0.04	10.71	1.70	1.42	45.65	7.31	4.19	0
2013	153.17	2.03	1.11	47.53	11.94	3.18	104.40	46.40	2.38	305.10	60.38	6.67	0
2014	55.64	1.39	0.30	13.18	1.32	0.001	11.26	1.94	1.05	80.08	4.65	1.36	0
2015	109.21	4.83	1.02	76.89	2.47	0.01	7.85	2.68	2.52	193.95	9.98	3.55	2

Note: Foxtail barley acreage is included in this data.

1- The method used to calculate acreage in this table differs from methods used in the past, thus acreages reported in this table differ from those listed in past reports.

2- The January 2015 NPS Land Status (NPS 2015) geodatabase was used to delineate NPS Lands. Due to conveyances this may not have been the status at the time it was mapped. Land that has been selected for conveyances but was not yet conveyed by March 2014 is counted as NPS managed land.

A-Problems with GPS units resulted in low mapping acres.

B-WRST EPMT members drove and mapped the Richardson Highway and the Nabesna and McCarthy Roads looking only for white sweetclover. This accounts for the unusually high number of survey acres.

C-Acres surveyed in 2013 and 2014 include acreage from *Elodea* surveys

Table 4. Summary of infested acres documented in 2015 organized by species and reporting zone.

Invasive Plant Species detected in 2015			McCarthy Front Country RZ	Nabesna Front Country RZ	Upper Copper River Front Country RZ	Big Volcanoes RZ
Scientific Name	Common Name	AKEPIC Ranking				
<i>Melilotus albus</i>	white sweetclover	81	0.005	2.231	0.414	
<i>Linaria vulgaris</i>	yellow toadflax	69	0.001			
<i>Melilotus officinalis</i>	yellow sweetclover	69	<0.001			
<i>Bromus inermis</i>	smooth brome	62	2.172			
<i>Leucanthemum vulgare</i>	oxeye daisy	61	0.009			
<i>Tanacetum vulgare</i>	common tansy	60			<0.001	
<i>Elymus repens</i>	quackgrass	59	0.796			
<i>Trifolium repens</i>	white clover	59	0.121			
<i>Taraxacum officinale</i> ssp. <i>officinale</i>	common dandelion	58	1.618	0.034	0.482	0.017
<i>Trifolium hybridum</i>	alsike clover	57	0.011	<0.001	0.034	
<i>Crepis tectorum</i>	narrowleaf hawksbeard	56	0.135	<0.001	0.920	
<i>Phleum pratense</i>	common timothy	54	0.081			
<i>Elymus sibiricus</i>	Siberian wildrye	53	0.001*			
<i>Trifolium pratense</i>	red clover	53	<0.001			
<i>Alopecurus pratensis</i>	meadow foxtail	52	0.004*			
<i>Tripleurospermum inodorum</i>	scentless false mayweed	48		0.004		
<i>Polygonum aviculare</i>	prostrate knotweed	45		0.008	0.004	
<i>Lappula squarrosa</i>	European stickseed	44			<0.001	
<i>Plantago major</i>	common plantain	44	0.223	0.068	0.136	
<i>Stellaria media</i>	common chickweed	42		0.007		
<i>Thlaspi arvense</i>	field pennycress	42				0.085
<i>Descurainia sophia</i>	flixweed	41	<0.001			
<i>Capsella bursa-pastoris</i>	shepherd's purse	40		<0.001		0.085
<i>Chenopodium album</i>	common lambsquarters	37	<0.001	0.001	<0.001	
<i>Matricaria discoidea</i>	pineapple weed	32	0.001	0.016		0.254
<i>Lepidium densiflorum</i>	common pepperweed	25	<0.001	<0.001	0.001	

* Documented in 2015 for the first time in this RZ

Note: The data presented in this table does not necessarily represent the full number or extent of invasive species present in a given RZ.

Big Volcanoes RZ

The Big Volcanoes RZ occupies most of the central portion of the park, in the heart of the Wrangell Mountains. This RZ is a mix of park and preserve, but is predominately designated Wilderness. There are multiple trails, airstrips and inholdings in this RZ which draw high visitation.

Donoho Basin is one of the most popular backcountry destinations in WRST. Surveys in Donoho Basin were last completed in 2010, during which a small patch of common dandelion (*Taraxacum officinale* ssp. *officinale*), was documented near the overlook at the first lake. In 2015 EPMT staff surveyed the campground on the moraine, the trails leading to the first and second lake as well as the route to Donoho Peak. No invasive species were documented during these surveys.



Figure 6. Dense infestations of field penny cress and pineapple weed in a corral along the Lakina River.

During a trip to a private concessionaire's hunting camp located in designated wilderness along the Lakina River, former WRST EPMT member, Morgan Gantz, documented dense infestations of shepherd's purse (*Capsella bursa-pastoris*), field pennycress (*Thlaspi arvense*), pineapple weed (*Matricaria discoidea*) and common dandelion in the camp's horse corral. These infestations were very dense reaching upwards of 75 percent cover within the corral (Figure 6), but did not appear to be moving out into the surrounding area. The concessionaire, Kelly Verm's Rough and Ready Guide Service, brings the horses in each summer to be used on

guided hunts into the preserve. The horses were most likely the vector for these invasive species and could spread them further into the surrounding wilderness.

McCarthy Front Country RZ

The McCarthy Front Country RZ is a complex portion of the park, which includes the Chitina Ranger station, Kennecott Mines NHL, the town of McCarthy, and the entire McCarthy Road. This RZ is a patchwork of private, state and federal lands as well as a mix of park and preserve (Figure 7). It is the most heavily visited area in the park outside of the visitor center in Copper Center.

McCarthy Road



Figure 7. Bike surveys on the McCarthy Road

The entire McCarthy Road was surveyed by bicycle in early August (Figure 7), starting at the Copper River Bridge outside of Chitina and proceeding 60 miles to the end of the road at the Kennicott River. The McCarthy Road acts as the primary conduit by which invasive plants spread to heavily used park lands in the McCarthy Front Country RZ. Bicycle surveys have been conducted bi-annually on the McCarthy Roads since 2010. This year's surveys focused on documenting, and when feasible, controlling small patches of high priority invasive plant species. Past surveys of the McCarthy road have documented all invasive species encountered, including low priority species such as; common dandelion, pineapple weed, common plantain (*Plantago major*), white clover (*Trifolium repens*), alsike clover (*Trifolium hybridum*) and

lambsquarters (*Chenopodium album*). To focus on higher priority infestations these more pervasive species were not documented during the 2015 surveys.

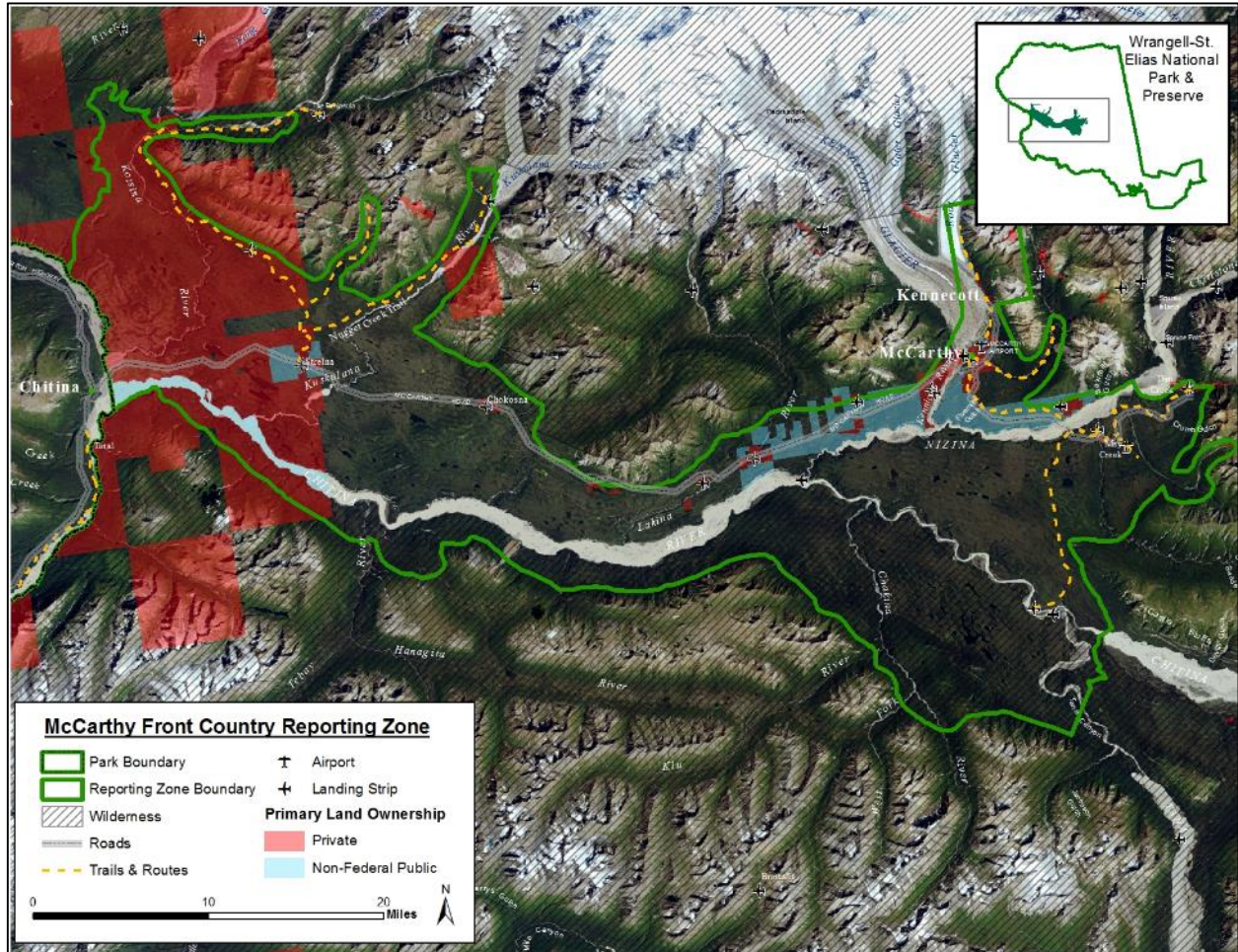


Figure 8. Map of McCarthy Front Country Reporting Zone

Copper River Bridge (Mile 0) to Kuskulana Bridge (Mile 16)

The highest density and greatest diversity of invasive species found along the McCarthy Road are in



Figure 9. Dense monotypic stands of smooth brome at the Kuskulana Bridge.

the first 16 miles. Three invasive grass species; Smooth brome (*Bromus inermis*), quackgrass (*Elymus repens*) and common timothy (*Phleum pratense*), were all documented regularly along this stretch of road. Several dense monotypic stands of smooth brome and quackgrass were noteworthy. Between mile 4 and mile 15, 4 large infestations of quackgrass covered the road margins in stretches as long as 1/3 of a mile. At mile 16, large populations of smooth brome were documented covering approximately 1.5 acres around the abutments on both sides of the Kuskulana Bridge (Figure 9). Two new invasive grass species; meadow

foxtail (*Alopecurus pratensis*) and Siberian wildrye (*Elymus sibiricus*), were documented for first time along the McCarthy road near the entrance to Silver Lake at Mile 10.

Three high priority invasive forbs were also documented in the first 16 miles. A single white sweetclover (*Melilotus albus*) plant was found and removed from the gravel margins on the north side of the road at mile 4. White sweetclover was last documented along the McCarthy Road in 2009. Small populations of narrowleaf hawksbeard were documented and controlled in miles 10, 12 and 14. A much larger and denser population of narrowleaf hawksbeard, found in mile 7, was only documented. A sparse patch of oxeye daisy (*Leucanthemum vulgare*) was found growing amongst native vegetation on a hillside at mile 10 just before the entrance to Silver Lake.

Kuskulana Bridge (Mile 16) to Gilahina Trestle (Mile 29)

White sweetclover, narrowleaf hawksbeard, quackgrass and smooth brome were all documented in an Alaska Department of Transportation (DOT) maintained gravel pit at mile 17. This finding is very concerning given the potential for these species to be dispersed on gravel taken from this pit and used elsewhere along the McCarthy Road. The 224 square foot infestation of white sweetclover found near the southern entrance to the gravel pit was manually controlled by EPMT staff.

Beyond the gravel pit, patches of quackgrass and smooth brome were documented at miles 25 and 26 respectively. Common timothy was documented sporadically between miles 17 to 29, with larger populations found at the Gilahina Trestle wayside.

Gilahina Trestle (Mile 29) to Long Lake (Mile 48)

Past the Gilahina Trestle the frequency and density of high priority invasive species remains low for until the Lakina River at mile 43. Small patches of narrowleaf hawksbeard were documented and controlled in miles 32, 38 and 40 (Figure 9). A single white sweetclover plant was found and removed in mile 37. Between the Lakina River and the end of Long Lake at mile 48, five large infestations of smooth brome were documented. The largest and densest of these infestations covered approximately 0.2 acres on the slopes below the pullout at the end of Long Lake.

Long Lake (Mile 48) to McCarthy Foot Bridge (Mile 60)

The final stretch into McCarthy has relatively few high priority invasive species. Three small patches of narrowleaf hawksbeard were documented and controlled in miles 48 and 52. Two patches of smooth brome were found in miles 49 and 52. After mile 52 the only invasive species found were 4 small and sporadic patches of common timothy.

End of the McCarthy Road (Mile >60)

In 2014, a small patch of yellow sweetclover (*Melilotus officinalis*), yellow toadflax (*Linaria vulgaris*) and narrowleaf hawksbeard was found growing in a pile of rip-rap east of the car bridge



Figure 10. Mapping invasive species found around a newly constructed culvert at mile 38.

over the Kennicott River. This infestation is on private property owned by the Rowland Family, and with their consent it was fully treated. Follow up visits in 2015 revealed that all three species had returned in addition to a single white sweetclover plant. This infestation was fully treated again in 2015. During control work, Keith Rowland, the property owner, approached EPMT staff to express his support for controlling these species. He mentioned that the rock which these species were growing in had been trucked in from Palmer and that he plans to crush it into smaller gravel for use in other projects. During a return visit in late August the rip-rap pile had been removed and crushed.

Kennecott Mines National Historic Landmark



Figure 11. Pulling dandelions on the Bonanza Mine Trail

The Kennecott National Historic Landmark (NHL), along with the nearby town of McCarthy, serve as a source of invasive plant species within the surrounding wilderness. In 2015, survey and control efforts focused on the trail systems which lead out from the Kennecott Mill Town and into the surrounding areas. The Root Glacier trail, which travels along the eastern moraine of the Root Glacier, was one of the focal points for control work in 2015. Common dandelion was the only invasive species documented along the Root Glacier Trail and was found as far as 3 miles up from the trailhead. Patches of common dandelion were relatively sporadic with larger infestations found on the tent pads at the Jumbo Creek Campground, 1.5 miles down the trail. In early June the EPMT, with the assistance of a 6 person SCA crew, were able to control all common dandelion found along the Root Glacier Trail and in the Jumbo Creek Campground. No additional control efforts were made on this population in 2015.

The Jumbo and Bonanza Mine Trails, which lead up to old mining sites in the mountains surrounding the Mill Town, were also targeted for control work in 2015. Control work on these trails was last attempted in 2010 and both were found to be heavily infested with common dandelion as well as smaller patches of white clover and common plantain. In early June, EPMT staff, along with a 6 person SCA crew, hiked up to the furthest extent of the common dandelion infestation, which for both trails was just below tree line. While traveling back toward the Mill Town, all invasive species found along the trails were controlled (Figure 11). On the Bonanza Mine Trail, the crew was able to remove invasive species from approximately 1 mile of trail. The Jumbo Mine trail had much denser infestations and the crew was only able to remove invasive species from approximately ¼ mile of trail. Control work was very difficult on these trails as it requires several hours of hiking over strenuous terrain to reach the farthest extent of the common dandelion infestation.

The priority for invasive species control in the Kennecott Mill Town site are the small populations of oxeye daisy found on NPS land. The largest of these populations is located on a hill- side southwest of the Kennicott Glacier Lodge. This area has been treated every year since 2004, excluding 2005 and 2012, and was fully treated in 2015 during each trip to the Mill Town. Control of oxeye daisy

can be difficult because the plants are perennial and can regrow from root fragments left in the soil. In 2015, fewer than 50 stems were found on this slope. The infestation seems to be decreasing in size with every additional year of control. Other small populations of oxeye daisy found in previous years near the gardens at the Silk Stocking Properties were not detected in 2015. Unfortunately, large populations of oxeye daisy are still cultivated on private property owned by the Kennicott Glacier Lodge and cannot be removed.

Nizina Road

The Nizina Road runs approximately 8.5 miles southeast out of McCarthy to the now abandoned and defunct truss bridge over the Nizina River. This road was partially surveyed in 2007 and extensive infestations of common dandelion, common plantain, pineapple weed, white, red (*Trifolium pratense*) and alsike clover were documented. Surveys in 2015 found all of these species to be prevalent in both road margins along the entire length of the road. Common dandelion was documented moving out from the road onto the gravel flood plain of the Nizina River. These dandelions were removed by EPMT staff. Several patches of quackgrass were also found along the bench cut which brings the road down to the river's flood plain. These infestations were too large to be manually controlled.

May Creek NPS Operations Facilities



Figure 12. A field of dandelions outside the employee cabins at May Creek.

The NPS operations facilities at May Creek are located approximately 11.5 miles southeast of McCarthy. These facilities include a state maintained airstrip, 3 employee sleeping cabins and 1 public use cabin (PUC). Extensive infestations of common dandelion were found around all the cabins (Figure 12) as well as along the trail system, which runs between the various infrastructures at May Creek. The 2,700 foot grass airstrip was also found to be heavily infested with common dandelion. Several populations of white clover and common plantain were found around the cabins and trail system and controlled when

feasible. Two stems of common lambsquarter and seven stems of common pepperweed (*Lepidium densiflorum*) were found and removed from the entryway to the May Creek Operations Lodge. A small trail leading east from the PUC to the banks of Chititu Creek has conveyed common dandelion onto the flood plain of Chititu Creek where it has spread in the gravel river bed and amongst the alders on the banks for at least ¼ downstream. The full extent of the common dandelion population in Chititu Creek was not mapped due to time constraints.

Three abandoned roads, remnants of bygone mining efforts, branch out from May Creek into the surrounding mountains. The Young Creek Trail which once connected May Creek to the bridge over the Nizina River remains partially maintained by private land owners. The trail has large populations of common dandelion and common plantain both in the trail and along the margins. Small

populations of white and hybrid clover were also documented. Approximately 1 mile west from the May Creek Operations Lodge the trail dead ends into Young Creek. Common dandelion has moved into the gravel river bed and is spreading both up stream and down from the end of the trails. The full extent of the common dandelion population in Young Creek was not mapped in 2015.

The Chititu Creek Trail leaves from the southern end of the airstrip and travels 4.5 miles southeast along Chititu Creek to an old mining camp at the confluences of Chititu and Rex Creek. This long abandoned wagon trail has largely been reclaimed by nature, but the invasive species which were brought in during its use, remain and in many locations still thrive in a naturalized setting. Common plantain, alsike clover and white clover were documented sporadically in the first 1.25 miles of the trail. Common dandelion was found to be prevalent along the majority of the 4.5 mile trail as well as on the flood plain at the confluence of Chititu and Rex Creek (Figure 13) and in the old mining camp.



Figure 13. Common dandelion growing in the flood plain along Chititu Creek.

The Dan Creek Trail was not surveyed in 2015 due to time constraints but based on surveys of the trail done in 2003 we expect it to have populations of invasive species similar to those seen on the Chititu and Young Creek Trails.

Nabesna Front Country RZ

The Nabesna Front Country RZ is a patchwork of private and federal lands containing, among other things: the entirety of the Nabesna Road, the highest density of trails in the park, the Slana Ranger station, the traditional Batzulnetas fish camp, and the community of Slana. NPS managed lands in this RZ are a mix of park and preserve, with small inclusions of wilderness (Figure 14).

Slana



Figure 14. Before and after photo of control work on white sweetclover at the Tok Cutoff

Since 2005, annual control work has been performed on a large infestation of white sweet clover found just outside of the park at the intersection of the Nabesna Road and Tok Cut-Off. Preventing the spread of white sweetclover down the Nabesna Road and onto park service land is one of the WRST EPMT top priorities. Over 4 days in mid-July EPMT staff, as well as crews from both the SCA and YCC,

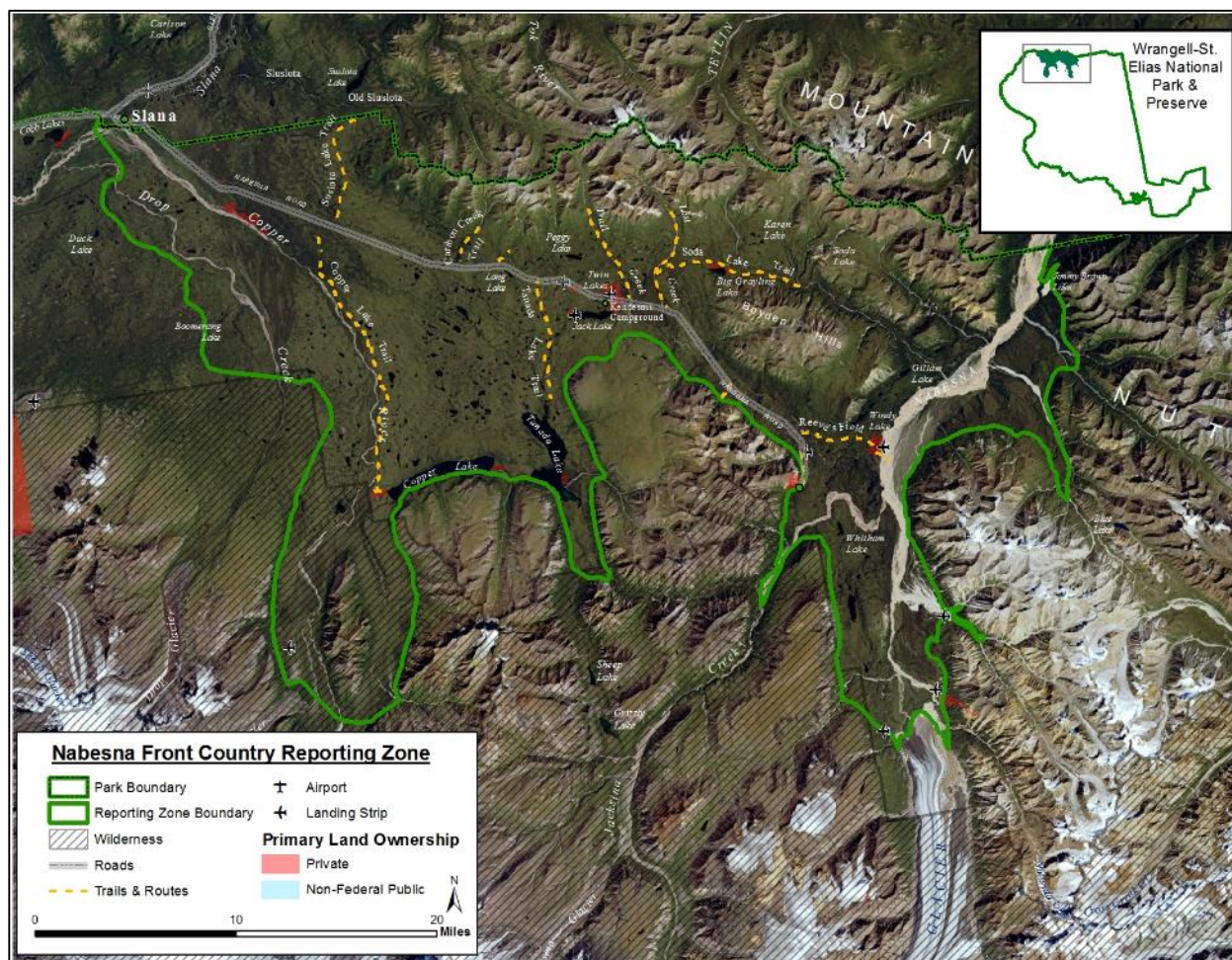


Figure 15. Nabesna Front Country Reporting Zone

manually removed and bagged approximately 2,030 lbs. of white sweetclover, which covered 2.06 acres of land (Figure 14). Control efforts focused on pushing the infestation away from the Nabesna Road, which leads to the Slana Ranger Station and into the park. EPMT staff partnered with the Copper River Watershed Project (CRWP) to obtain permits from the Alaska DOT to control this infestation with herbicides. Though the permit was granted, each attempt to spray had to be cancelled due to poor weather conditions.

The Slana Ranger Station is located just outside of the park boundary at the beginning of the Nabesna Road. In mid-June, EPMT staff surveyed the areas around the Slana Ranger Station and associated park buildings. Common dandelion, common plantain and pineapple weed were documented and controlled around park buildings behind the ranger station. Construction in the housing area behind the Ranger Station had covered several small patches of pineapple weed and common plantain documented in previous years.

Approximately 2 miles west of the Slana Ranger Station along the Nabesna Road is the Betty Freed Property. This small piece of park owned land is used for seasonal staff housing. In early June,

EPMT staff applied herbicides to control all invasive plant species found on this property. This was the first time that EPMT staff used herbicides to control invasive species in the Nabesna Front Country RZ. Treated species included: scentless false mayweed (*Tripleurospermum inodorum*), common dandelion, pineapple weed, shepherd's purse, prostrate knotweed and common lambsquarters. These species were found primarily in the mowed areas and gravel margins around the buildings. Scentless false mayweed was specifically targeted as control efforts have steadily reduced its extent on the Freed property over time. In 2015, only 32 stems of scentless false mayweed were documented and controlled. Narrowleaf hawksbeard was found for the first time at the Betty Freed property in 2015. A single plant was found and removed from a pile of gravel which had been brought to the area from the Glennallen Maintenance Yard.

Nabesna Road and Trail System

The Caribou Creek Trail starts at mile 19.5 of the Nabesna Road and travels 3 miles north into the foot hills of the Mentasta Mountains to a small PUC. Extensive maintenance was completed on this trail in 2013 and 2014. EPMT staff surveyed the trail in early June and found no invasive species.

Reeve's Field Trail provides access to a historic airstrip located 5 miles east of the Nabesna Road along the banks of the Nabesna River. EPMT staff partially surveyed this trail via ORV in mid-July, but the trail was found to be impassable beyond Cabin Creek approximately 3.5 miles from the trailhead. The trail travels primarily through open sedge bogs and tussocks and there appears to be limited suitable habitat for invasive species. Aside from small populations of pineapple weed and common plantain at the trail head, no invasive species were documented on the Reeve's Field Trail.

The Copper Lake Trail runs south from the Nabesna Road 14 miles to Copper Lake and the wilderness boundary. This trail has received extensive maintenance in the past several years and is currently undergoing construction to reroute the trail to dryer ground near the flood plain of the Copper River. EPMT staff surveyed 9 miles of the trail up to the furthest point along the new reroute. Several invasive species were documented in the first 3 miles, between the trailhead and Tanada Creek. Shepherd's purse, common plantain and prostrate knotweed (*Polygonum aviculare*) were found sporadically and removed from the trail and drainage swales dug by the trail crew. Larger infestations of prostrate knotweed, shepherd's purse and common chickweed (*Stellaria media*) were documented around the Tanada Creek Bridge as well on the old creek crossing trails east of the bridge (Figure 16). A single specimen of narrowleaf hawksbeard was found and removed from the gravel in front of the northern entrance to the Tanada Creek Bridge. No invasive species were documented more than ¼ mile south of the Tanada Creek Bridge.



Figure 16. Common chickweed found along the Copper Lake Trail.

In 2014 the WRST trail crew installed rice straw wattles to decrease runoff and soil erosion along a bench cut at mile 7 of the Copper Lake Trail. The rice straw wattles were “Certified Weed Free” in California, but are not certified for Alaska. Areas where these wattles had been installed were surveyed in 2015 and no invasive species were found.

Upper Copper River Front Country RZ

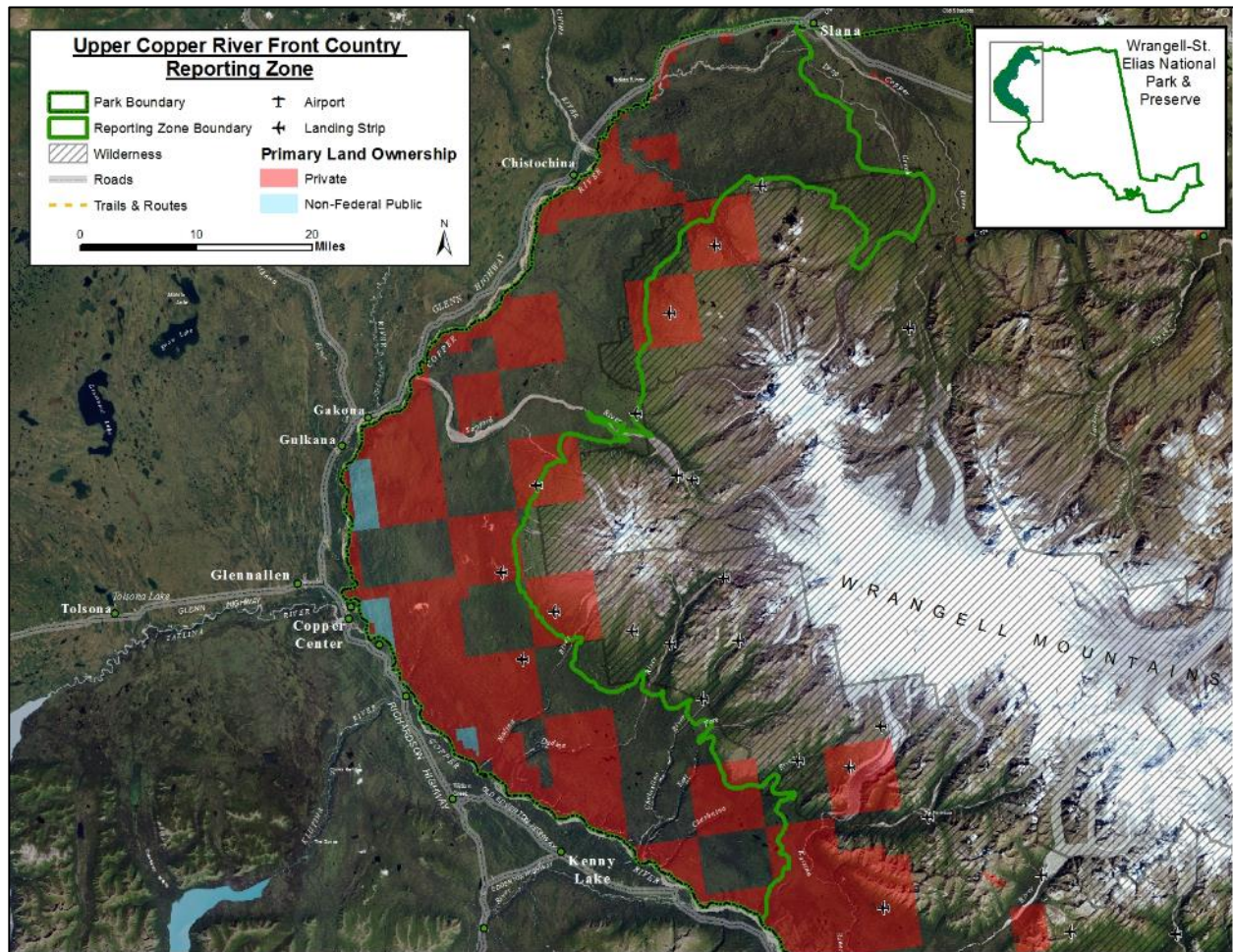


Figure 17. Upper Copper River Front Country Reporting Zone

This RZ covers the lowlands around the Copper River east to the foot hills of the Wrangell Mountains. Within this RZ (Figure 16), 41 percent of the land is owned by Native corporations (NPS 2015). Though not contained within the park boundary, the park headquarters in Copper Center and park properties in Glennallen are included in this RZ. These locations serve as the main hubs from which NPS employees and equipment depart when traveling into the park. As such, these sites serve as potential sources for the translocation of invasive species into the park. Therefore, these areas are an important component of the invasive plant management strategy in WRST.

WRST Headquarters

The WRST Headquarters campus is located off the Richardson Highway near Copper Center. Despite not being within the park boundary, it is the most visited area under park ownership. Efforts have been made to control and monitor invasive plants within this complex since its construction in

2002. During the 2015 season, common dandelion, alsike clover, common plantain, narrowleaf hawksbeard, pineapple weed and prostrate knotweed were all documented on the headquarters campus. In late May EPMT, staff applied 20 gallons of mixed herbicide (3.25 fl.oz. of Milestone concentrate) to 0.54 infested acres around the WRST Headquarters campus. These treatments focused on the road and parking lot margins as well as the maintained landscapes surrounding the NPS entrance sign, visitor center facilities and administrative buildings. Larger infestations found in the gravel pit and employee housing areas south of the main headquarters campus were not treated in 2015.

During surveys along the newly constructed Copper River Bluffs trail, small populations of narrowleaf hawksbeard, common lambsquarter, European stickseed (*Lappula squarrosa*), and a single white sweetclover plant were documented and manually controlled. These species were likely brought in on gravel from the Glennallen Maintenance Yard which was used to harden the trail.

Glennallen Maintenance Yard

The joint BLM/NPS maintenance yard in Glennallen is used to store and stage equipment used for multiple projects throughout the park. Narrowleaf hawksbeard and common tansy (*Tanacetum vulgare*) have been targeted for manual control in the maintenance yard since 2009 and chemical control since 2011. The density of common tansy has decreased significantly as a result of this continued control and in 2015 only 3 plants were documented. Control of narrowleaf hawksbeard has not been as successful and despite annual control efforts, the maintenance yard remains heavily infested. The small population of white sweetclover documented in a gravel pile at the center of the maintenance yard in 2014 was not found in 2015.



Figure 18. Narrowleaf hawksbeard growing along the Chetaslina River.

Lower priority species including; common dandelion, common plantain, pineapple weed, prostrate knotweed, common lambsquarter, alsike clover and common pepperweed are well established throughout the maintenance yard.

In late May, EPMT staff applied 16 gallons of mixed herbicide (2.6 fl. oz. of Milestone concentrate) to 0.43 infested acres in the Glennallen maintenance yard. This application targeted all invasive forb species found throughout the yard.

This initial treatment appeared to have moderate

efficacy, especially when target species were in the cotyledon or rosette stage. Invasive species which germinated later during the summer, as well as the large infestations of quackgrass and smooth brome documented in 2014, were not treated due to limited staff availability and time constraints.

Chetaslina River

In 2014 Kate Morse of the CRWP contacted staff at Wrangell-St. Elias National Park and Preserve (WRST) to report that a population of narrowleaf hawksbeard was found on Ahtna, Incorporated lands at confluence of the Copper and Chetaslina Rivers. Ahtna, Inc., is an Alaska Native Regional

Corporation that owns lands within WRST's external boundaries. The population was reported to cover multiple acres of an open field and bison wallow on the eastern banks of the Chetaslina River. In mid-July, EPMT staff, along with a NPS fisheries biologist and a NPS compliance archeologist, traveled to this site via jet boat from the Chitina Airport. Surveys of the area found a large but diffuse population of narrowleaf hawksbeard spanning over 11.7 acres. The percent cover of this infestation was relatively low, between 1 and 5 percent with isolated patches up to 25 percent cover. The infested acreage was calculated to be only 0.7 acres. At the time of observation the majority of narrowleaf hawksbeard had already set seed or was beginning to set seed (Figure 17), and a significant number of plants had already completed their life cycle and were found standing dead. Therefore, it is likely that the density of narrowleaf hawksbeard at this site is higher than what was observed during this trip. EPMT staff submitted a technical report to Ahtna, Inc., which detailed the extent of this infestation and assessed future management alternatives.

***Elodea* Surveys**

Since 2011, yearly surveys for non-native aquatic plant species have been conducted in WRST, as part of an early detection effort. In 2015, three lakes were surveyed; Long Lake, Hanagita Lake and Summit Lake. Long Lake, located at mile 45.2 along the McCarthy Road, was surveyed for the third time in 2015. The outlet creek of Long Lake flows into the Lakina River, a tributary of the Chitina River in the Copper River drainage. This system provides important spawning habitat for sockeye salmon, which contribute to down-river commercial, personal use, and subsistence fisheries (McCormick and Sarafin 2013). Private land owners regularly fly between Long Lake and Cordova, which has several float plane lakes infested with *Elodea*. The lake was surveyed in a hard sided canoe in late August and no non-native aquatic plants were documented.



Figure 19. EPMT staff takes vegetation samples during *Elodea* surveys on Hanagita Lake.

Hanagita Lake is the largest of three lakes connected by the Hanagita River. Located approximately 28 miles south of Chitina, this lake is only accessible by float plane. A small plot of land owned by Alaskan Wilderness Outfitting Company, operating out of Cordova, is located at the north western end of the lake near the outlet. Surveys were conducted in late August and no non-native aquatic plants were documented (Figure 19).

Summit Lake, located 15 miles southeast of Chitina, was once a popular fishing destination known for its introduced rainbow trout population. Current visitation is limited primarily to state and federal fisheries biologists due to an ongoing project to manage the rainbow trout population. The lake is highly oligotrophic, and has very little naturally occurring vegetation. No non-native aquatic plants were documented during surveys conducted late August.

Restoration and Prevention

EPMT staff coordinated with the maintenance staff to ensure that equipment, gear and most importantly all ORVs were cleaned outside the park prior to being taken into the field. The EPMT hopes to work with maintenance staff to create contract language which will ensure that best management practices for mitigating the spread of invasive are followed by WRST staff and contractors. This would include a more formal equipment cleaning process and inspection of outside materials being used such as fill, gravel or erosion control materials.

Table 5. Native seed collected for the Need for Seed within the Kennicott Valley

Scientific Name	Common Name	Seed Weight (g)
<i>Achillea millefolium</i>	common yarrow	1
<i>Aquilegia formosa</i>	western columbine	10
<i>Arctostaphylos rubra</i>	red bearberry	24
<i>Arnica latifolia</i>	broadleaf arnica	10
<i>Artemisia arctica</i>	arctic wormwood	2
<i>Aster sibiricus</i>	siberian aster	2
<i>Bromus ciliatus</i>	fringed brome	178
<i>Calamagrostis canadensis</i>	bluejoint reedgrass	1829
<i>Castilleja unalaschcensis</i>	unalaska indian-paintbrush	5
<i>Chamerion angustifolium</i>	fireweed	18
<i>Cornus Canadensis</i>	bunch berry	11
<i>Dryas drummondii</i>	yellow dryas	335
<i>Elaeagnus commutata</i>	silverberry	406
<i>Elymus trachycaulus</i>	slender wild rye	44
<i>Erigeron acris</i>	daisy fleabane	5
<i>Geranium erianthum</i>	geranium	1
<i>Geum macrophyllum</i>	large leaf avens	28
<i>Hedysarum alpinum</i>	eskimo potato	895
<i>Heracleum maximum</i>	cow parsnip	1610
<i>Juniperus communis</i>	common mountain juniper	3
<i>Lupinus arcticus</i>	lupine	1
<i>Mertensia paniculata</i>	tall bluebells	2
<i>Oxytropis campestris</i>	oxytrope	57
<i>Polemonium boreale</i>	jacob's ladder	1
<i>Potentilla fruticosa</i>	shrubby cinquefoil	2
<i>Rosa acicularis</i>	prickly rose	218
<i>Solidago multiradiata</i>	northern goldenrod	29
<i>Trisetum spicatum</i>	spiked trisetum	12
<i>Veratrum viride</i>	false hellebore	17
<i>Viburnum edule</i>	highbush cranberry	31

EPMT staff surveyed a privately owned gravel pit in Chistochina, from which WRST maintenance staff will be pulling gravel for projects in the Nabesna Front Country RZ. The gravel pit, which is owned by the Charley Family, was surveyed in accordance with the standards laid out by the Alaska Department of Natural Resource's Weed Free Gravel Program. Four invasive species were documented on the periphery of the gravel pit, and no invasive species in or around the gravel piles,

storage areas or equipment. This information was passed along to both the owners and to WRST maintenance staff.

In an effort to build-up the parks native seed bank, EPMT staff collects seed from around the park each fall. EPMT staff worked with a six person SCA crew for five days in early September to collect native seed from areas around the Kennicott Valley. Thirty species of native plants were collected, including 10 species added in the WRST seed bank for the first time (Table 5). Seed collection efforts in 2015 resulted in a 2 fold increase, from 5.4 pounds in 2013 to 12.75 pounds in 2015.



Figure 20. SCA crew collects seed along the Jumbo Mine Trail.

This increase was largely due to a greater focus on collecting seed from grass species. EPMT staff found several open meadows off of the Jumbo Mine Trail to be very productive sites for seed collection (Figure 20).

The third annual Need for Seed community event was co-hosted by the WRST EPMT and the Wrangell Mountain Center on Friday September 4th from 10am-2pm in McCarthy. No community volunteers came out to participate in the seed collection portion of the event, but two individuals attended the pot luck and presentations held after the seed collection.

Education/Outreach

Efforts to educate the park staff, visitors and the general public about the presence and impacts of invasive plants is an important component of the WRST EPMT's invasive plant management strategy. The WRST EPMT had informational booths at both the McCarthy Fourth of July Parade and the Kenny Lake Fair. These events allow EPMT staff to discuss invasive species issues and concerns with event participants. These booths also allowed EPMT staff to disseminate educational materials into the community and provide technical assistance to local community members. Both booths were well received and allowed for lively discussion and interaction with area residents.

The CB-CWMA held the third annual Glennallen Weed Smackdown to combat the infestation of white sweetclover along the Glen Highway through the gateway community of Glennallen. The event was held at the ROAR recycling center and 27 participants, including 11 community volunteers, assisted in removing 1,319 pounds of white sweetclover from the margins of the Glenn Highway (Figure 20). Participants received a free CB-CWMA water bottle and pizza lunch, which were provided by partners from the CB-CWMA.



Figure 21. Glennallen Weed Smackdown participants

Recommendations

Inventory and Monitoring

Increasing human activity and development within WRST creates a high level of invasive species propagule pressure. This is exemplified by the steady movement of white sweetclover down the McCarthy Road or the introductions of narrowleaf hawksbeard to the Copper Lake Trail. Despite attempts at prevention, there remains a constant stream of invasive plant propagules flowing into WRST. Continued surveys are critical to identify these introductions early and allow for management while populations can still be successfully controlled.

EPMT staff should continue with its biannual bicycle survey of the Nabesna road; focusing on pullouts trailheads and developed areas such as the Kendesnii Campground. There were several DOT projects conducted along the Nabesna road in 2015 which should be monitored during next summer surveys. These include; road hardening between mile 15 and 18 and the replacement of the Jack Creek bridge.

WRST trail crew staff employs a cyclical maintenance schedule to improve commonly used ORV trails throughout the park. During the 2015 season, extensive trail work was performed on the Copper Lake Trail, Caribou Creek Trail and Kotsina Trail. If feasible, these trails should be surveyed in 2016 to ensure that no invasive species were brought during trail work. Several other trails and maintained areas including the Trail Creek Trail, Nabesna Mine Trail and Chisana have not been surveyed in at least four years. These areas should be surveyed in 2016 if time allows.

EPMT staff should obtain permission to survey the private inholdings at Ultima Thule Lodge and Marvelous Mill. Ultima Thule Lodge is located on the Chitina River 50 miles southeast of McCarthy. Donna Claus, one of the Lodges proprietors, expressed interest in learning about invasive species in the spring of 2015. The 2016 EPMT should follow up on this and offer to survey their inholding for invasive species. Marvelous Mill, located roughly 8 miles northeast of McCarthy, was last surveyed in 2012 and was found to be heavily infested with several invasive species. A thorough inventory and assessment of management options for the invasive species on and around this property will be important when evaluating any potential future developments.

No surveys have been conducted in the Coastal-Icy Bay RZ since 2009. If feasible, EPMT staff should survey park property in Yakutat as well as points of interest along the coast, such as the Esker Stream Cabin. While in Yakutat there may also be an opportunity to monitor other invasive species in the marine environment, such as the European green crab (*Carcinus maenas*) and/or colonial tunicates, such as *Didemnum vexillum*, both of which are a concern in Alaska but have never been surveyed for in this area.

Elodea Surveys

The number of documented occurrences of *Elodea* in Alaska is steadily increasing; with new infestations in Anchorage, Fairbanks and Cordova identified in 2015. Although no lakes within WRST have been found to contain *Elodea*, monitoring of popular float-plane lakes should remain a priority to ensure early detection. The WRST EPMT should develop an *Elodea* survey protocol

which outlines the methods for surveying lakes, identifies at risk lakes in WRST (Appendix C) and establishes a hierarchical survey schedule. High float plane traffic and close proximity to established populations of *Elodea* make WRST very susceptible to introductions; therefore, it is important that future EPMT staff contribute to any planning efforts on dealing with this species in the region.

During the 2015 season, an inflatable canoe was used to survey lakes where float plane travel was required. The inflatable canoe worked well and seemed to be faster and more stable than pack rafts. For lakes that are road accessible, a regular hard sided canoe worked very well, as it provides more control and maneuverability than the inflatable canoe.

For 2016, target lakes should include: Jack Lake, Tebay Lakes, Tanada Lake, Carden Lakes, Steamboat Lake and Ross Green Lake. Annual surveys of Long Lake on the McCarthy Road should also continue.

Control Work

Consistency is crucial to the success of any invasive plant control project. In 2016 the WRST EPMT should strive to identify infestations which are a high priority for control and establish treatment goals which can be maintained into the future. This process will involve reassessing the variables (Table 1) which go into establishing an infestations priority, with particular scrutiny toward an infestations feasibility of successful control.

Manual Control

Manual treatments are the primary means of invasive plant control employed by the WRST EPMT. In many cases consistent manual control has allowed for significant reductions in an infestations density and extent; examples of this include the oxeye daisy in the Kennecott NHL and scentless false mayweed in Slana. In other cases, despite diligent control efforts, populations have shown little to no response to manual treatments; this is exemplified by the infestations of common dandelion along the Root Glacier Trail (Figure 22), and white sweetclover at the intersection of the Nabesna Road and Tok Cutoff. Populations which respond well to manual treatment are typically small, making thorough control

relatively easy, and isolated, limiting future propagule pressure. The 2016 EPMT should focus manual control efforts on populations with a high probability for successful control and reevaluate other populations to identify new, potentially more effective, means of control.

Infestations that should be manually controlled in 2016 include: oxeye daisy in the Kennecott NHL; shepherd's purse, common plantain, prostrate knotweed and common chickweed on the Copper Lake Trail; white sweetclover and narrowleaf hawksbeard on the McCarthy Road; and white sweetclover, yellow sweetclover, narrowleaf hawksbeard and yellow toadflax in McCarthy.



Figure 22. SCA crew poses while pulling dandelions on the trails within the NHL but outside of the Mill Town

Manual treatments should also be used in conjunction with herbicide applications to obtain more complete control. For many target species, such as common dandelion and narrowleaf hawksbeard, the efficacy of herbicides decreases as the plant matures. A combination of manual and chemical treatments is needed to provide complete control. Using this dual treatment strategy will require having a larger crew available when spraying, or investing more time into each treatment area.

Chemical Control

Herbicides were first used in WRST in 2011, and over the past five years have proven to be an effective and efficient means of controlling invasive plant species. An excellent example of this is the management of common tansy in the Glennallen Maintenance Yard, where, since initial herbicide treatments in 2012, the population has decreased from 0.14 acres to just three isolated plants in 2015. In the past, there has only been one member of the WRST EPMT licensed to apply herbicides, which limits the number of treatments that can be effectively made in a season. In 2016, it's recommended that seasonal EPMT staff, whose appointments are longer than five months, be asked to obtain their Alaska Pesticide Applicators license.

Herbicide applications should continue at the Copper Center Headquarters Campus, Glennallen Maintenance Yard and Betty Freed Property in Slana. In the past, these sites have only been treated with herbicide once a year, typically in early or late summer. Given the continual emergence of many invasive plant species throughout the growing season, it is suggested that herbicide control occur multiple times throughout the year.

The 2016 EPMT should obtain permits from the AK-DOT to use herbicide for controlling white sweetclover at the intersection of the Nabesna Road and Tok Cutoff as well as in Kuskulana Gravel Pit. In the early spring, EPMT staff should partner with the CRWP to complete the necessary paperwork for these herbicide applications. The applications should be conducted in early June with the potential for follow up treatments in mid-August.

Restoration and Prevention

Restoration efforts at the Kennecott Mines NHL should continue as outlined in the Kennecott Mines NHL Operations Plan (NPS 2013). Park managers have identified three restoration projects for the 2016 field season. The first project includes revegetation and invasive plant removal on the re-contoured slopes leading to the general manager's office. The earth work on this project was completed several years ago and a mix of native and invasive vegetation has begun to colonize the area. These steep gravelly slopes would be an ideal place to plant native grass seed collected in past years. The second project is to establish vegetation screening for maintenance infrastructure and equipment below the dairy barn. The slope just above the generator conex has been identified as a potential site for this screening. This project would involve controlling the invasive quackgrass which currently covers this hill and transplanting dormant hardwood cutting of willow and cottonwood. Finally, the WRST EPMT should continue its annual seed collection efforts in Kennicott Valley (the area around the NHL). The focus of these collections should be on native grass species such as *Calamagrostis canadensis* and *Elymus trachycaulus*. In 2015, EPMT staff found the Jumbo Mine Trail to have several large grassy meadows that were excellent for seed collection (Figure 23).



Figure 23. SCA crew collects seed in grassy meadows along the Jumbo Mine Trail.

Increased communication and partnership with WRST trail crew leads is a key part of preventing the introduction of invasive plants through regular park maintenance. 2016 EPMT staff should meet with trails leads in the spring to discuss equipment and tool cleaning, sources of fill material and potential restoration projects. Specific projects, such as concealing and restoring old trail alignments along the Copper Lake Trail, were discussed in 2015. The 2016 EPMT staff should follow up with trail leads and create a work plan for these projects. EPMT staff should also begin collecting seed in the Nabesna Front Country RZ to be used in restoration projects

on the numerous ORV trails in the area.

Education and Outreach

Glennallen Weed Smackdown

The Glennallen Weed Smackdown was a great success in 2015. Although the overall participation decreased from the 2014, a higher proportion of unsolicited community volunteers attended.

Improving advertisement and public awareness of the event should be stressed in 2016. The free lunch, provided by Fireweed Grill and paid for by CB-CWMA partners, was a great incentive for community involvement and should be continued in future years.

Need for Seed

The community participation at the Need for Seed event in Kennicott Valley has been very poor for the past three years. Although the seed bank has been greatly increased in that time due to the hard work of SCA crews, the support of the community is still missing. In the future, seed collection with the SCA crew should be separate from the community event. EPMT staff should partner with the Wrangell Mountain Center to hold a McCarthy Need for Seed workshop in early August before community members leave for the winter. This event should involve a presentation on the benefits of collecting and propagating native plant seed followed by seed collection and cleaning demonstrations.

EPMT Informational Booths

The EPMT should continue to participate in the McCarthy 4th of July parade and Kenny Lake Fair. These events are a great way to increase community involvement and awareness of efforts to manage invasive species in the Copper River Basin. Information provided at these booths has focused primarily on identifying species of concern and explaining their potential impacts on the local environment. In the future, EPMT staff should include more information on things community members can do to help, such as; controlling weeds on their property, planting native or non-invasive seed and spreading the word to others. Giving out native plant seed or seedlings could be a good way to draw attention to the booth and promote the use of native plants in landscaping.

Outreach and WRST Staff

Training, education and partnership with the park's maintenance staff, trail crews and contractors is an important part of mitigating the spread of invasive species through park maintenance projects. Presentations at spring training on vegetation salvage and invasive plant mitigation best management practices are recommended for 2016. It may also be useful to have an EPMT member attend or call in to trail crew meetings whenever possible to get scheduling information and project updates.

WRST Interpretative rangers have assisted the EPMT in recording data on both native and invasive plant phenology around the Copper Center, Slana, Chitina and Kennecott visitor centers since 2010. Participation and thoroughness of the data collection vary significantly year to year depending on staff. If possible, EPMT staff should work with the supervisors in the interpretation division to make the phenology log a fixed part of one or multiple ranger's weekly duties. Focusing the target species to include only specific plants of interest could decrease the time and effort required for phenology monitoring.

The use of social media and mobile technology to raise awareness for invasive plant issues should be increased by the WRST EPMT. The park's Flickr and Facebook pages are two quick and easy social media venues through which EPMT staff can share recent accomplishments, announce events, or publicize newly documented invasive species. In 2015, the University of Alaska Cooperative Extension Service Alaska released Alaska Weed ID, a mobile application used to identify and report invasive species. This app could be a useful tool for other park staff or field researchers to assist the WRST EPMT with invasive species inventory efforts.

Exotic Plant Herbarium Vouchers

The collection of vouchers is an important part of the invasive plant management program at WRST because they provide tangible evidence that a species is or was present within the park. Vouchers can also be used to aid in future identification of the species. Voucher specimens of invasive plants have been collected in WRST since the 1930's and the park herbarium contains vouchers for the majority of invasive plant species currently or formerly found in the park (Appendix C). EPMT staff should continue to collect vouchers for the initial documentation of a species in the park or at a specific site. It should also be a priority to fill in the gaps in the collection by gathering vouchers of known invasive species in the park which are currently not represented in the herbarium.

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Appendix A: List of park owned invasive plant vouchers

This table lists the invasive plant species documented within Wrangell-St. Elias National Park and Preserve and adjacent lands sorted by their 2015 AKEPIC invasiveness ranking. Plants where there are no vouchers should be targeted for collecting in future years. Species with an AKEPIC ranking over 50 are considered the highest priority for inventory and control by the EPMT. This list is not comprehensive as there may be other invasive plant vouchers that the park is not aware of.

Latin Name	Common Name	2015 AKEPIC Rank	Voucher Specimen No.	Found in Following Reporting Zones
<i>Phalaris arundinacea</i>	reed canarygrass	83	1	Upper Copper River RZ (Glennallen)
<i>Melilotus albus</i>	white sweetclover	81	1	McCarthy RZ, Nabesna RZ, Upper Copper River RZ
<i>Caragana arborescens</i>	Siberian peashrub	74	1	McCarthy RZ
<i>Vicia cracca</i>	bird vetch	73	4	Upper Copper River RZ (Kenny Lake)
<i>Linaria vulgaris</i>	yellow toadflax	69	2	McCarthy RZ
<i>Melilotus officinalis</i>	yellow sweetclover	69	1	McCarthy RZ (private property)
<i>Medicago sativa</i>	alfalfa	64	1	Upper Copper River RZ
<i>Bromus inermis</i>	smooth brome grass	62	4	McCarthyRZ, Upper Copper River RZ
<i>Leucanthemum vulgare</i>	oxeye daisy	61	1	McCarthy RZ
<i>Tanacetum vulgare</i>	common tansy	60	1	Upper Copper River RZ
<i>Elymus repens</i>	quackgrass	59	3	McCarthy RZ, Upper Copper River RZ
<i>Trifolium repens</i>	white clover	59	3	Big Volcanoes RZ, McCarthy RZ , Upper Copper River RZ
<i>Taraxacum officinale ssp. officinale</i>	common dandelion	58	0	McCarthy RZ, Nabesna RZ, Big Volcanoes RZ, St. Elias-Chugach RZ, North Country RZ, Upper Copper River RZ
<i>Trifolium hybridum</i>	alsike clover	57	1	McCarthy RZ, Nabesna RZ, Upper Copper River RZ
<i>Crepis tectorum</i>	narrowleaf hawksbeard	56	2	McCarthy RZ, Nabesna RZ, North Country RZ, Upper Copper River RZ, Tetlin-Tanacross RZ
<i>Phleum pratense</i>	common timothy	54	4	Big Volcano, McCarthy RZ, Nabesna RZ, Upper Copper River RZ, North Country RZ.
<i>Elymus sibiricus</i>	Siberian wildrye	53	1	McCarthy RZ
<i>Trifolium pratense</i>	red clover	53	1	McCarthy RZ, Big Volcanoes RZ, Upper Copper River RZ
<i>Alopecurus pratensis</i>	meadow foxtail	52	1	McCarthy RZ
<i>Poa pratensis ssp. pratensis</i>	Kentucky bluegrass	52	4	Big Volcanoes RZ, North Country RZ, Upper Copper River RZ
<i>Lolium perenne spp. perenne</i>	perennial ryegrass	52	0	McCarthy RZ
<i>Fallopia convolvulus</i>	black bindweed	50	1	Big Volcanoes RZ, McCarthy RZ, North Country RZ, Tetlin-Tanacross RZ
<i>Galeopsis tetrahit</i>	hempnettle	50	2	McCarthy RZ , Big Volcanoes RZ
<i>Tripleurospermum inodorum</i>	scentless false mayweed	48	0	Nabesna RZ, Upper Copper River RZ, McCarthy RZ

Latin Name	Common Name	2014 AKEPIC Rank	Known Vouchers	Found in Following Reporting Zones
<i>Medicago lupulina</i>	black medic	48	0	Upper Copper River Front Country
<i>Rumex crispus</i>	curly dock	48	0	McCarthy RZ
<i>Polygonum aviculare</i>	prostrate knotweed	45	3	Nabesna RZ, McCarthy RZ, North Country RZ, Upper Copper River RZ
<i>Amaranthus retroflexus</i>	pigweed	45	0	Upper Copper River RZ
<i>Lappula squarrosa</i>	European stickseed	44	5	Nabesna RZ, Upper Copper River RZ, McCarthy RZ
<i>Plantago major</i>	common plantain	44	1	McCarthy RZ, Nabesna RZ, North Country RZ, Upper Copper River RZ
<i>Thlapsi arvense</i>	field pennycress	42	1	Nabesna RZ, McCarthy RZ, Upper Copper River RZ, Big Volcanoes RZ
<i>Silene noctiflora</i>	night-blooming cockle	42	0	McCarthy RZ
<i>Silene latifolia</i>	bladder campion	42	0	Upper Copper River RZ
<i>Stellaria media</i>	common chickweed	42	1	McCarthy RZ, Nabesna RZ, Big Volcanoes RZ
<i>Descurainia sophia</i>	flixweed	41	0	Big Volcanoes RZ, McCarthy RZ, Nabesna RZ, North Country RZ, Upper Copper River RZ
<i>Capsella bursa-pastoris</i>	shepherd's purse	40	1	Big Volcanoes RZ, McCarthy RZ, Nabesna RZ, North Country RZ, Upper Copper River RZ
<i>Papaver croceum</i>	Icelandic poppy	39	1	Nabesna RZ (Ellis Property)
<i>Chenopodium album</i>	common lambsquarter	37	1	Big Volcanoes RZ, McCarthy RZ, Nabesna RZ, North Country RZ, Upper Copper River RZ
<i>Cerastium fontanum ssp. vulgare</i>	mouse ear chickweed	36	0	McCarthy RZ, Nabesna RZ, North Country RZ
<i>Veronica serpyllifolia</i>	Thyme-leaf speedwell	36	2	McCarthy RZ
<i>Senecio vulgaris</i>	common groundsel	36	1	McCarthy RZ
<i>Matricaria discoidea</i>	pineapple weed	32	0	McCarthy RZ, Nabesna RZ, North Country RZ, Upper Copper River RZ
<i>Lepidium densiflorum</i>	common pepperweed	25	1	McCarthy RZ, Nabesna RZ, Upper Copper River RZ
<i>Turritis glabra</i>	tower rockcress	-	0	McCarthy RZ
<i>Papaver somniferum</i>	opium poppy	-	0	McCarthy RZ (private)
<i>Lupinus polyphyllus</i>	big leaf lupine	-	0	adjacent, Yakutat RZ
<i>Erysimum cheiranthoides subsp. cheiranthoides</i>	wormseed mustard	-	3	McCarthy RZ
<i>Kochia scoparia</i>	kochia	-	1	adjacent - Silver Springs subdivision, Copper Center - 2013 voucher with ALA
<i>Erysimum capitatum</i>	sanddune wallflower	-	1	McCarthy RZ, Upper Copper River RZ

Appendix B: List of Maintained Trails and Survey Efforts.

Name	Use Type	Location	Last Year Surveyed	Invasive Species Documented
Batzulnetas and Fish Wier	ORV	Nabesna Rd mile 8.5	2014	common plantain
Bonanza Mine	Hiking	Kennecott Mines NHL	2015	common dandelion, common plantain, white clover and alsike clover
Caribou Creek	ORV	Nabesna Rd mile 19.2	2015	none
Chititu Camp	Hiking	May Creek	2015	common dandelion, common plantain and white clover
Copper Lake	ORV	Nabesna Rd mile 12.2	2015	narrowleaf hawksbeard, common plantain, Shepherd's purse, common chickweed and prostrate knotweed
Crystalline Hills	Hiking	McCarthy Rd mile 34.7	2010	none
Dan Creek	Hiking	May Creek	2009	common dandelion, common plantain and white clover
Dixie Pass	Hiking	McCarthy Rd mile 14.5	2010	none
Donoho Basin	Hiking	Kennicott Valley	2015	none
Erie Mine	Hiking	Kennecott Mines NHL	-	Unsurveyed
Jumbo Mine	Hiking	Kennecott Mines NHL	2015	common dandelion, common plantain, white clover and alsike clover
Kennecott Glacier Toe	ORV	McCarthy	2014	common dandelion and white clover
Kotsina Trail	ORV	McCarthy Rd mile 14.5	2010	common dandelion
Lost Creek	ORV	Nabesna Rd mile 30.8	2014	none
McCarthy Creek	Hiking	Nazina Road mile 1	2014	common dandelion
Nugget Creek	ORV	McCarthy Rd mile 14.5	2014	common dandelion, common plantain, white clover, alsike clover and pineapple weed
Old Wagon Road	ORV	McCarthy -Kennecott	2009	common dandelion
Public Use Cabin	Hiking	May Creek	2015	common dandelion
Rambler Mine	Hiking	Nabesna Rd mile 42	2014	none
Reeve's Field	ORV	Nabesna Rd mile 40.2	2015	none
Root Glacier	Hiking	Kennecott Mines NHL	2015	common dandelion, common plantain, common timothy
Skookum Volcano	Hiking	Nabesna Rd mile 36.2	2009	none
Soda Lake	ORV	Nabesna Rd mile 31.8	2014	none
Suslota Lake	ORV	Nabesna Rd mile 11	2009	none
Tanada Lake	ORV	Nabesna Rd mile 24	2010	none
Trail Creek	ORV	Nabesna Rd mile 29	2010	none
Viking Lodge	Hiking	Nabesna Rd mile 21.8	2014	common plantain
West Glacier Trail	Hiking	McCarthy	2009	common dandelion
Young Creek	ORV	May Creek	2015	common dandelion, white clover and alsike clover

Appendix C: List of Float Plane Lakes and Elodea Surveys.

Lake Name	Access	Reporting Zone	Inside the Park	Last Year Surveyed
Carden Lakes	Plane	Tetlin-Tanacross-North Country	Yes	-
Chelle Lake	Plane	Upper Copper River Front Country	Yes	-
Copper Lake	Plane	Nabesna Front Country	Yes	2014
Crystall Lake	Plane	Upper Copper River Front Country	Yes	-
Donoho-Upper/Lake	Foot	McCarthy Front Country	Yes	-
Jack Lake	Road	Nabesna Front Country	Yes	-
Grizzly Lake	Plane	Wrangell Mountians	Yes	2014
Hanagita Lake	Plane	St. Elias-Chugach Mtns	Yes	2015
Lake Louise	Road	Upper Copper River Front Country	No	-
Lake Redfield	Plane	Coastal-Icy Bay	No	-
Long Lake	Road	McCarthy Front Country	Yes	2015
Long Lake	Road	Nabesna Front Country	Yes	-
Ptarmigan Lake	Plane	Tetlin-Tanacross-North Country	Yes	-
Rock Lake	Plane	Tetlin-Tanacross-North Country	Yes	-
Ross Green Lake	Plane	St. Elias-Chugach Mtns	Yes	-
Situk Lake	Foot	Coastal-Icy Bay	No	-
Steamboat Lake	Plane	St. Elias-Chugach Mtns	Yes	-
Summit Lake	Plane	St. Elias-Chugach Mtns	Yes	2015
Tanada Lakes	Plane	Nabesna Front Country	Yes	2013
Tebay Lakes	Plane	St. Elias-Chugach Mtns	Yes	2013
Tolsona Lake	Road	Upper Copper River Front Country	No	2014
Twin Lakes	Road	Nabesna Front Country	Yes	2014
Miller Lake	Plane	Upper Copper River Front Country	Yes	-
Mesa Lake	Plane	Wrangell Mountians	Yes	-
Sheep Lake	Plane	Wrangell Mountians	Yes	-

Appendix D: 2015 Herbicide Treatments Press Release



National Park Service
U.S. Department of the Interior

Wrangell-St. Elias
National Park and
Preserve

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Wrangell-St. Elias National Park and Preserve News Release

For Immediate Release – May 11, 2015

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2015 Proposed Herbicide Treatments Targeting Invasive Plants

Copper Center, Alaska – Wrangell-St. Elias National Park and Preserve (WRST) is home to complex native communities of plants and animals that have developed over millions of years. The delicate natural balance within these communities is threatened by the influx of invasive species, which are considered the second greatest threat to biodiversity after habitat loss.

Invasive species are capable of rapid proliferation, are expensive to remove and difficult to control once established. These species are a concern because they can out-compete native species for limited resources and can change the structure and function of ecosystems. Establishment of invasive species can also result in loss of habitat and food sources for native insects, birds, fish, and other wildlife.

The Exotic Plant Management Team at WRST has been documenting and managing invasive plants in and around the park since 2003. Herbicides have been used in WRST since 2011 to control infestations which have not responded to manual control efforts. The following are the proposed herbicide treatments for 2015:

Park Headquarters and Seasonal Housing in Copper Center

- Proposed treatment area: 0.2 acres
- Proposed herbicide: Milestone and AquaMaster
- Proposed application window: May 25th to September 18th.

Joint NPS/BLM Maintenance Yard in Glennallen

- Proposed treatment area: 0.4 acres
- Proposed herbicide: Milestone and AquaMaster
- Proposed application window: May 25th to September 18th.

Ranger Station and Seasonal Housing in Slana

- Proposed treatment area: 0.06 acres
- Proposed herbicide: Milestone
- Proposed application window: May 25th to September 18th.

All proposed applications will be made by State of Alaska certified pesticide applicators using a precise, spot application method with calibrated backpack sprayers. These application techniques as well as the chemical makeup

of the herbicides used reduce the potential for translocation in the soil. The timing of herbicide applications will be dependent on the target plant's growth stage and the weather.

Appendix E: 2015 Weed Smackdown Press Release

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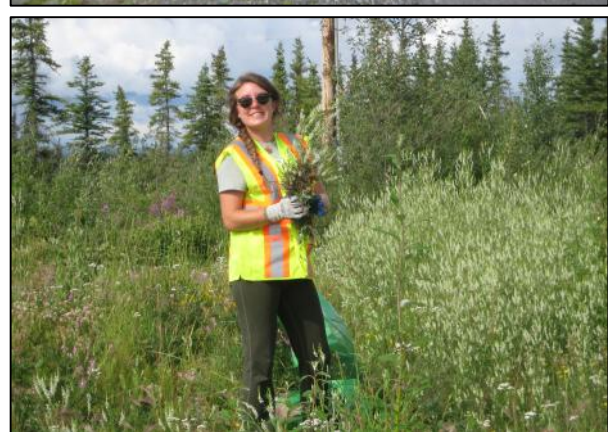
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Wrangell-St. Elias National Park and Preserve

Invasives Lose at WRST

Wrangell-St. Elias National Park and Preserve and other partners of the Copper Basin Cooperative Weed Management Area (CB-CWMA) hosted the 3rd Annual Glennallen Weed SmackDown recently with 27 participants pulling 1,319 pounds of invasive White Sweetclover. The event was topped off with pizza and free water bottles. (Submitted by Miranda Terwilliger, WRST)



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

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